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CONTENT

Abstract:
This paper deals with application of Barkhausen noise for analysis of surface integrity in turning and grinding operations. The stress state is analyzed in relation to tool wear.
The results of measurements show that the residual stresses are not homogenous on the machined surface. This homogeneity depends on tool wear and stability of cutting process. Application of non-destructive testing through the Barkhausen noise is more suitable for grinding operations. Application of Barkhausen noise testing for turning operation will require the next research.
The higher presented conclusion should be related to the cutting conditions applied in the experimental part of this paper. Turning and grinding process are affected by many factors and their influence can modify obtained results of measurements.

Abstract:
Efforts have been a foot to study and analyze the performance of magnetic fluid based squeeze film between porous infinitely long rough rectangular plates. A magnetic fluid is used as lubricant and the external magnetic field is oblique to the lower plate. The random roughness of the bearing system is modeled by stochastic random variable with non-zero mean, variance and skewness.
The associated stochastically averaged Reynolds equation is solved with suitable boundary conditions in dimensionless form to obtain the pressure distribution resulting in the calculation of load carrying capacity. This investigation indicates that the bearing system registers an improved performance as compared to that of bearing system working with conventional lubricant. It is observed that the bearing suffers owing to transverse surface roughness in general. However, the present study reveals that the negative effect of the standard deviation and porosity can be compensated to some extent by the positive effect of magnetization parameters in the case of negatively skewed roughness by suitably choosing the aspect ratio. Further, this compensation becomes more evident when negative variance is involved.

Abstract:
Universal worm and helical-worm gear units are among the mechanisms that operate with a relatively low level of efficiency for which their thermal power capacity is paid extremely high attention. Value of thermal power limit for gearboxes with free input shaft is particularly defined in the catalogue, enabling their correct choice, i.e. enables the timely assessment of the needs of taking certain procedures in order to overcome problems that may arise due to excessive heating of reducers. Thermal power capacity of motor gear reducer is taken into account when defining a range, i.e. when combining (connecting) the motor and gearbox which is made according to the catalogue, so that the problem is not noticeable to the customer. Today, in an era of tough competition, it is necessary to consider the impact of external overhung and axial loads applied to output shaft on the thermal power capacity of gearbox, so that it could be eventually taken into account when gear reducer is selected.
This paper deals with the problem of reducing of thermal power capacity of gearboxes due to external loads of output shaft, i.e. it deals with additional heating due to increased power loss in the bearings. At the end it is concluded (as expected) that the effect of those loads is negligible and there is no need to take them into account when selecting the gear unit, because it does not achieve any effect.

Abstract:
In past few decades significant changes happened in the field of technological development of agricultural tractors, leading to great improvements in different aspects of their operation. This is enabled, above all, by introducing of electronic control systems and their wide application in different systems of the tractor. Due to these changes, agricultural tractor has evolved from rough and robust heavy duty machine to high-tech system capable of executing fully new functions and achieving much higher level of overall working results.
A few main examples can be named, such as higher energy efficiency, lower emission, higher quality of agrotechnical operations, better soil protection and enhanced working conditions for human operator. New technologies, whose application has led to achieved results, are mostly based on mechatronic systems. This paper will give a basic overview of current achievements and discuss possibilities for future development.

Abstract:
The thermal environment and air quality in a passenger car can affect driver's and passengers' health, performance and comfort. Due to spatial and temporal variation of state variables and boundary conditions in the vehicle cab, the heating, ventilating and air-conditioning (HVAC) does not have to be designed to provide a uniform environment, especially because of individual differences regarding to physiological and psychological response, clothing insulation, activity, air temperature and air movement preference, etc. Therefore the system should be able to generate preferred local environmental conditions, even on individual body part level.
Comfortable thermal conditions in the vehicle are easier to achieve in cold conditions than in warm conditions, therefore this paper focuses on human thermal sensation in warm ambient. Vehicle HVAC system delivers conditioned air into the cab space, and human body is cooled by convection and sweat evaporation. The heat loss from the body will mainly depend on air velocity and temperature over the individual body part. The resulting distribution of skin temperature over the body surface will dictate human thermal sensation and thermal comfort.
The aim of this paper is to provide an overview of local microclimate parameters which HVAC system should achieve in vehicle cab in warm ambient, regarding thermal sensitivity of individual parts of human body obtained from empirical data. Required conditions are prerequisite for air distribution design that would have optimized performance from the point of view of thermal comfort as well as energy consumption, in comparison with the conventional approach.

Abstract:
The objective of this paper is to establish standardization concept that enhances the communication process and facilitates better document management as a management tool. Basically the study is conducted by literature review on communication planning; flow, structure and a questionnaire survey were distributed among the stakeholders in the construction industry.
The respondents in this study are stakeholders from the city of Ipoh, which located in the state of Perak, Malaysia. In all 45 respondents were involved in this research. The result indicates that standardization and standard communication instrument play an important role in effective communication. It is understood that improvements in these standards documentation and communication instrument is needed. Implication in this studies include the improvement of project communication processes and technologies on different functional levels may change the organization of future projects and how its business activities and work routines are designed, planned and performed.

Abstract:
Nowadays in environmental field, it is necessary to concern about the relation between economical expenses and technical level of actions for preserving the environment against negative factors. The following publication gives an overview Economic of the development of environmental protection. The impact of motorization, CO2 emissions and various fuels – fossil as well as biomass based fuels is given – are discussed in brief showing the need for future developments.
The environmental requirements do not only have a huge impact on energy generation in industry and society. Environmental protection has generally great influence on everyday life and placed high demands on research, development and infrastructure. However, the economic aspect is very important. In the following, the requirements, influencing factors and effects of environmental protection are presented from the economic point of view, on the example of operating supplies.

Abstract:
Solid waste management is a growing problem in Malaysia. For this reason the government of Malaysia through the Ministry of Housing and Local Government (MOHLG) have taken various measures to promote recycling amongst its population. Recently, a nationwide campaign was launched to get the people to recycle their wastes.
Recycling centers equipped with separate recycling bins for different recyclables have been set up across the country. In addition, publicity drives using the newsprint, the electronics media on top of the other modes of information dissemination such as seminars, workshops and meetings were held on a continuous basis over the years. However, despite the effort little has been achieved due to the lack of participation from the households. This paper identifies the reasons for the failure of the campaign. Data were gathered using a mail-out questionnaire to 400 randomly chosen households. Quantitative analysis made based on 347 responds received indicated that although all of the respondents had a positive attitude towards recycling only a few did recycle. The poor response is largely due to the lack of facilities provided. Many residents are turned down when they are unable to locate the recycling centers and if they are able to locate one, it seems too troublesome to be needed.

Abstract:
The exploitation of wind force has been known for a couple of thousand years and it is being linked to the beginning of the human civilization when man decided to make use of this kind of energy. An effective step in transforming wind energy into electricity is also building wind energy plants/parks where the main concept is to maximize the possibilities of the given location.
The following article is focused on wind energy as one of the mostly used renewable energy sources. The goal of this paper is to familiarize the reader with the current situation of electrify generation using wind energy in the Slovak Republic and it's share on the market. Bringing the basic patterns of usage of this energy and the positive impact on the environment. The contribution shows the current share of wind energy in Slovakia and the subsequent plans and visions of the Slovak Republic as EU Member States, which wants to increase the proportion of use of this energy in the coming years.

Abstract:
In this paper we demonstrate a detailed overview of the history of forecasting software applications over the past decades, concentrating especially on the interaction between hardware and software. Additionally we present a framework by describing important developments of forecasting techniques in terms of hardware and software environments.
We then focus on the application areas of forecasting software modules in business and planning environments which are often partially automated due to the large number of time series involved. Finally we make some suggestions about in which direction forecasting software should be improved.

Abstract:
In this work the multi-agent technology is exploited in order to develop a Multi-Agent Robotic System with the aim to simulate and control a production chain and lays the bases for the introduction of the agent technology into a manufacturing industrial process.
In particular, a simplified washing-machine production system has been studied and agentified. More in detail, automatic production, negotiation, supplying of pieces and management of the production have been considered.
The overall simplified system has been implemented by means of the JADE (Java Agent Development Environment) platform, compliant with the FIPA (Foundation for Intelligent Physical Agents) specifications, and extensively tested in order to prove the robustness and effectiveness of the approach. The developed simplified system has been conceived in order to be easily expansible, thanks to its modularity and structure, and ready to be upgraded.

Abstract:
This post is dedicated to acoustic waves, which is part of the physical fields that surround the man, acting on the body, affecting his health, behavior, activity, efficiency and wellbeing. Frequency distribution of sound waves, infrasound and ultrasound affecting human biosphere. However, if the rate exceeded the intensity of the initiative, becoming the acoustic load producing a stress event with the following characteristics of nonspecific adaptive responses with normal speech.
This article provides basic terminology, determinants and physical properties of acoustic wave propagation environment. Discusses the effects of sound waves to a man and an example of noise reduction by optimizing technological elements of the mechanical system.

Abstract:
This paper deals with questions of production supply of assembly plants. It is a general aim to resolve the trade-off between production supply service level and engrossed component stock level in production.
On the one hand by pumping components to production in larger portions supply processes become simpler and quicker.
On the other hand large portions cause high level of component stock. By inserting unpacking stations between warehouse and production lines, optimal system can be achieved. With the help of computer simulation software a model a single-stage kanban controlled production supply system was modeled where production lines receive components directly from warehouse. After that we simulated the effects of establishing unpacking stations that distribute components for production lines and determined the inventory level reduction.

Abstract:
The sustainability is strongly connected to the conception of Food Sovereignty, which became an everyday issue again in the last years among the people dealing with agriculture. Considering the philosophy of the movement, the farmers have a right to produce local food, and the consumers have a right to decide by whom and how produced provisions intend to buy. In our research we examined the attitude of the consumers toward the natural foodstuff. The tools of the marketing have a role in the positioning of these products.
Regional marketing is a new concept, which is not widely known in Hungary, there are only very few and limited experiences with it. It is a total of all the activities and at the same time a way of thinking, the aim of which is to take a product to the customers very efficiently.
In the South Great Plain Region several top-quality products are made and these products are Hungarian specialties. In this immense competition an image formed about a country, a part of a country or about a region has a considerable influence on the decision of customers – both on the national and international market.

Abstract:
This paper deals with the use of video detection to identify the occupancy of a parking place from image information. The video detection comes in handy for cases of large and indented car parks. Suitably mounted camera can cover large area and software can locate from its images occupied places. The whole video detection system interprets the situation at car park and information about free parking places could be displayed on navigation panels guiding the drivers to the nearest free places. An added value for the management is the real-time video overview about the situation.

Abstract:
In this paper is described the main ideas of national project "KEGA 3/7131/09 – Laboratory of production system program control". This project is focused to build of virtual laboratory and supplemental e-learning documents for several studying subject at our institute. This virtual laboratory serve for teaching automatic control principles and programming in flexible production via various control modes often used in the technical practice. In this laboratory there are applied real elements of control systems. By means of these laboratory students as future graduates of technical university can acquire and improve occupational competences demanded by actual labour market.

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A NEW ALGORITHM FOR FACILITY LOCATION PROBLEM BASED ON DYNAMIC MESH OPTIMIZATION

ABSTRACT:
This paper proposes Dynamic Mesh Optimization for the classical Facility Location Problem, we introduce this meta-heuristic which is a technique of evolutionary computation. A set of nodes that represent potential location solutions conform a mesh; it grows and moves dynamically throughout the search space. The algorithm performance has been compared with data set from literature. Computational results confirm the efficiency of the strategy we propose.

KEYWORDS:
Algoritm, location problem, Dynamic Mesh Optimization

INTRODUCTION

One of the most important decisions in the logistical planning is to establish where the locations have to be (whether factories, warehouse, markets, etc). The Facility Location Problem (FLP) has been widely studied by different authors, often specialists from Operation Research and Logistic areas. This kind of problem is a well-known NP-Hard combinatorial optimization problem which is encountered frequently in decision making process, beside in logistics system.

In FLP there is a set of locations at which we may build a facility (such as a warehouse), where the cost of building dependents of each location; furthermore, there is a set of client locations (such as stores, markets) that require to be serviced by a facility, and if a client at location j is assigned to a facility at location i, a cost of c_{ij} is incurred that is proportional to the distance between i and j. The objective is to determine a set of locations at which to open facilities so as to minimize the total facility and assignment costs.

An abundant literature on facility location problem is available. Beside, there are several type of them, such as uncapacitated facility location problem introduced by [4], [1] and capacitated facility location problem (CFLP) reported in [3] and [5]. In this paper we focus in the CFLP.

Moreover, various researches have shown the effective use of meta-heuristic in CFLP [10], [6]. This paper proposes to examine the capacitated facility location problem based on DMO, which is classifying as evolutionary computation techniques. Multiple types of nodes are generated in order to conform a mesh, which dynamically expands itself and moves across the search space. This meta-heuristic was created by [7], however all work deals with the optimization process in continuous approach; we modify the algorithm for optimization process in discrete context, such as CFLP.

The paper is structured as follows: In Section 2 is formulated the capacitated facility location problem, description of meta-heuristic and the algorithm steps are defined at Section 3. Computational results and the algorithm performance can be found in Section 4. Conclusions and future researches are outlined in Section 5.

PROBLEM DESCRIPTION

The CFLP is define on a graph G (V, E) where |V| = n, vertices (customer to meet) and "E" indicates the Euclidian distance by which the vertices are connected "V". The decision variable can be described as Xij = (0, 1): where (0) that vertex "j" is not assigned to the facility "i" and (1) otherwise. There is a set M(i) which represents the number of arcs that affect the vertex "i". In addition to each arcs poses a d(i,j) representing the minimum distances between "i" and "j". It is expressed therefore an integer value m_i, which represents nodes, allocated to an installation "i", where i = (1…k). For the capacitated facility location problem are established usually the following constrains:

- $\sum_{i=1}^{k} m_i = n$: *All customers have to be allocated.*
- $\forall i : \sum_{j=1}^{n} X_{ij} = m_i$: *"k" facilities have to cover all customers.*
- $\forall j : \sum_{i=1}^{k} X_{ij} = 1$: *Each customer has just one allocated facility.*

Nodes Generation in DMO

The dynamic nature of our proposal manifests in the generation of (I) the initial mesh; (II) intermediate nodes oriented toward the local optima; (III) intermediate nodes in the direction of the global optimum and (IV) nodes aiming at expanding the dimensions of the current mesh.

The model gives rise to the following parameters: (I) Ni → size of the initial mesh, (II) N → maximum size of the mesh across each cycle (Ni < N) and (III) M → number of cycles.

During the mesh expansion in each cycle, a weight w is defined using expression (1) as in [8], [9].

$$w = (w_0 - 1.4) \times \frac{M - j}{M + 0.4} \qquad (1)$$

DYNAMIC MESH OPTIMIZATION AS A META-HEURISTIC

The main idea of the DMO method is the creation and representation of a mesh in points according to the N-dimensional space wherein the optimization of $f(x_1, x_2, \ldots, x_n)$ is performed.

The mesh endures an expansion process toward the most promising regions of the search space but, at the same time, becomes finer in those areas where there exists points that constitute local ends of the function. The dynamic nature of the mesh is given by the fact that its size (number of nodes) and configuration both change over time. When it comes to the feature selection problem, nodes can be depicted as binary vectors $n(x_1, x_2, \ldots, x_n)$ of N components, one per attribute, with the component n_i = 1 if the i-th attribute is being considered as part of the solution or zero otherwise. In each cycle, the mesh is created with an initial number of nodes. Subsequently, new nodes are generated until an upper boundary in the number of nodes is reached. The mesh at the next cycle is comprised of the fittest nodes of the mesh in the former iteration. Along the search process, the node carrying the best value of the objective (evaluation) function so far is recorded, so n_g denotes the global end attained up to now by the search algorithm.

In the case of the facility location problem, the quality and evaluation function at the same time is displayed by expression (2), which is formulated in the classical FLP.

$$Eval(n) = \sum_{i}^{k} \sum_{j}^{n} d_{ij} \cdot X_{ij} \qquad (2)$$

THE DMO-FLP ALGORITHM

STEP 1. Generate the initial mesh for each cycle: At the beginning of the algorithm's execution, the initial mesh (binary values represented by decision variable) will be made up of Ni randomly generated nodes while in the remaining iterations, the initial mesh is built upon the selection of the best (in terms of evaluation measure) Ni nodes of the mesh in the preceding cycle.

STEP 2. Node generation toward local optima: The aim of this step is to come up with new nodes settled in the direction of the local optima found by the algorithm. For each node n, its K-nearest neighbor nodes are computed (the Hamming distance is a suitable option for the FLP). If none of the neighbors surpasses n in fitness function value, then n is said to be a local optimum and no nodes are begotten out of it in this step. Conversely, suppose that node n_e is "better" than n and the rest of its neighbors. In this case, a new node arises somewhere between n and n_e.

The proximity of the newly generated node n^* to the current node n or to the local optimum n_e is contingent upon a factor r which is calculated based on the evaluation function values both at nodes n and n_e. Each component of n takes either the value of n_i or ne_i according to a rule involving a stochastic value. The threshold r determining how every component n_i^* is set is calculated by expression (3).*

$$r = 1 - 0.5 \frac{Eval(ne)}{Eval(n)} \qquad (3)$$

f(n, ne, r) : For each component n_i: If Random() < r then $n_i^* = ne_i$ otherwise $n_i^* = n_i$

Notice from (4) that the lower the ratio between Eval(n) and Eval(ne), the more likely it is that ni takes the value of the i-th component of the local optimum.*

STEP 3. Node generation toward global optimum: Here the idea is the same as in the previous step but now r is computed differently and a function g is introduced. Needless to say that n_g represents the global optimum found thus far by the algorithm in each cycle, see expression (4).

$$r = 1 - 0.5 \frac{Eval(ng)}{Eval(n)} \qquad (4)$$

g(n, ng, r) : For each component n_i: If Random() < r then $n_i^* = ng_i$ otherwise $n_i^* = n_i$

STEP 4. Mesh expansion: In this step, the mesh is stretched from its outer nodes using function h, i.e. using nodes located at the boundary of the initial mesh in each cycle. The weight w depicted in (1) assures that the expansion declines all over the search process (i.e., a bigger expansion is achieved at the early cycles and it fades out as the algorithm progresses). To determine which nodes lie in the outskirts of the mesh, those having the lowest and greatest norm are picked. Remark that, in this step, as many outer nodes as needed are selected so as to fill out the maximum mesh size N. The rules governing this sort of node generation can be found next:

For each node nl in the lower boundary (those with lower norm):
h(nl, w) : For each component n_i: If Random() < w then $n_i^* = 0$ otherwise $n_i^* = nl_i$
For each node nu in the upper boundary (those with greater norm):
h(nu, w) : For each component n_i: If Random() < w then $n_i^* = 1$ otherwise $n_i^* = nu_i$
In the context of facility location, the norm of a node (vector) is the number of its components set to 1. Finally, Algorithm 1 outlines the workflow of the DMO approach. It is also worth remarking that no direct search algorithm guarantees to find the global optimum no matter how refined the heuristic search might be.

Algorithm 1 The DMO meta-heuristic

```
Randomly generate Ni nodes to build the initial mesh
Evaluate all the mesh nodes
Repeat
   for each node n in the mesh do
      Find its K-nearest neighbors
      n_best ← the best of its neighbors
      if n_best is better than n then
         Generate a new node by using function f
      end if
   end for
   for each initial node in the current mesh do
      Generate a new node by using function g
   end for
   Repeat
      Select the most outward node of the mesh
      Generate a new node by using function h
   until MeshSize = N
   Select the best Ni nodes of the current mesh and
set up the next mesh
until CurrentIteration = M
```

COMPUTATIONAL RESULTS

In this section some computational results are presented in order to evaluate the performance of the algorithm described in Section 3. Algorithm runs have been carried out on a personal computer equipped with a Intel Pentium dual-core processor 1.6 GHz and 1 GB of ram memory. The FLP-DMO was coded Java 1.5.0.
The configuration of the DMO-FLP has been defined as follows: a mesh with 40 nodes is used, 15 of them regarded as initial nodes, therefore is necessary to generate 25 nodes per cycle according with Algorithm 1. Finally 100 iterations were executed.

Table 1: Numerical results for DMO compared to GA.

	DMO		GA	
Instances	bestf	Avg.	Bestf	Avg.
6Cap10	2882.2	2974.6	2796.1	2984.3
10Cap10	3029.3	3102.7	2998.3	3042.2
12Cap20	2225.1	2386.5	2227.3	2324.6
16Cap30	2032.1	2234.4	2002.7	2103.4
20Cap40	1824.0	1975.8	1796.1	1854.8

The algorithm is tested into five different problems from literature. These problems are derived form a benchmark datasets found in [2].

In Table 1, the best found solution (bestf) and run time (RT) are reported for two algorithms: DMO and Genetic Algorithm (GA). For Generic algorithm were fixed a group of parameters figured in Table 2.

Table 2: GA parameters

Parameters	Value
Population Size	300
Crossover rate	0.90
Mutation rate	0.10
Number of Runs	20

Starting from figures of Table 1 we obtained non significant differences between these algorithms, due to results of Wilconxon coefficient as statistic test.

CONCLUSIONS & FUTURE RESEARCH

In this paper, Dynamic Mesh Optimization is presented as evolutionary algorithm. Moreover, the performance of DMO in Facility Location Problem outcomes relevant for datasets found in literature. According with numerical and statistic test, we can conclude that DMO can solve CFLP in similar way than Genetic Algorithm.
Future researches would focus to combine Dynamic Mesh Optimization with Local Search strategy in order to improve the solution quality. Beside we have to consider sensitivity analysis of the fixed parameters in the algorithm.

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THE NEEDS FOR STANDARDIZATION OF DOCUMENT TOWARDS AN EFFICIENT COMMUNICATION IN THE CONSTRUCTION INDUSTRY

ABSTRACT:
The objective of this paper is to establish standardization concept that enhances the communication process and facilitates better document management as a management tool. Basically the study is conducted by literature review on communication planning; flow, structure and a questionnaire survey were distributed among the stakeholders in the construction industry. The respondents in this study are stakeholders from the city of Ipoh, which located in the state of Perak, Malaysia. In all 45 respondents were involved in this research. The result indicates that standardization and standard communication instrument play an important role in effective communication. It is understood that improvements in these standards documentation and communication instrument is needed. Implication in this studies include the improvement of project communication processes and technologies on different functional levels may change the organization of future projects and how its business activities and work routines are designed, planned and performed.

KEYWORDS:
Communication, Standardization, Standard Document, Construction Industry

INTRODUCTION

Nowadays people have more understanding of the needs to practice good communication in the society in order to deliver a meaningful communication. Construction is a fragmented and dynamic sector with a project based nature. This makes that many stakeholders operate in frequently changing sets of relationship which are contractually driven (Dainty et all 2006). There are different communication instruments, such as contracts, specifications, reports, manuals, schedules, calculations, drawings, computer files, disks, print-outs, photographs, agenda's and minutes of meetings (Knipe, 2002). The management of documentation and communication used in a project is used by a number of subcontractors, the storage and retrieval thereof for further use. All these documents describe different range of usage at different project lifecycle. It is understood that without a proper standard documents and communication structure, the development of a project could be delayed. The purpose of this research paper is to improve communication in structure, flow and planning in the construction industry for a better management of documentation. The importance of process-oriented approach to the success of any business is very well documented (Garvin, 1995; Hammer, 2002; Zairi, 1997). Management process especially in documentation in every organization is very important as it is used as tools for analysing and enhancing any business process. Nowadays people have more understanding of the needs to practice good communication in the society in order to deliver a meaningful communication. Construction is a fragmented and dynamic sector with a project based nature. This makes that many stakeholders operate in frequently changing sets of relationship which are contractually driven (Dainty et all 2006). There are different communication instruments, such as contracts, specifications, reports, manuals, schedules, calculations, drawings, computer files, disks, print-outs, photographs, agenda's and minutes of meetings (Knipe, 2002). The management of documentation and communication used in a project is used by a number of subcontractors, the storage and retrieval thereof for further use. All these documents describe different range of usage at different project lifecycle. It is understood that without a proper standard documents and communication structure, the development of a project could be delayed. The purpose of this research paper is to improve communication in structure, flow and planning in the construction industry for a better management of documentation. The importance of process-oriented approach to the success of any

business is very well documented (Garvin, 1995; Hammer, 2002; Zairi, 1997). Management process especially in documentation in every organization is very important as it is used as tools for analyzing and enhancing any business process.

RESEARCH OBJECTIVE

The objective of this research is to identify the needs of better organization standardization which leads to good communication process in order to remain competitive and to emphasize in providing a better communication tool and standardization. This is very important to foster better understanding of what the organization need at the same time considering time, cost and quality in the construction industry. Good document standardization is needed to increases the communication efficiency within the stakeholders and different parties in the industry. Documentation control brings to good information sharing between the team workspaces whereby it leads to cooperation within the members who involved the project. To summarize shortly, this papers intend to discuss and suggest on the importance of standardization towards a good communication in the organization and off course as well as in the construction industry.

DEFINITION OF STANDARDIZATION

Standardization is an important benefit of process documentation. Well-defined process documents can be used to develop standard operating procedures (Bae, 1993; Symons and Jacobs, 1997). Document standardization will help to achieve consistency in operations. It is well understood that proper document standardization improves management procedure whereby at the same time it reduces the conflict among current employees and give an overall idea on how management system should be conducted. The main purpose of standardization is to develop a specific level of conformity (Smit & Cronje, 2002).

Project documentation and records which has been standardize helps to establish baseline and communication process in the project team. Document which has been standardize in the most professional way define requirement to support and enhance the management function daily especially in delivering a good communication. By having good document standardization, internal communication between the various levels and functions will meet it effectiveness. Standardization contributes to increased productivity because the documents and communication from one project to the next are the same or similar and thereof less confusion is created. In this lines, a better communication plan, communication flow and instrument and last but not least the communication structure is very important in enhancing a good standardization (Zairi, 1997).

DEFINITION OF COMMUNICATION

Communication is a process whereby information is encoded and imparted by a sender to a receiver via a channel/medium. The receiver then decodes the message and gives the sender a feedback. Communication requires that all parties have an area of communication commonality. There are auditory means, such as speaking, singing, and sometimes tone of voice, and nonverbal, physical means, such as body language, sign language, paralanguage, touch, eye contact, or by using written communication. Communication is a process by which we assign and convey meaning in an attempt to create shared understanding. This process requires a vast repertoire of skills in intrapersonal and interpersonal processing, listening, observing, speaking, questioning, analyzing and evaluating. It is through communication that collaboration and cooperation occur. Basically, there are three 3 types of communication in business, written, verbal and non- verbal. Written includes letters, emails, memos, reports and formal documents. Verbal communication includes chats, presentation and voicemails. Non-verbal communication is using signals to communicate and studying body language (Simon, 2002).

COMMUNICATION AND STANDARDIZATION

Communication is pervasive in all areas of organizational life. Communication is process of transferring information from one source to another. Communication is commonly defined as "the imparting or interchange of thoughts, opinion, or information by speech, writing, or signs" Communication can be perceived as a two-way process in which there is an exchange and progression of thoughts, feelings or ideas towards a mutually accepted goal or direction (Simon, 2002). The construction industry depends on external communication for dealing with ever more complex inter-organizational relationships. Project communication management tools and techniques ensure the timely and appropriate generation, collection, dissemination, storage and ultimate disposition of project information (Wagner & Hollenbeck, 1992). For this, communication planning, flow, structure and document standardization in an organization are very important in enhancing the business project.

Proper and good communication skills in terms of verbal, written and contractual are very essential at all stages of project from inception till completion. Standardization in document will enhance the concept of communication skills in any organization. With a proper standardization system, procedure and policy in the organization, it will boost the communication in all aspect such as planning, controlling, monitoring and as well as organizing. Information flow through proper communication channels and standardized documentation is a key enabler to run any project successfully (Burke, 2003).

TYPES OF COMMUNICATION

Verbal communication involves using speech to exchange information with others where we communicate verbally in face to face conversation. Meetings, interviews, conferences, speeches, and phone calls are other forms of verbal communication. We can communicate verbally to exchange ideas, understand diverse points of view, and solve problems.

Verbal skills are among those most valued by employers to improve professional work performances (Melody, 2002). In verbal communication, one person sends a message to another person or group using speech. Communication is successful only when the speaker and listener understand each other. Because the average person is exposed to thousand of messages every day, messages must rise above competing information to gain our listener's attention. After receiving messages, listeners must be able to interpret or decode its meaning.

A written communication is a communication by means of written symbols either printed or hand written. Also include questions related to communicating with others through written word like emails, notes, memos and proposal as well. For business purposes, managers must deliver their messages clearly, sufficiently and effectively if they want to be successful. Poorly written messages create confusion and fail to achieve intended purpose. Communicating through writing is essential in the modern world and is becoming ever more so as we participate in what is now commonly called the information age. Written messages do not have to be delivered on the spur of the moment; instead they can be edited and revised several times before they are sent so that the content can be shaped to maximum effect. Meanwhile written communication are often considered more appropriate for complex business messages that include increased customer/client satisfaction, improve inter organizational efficiency and enhanced image in the community and industry (Gail, 2004).

Contract communication process is a process communicating through contractually by several official documentations within designated authority. Such direction should be in writing, but may be provided orally in meetings, briefings, phone or video conferencing. A written record of direction should be created for such oral directions. All formal written correspondence to the contractor should include the contract number within the subject line. Formal communication from the contractor should follow a formal contract correspondence tracking system with commitments appropriately assigned and tracked for timely completion. The contractor will be required to communicate with other team member and staff in conjunction with its responsibilities and work scope (Justin & Marc, 2009)

COMMUNICATION FLOW AND INSTRUMENTS

Communication flows in four directions: downwards, upwards, horizontally and laterally. These basic communication flows are shown in Figure 1.

Communication which flows from the superiors to subordinates is known as downward communication. In an organization structure, the superiors utilize their abilities to attain the desired targets which mean that they may be engaged in issuing commands, directions and policy directives to the persons working under them (at lower levels). Under downward communication, the superiors anticipate instant recital of a job that's why it is highly directive. This may include statements of organizational philosophy, policies, project objectives, schedules, budgets, and constraints, position descriptions and other written information relating to the importance, rationale and interrelationships and interactions of various departments' projects, and jobs in an organization (Smit & Cronje, 2002).

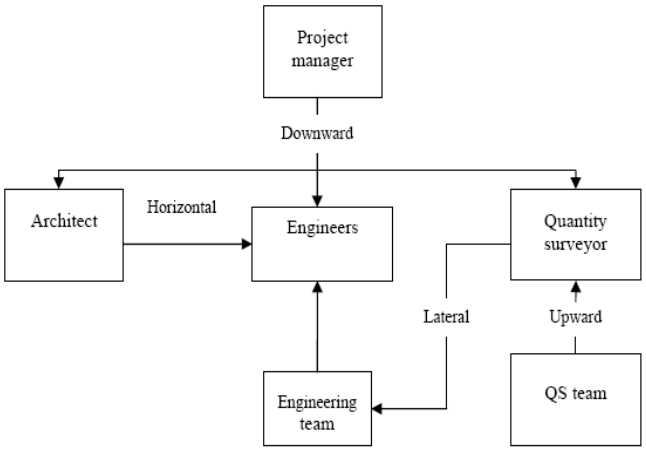

Figure 1 Communication Flows: Source (Adapted from Smit & Cronje, 2002)

According to Smit & Cronje (2002), upward communication can be very beneficial for the companies because it can increase the participation of the employees and exposes their issues and problems. In this type of communication, Information provided to upper management for their purposes of evaluating the overall performance of the projects for which they are responsible, or to refine organizational strategy. Meanwhile horizontal communication occurs across the same level and facilitates the linking of different areas of expertise and this may encourage innovation. In an organization, lateral communication works in contrast to traditional top-down, bottom-up communication methods. Individuals participating in this non-traditional form can often become aware of new events before those individuals higher up on the communication ladder. Information spread through lateral communication often moves at a faster pace than that of tradition methods and allows individuals with a diverse.

INFORMAL COMMUNICATION

Grunig (2000) stated informal communication takes place due to the individual needs of the members of an organization and subsists in every organization. Normally, such communication is oral and may be expressed even by simple glance, sign or silence. Informal communication, is implicit, spontaneous multidimensional and diverse. It often works in group of people, i.e. when one person has some information of interest; he passes it on to his informal group and so on. In spite on many advantages, informal communication has certain disadvantages. Informal communication contains facts, deceptions, rumors and unclear data. The informal channels of communication may transmit completely imprecise information that may harm rather than help an organization. In

addition, it is impossible to fix the responsibility for its origin or flow of information. However, for the efficient working of any organization both formal and informal communications are required.

PROJECT COMMUNICATION INSTRUMENT

Project communication, as shown in Figure 2, is internal and external communication between members of an organization at all levels in order to achieve a mutual goal or goals.

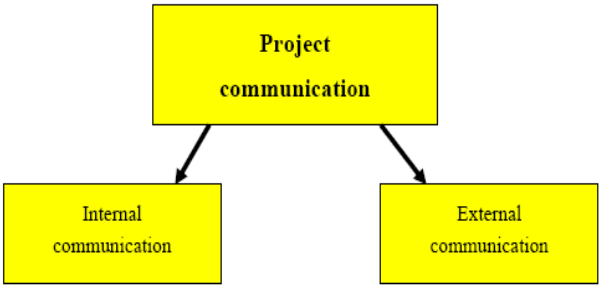

Figure 2. Project Communication:
Source: (Adopted from Le Roux, 1999)

To achieve goals, it is necessary to communicate or interact at various levels of the organization and as this is known as internal communication. Members also have to communicate with individuals or groups who are not members of the project. This is referred to as external communication. The project communication instrument section defines how and what the project will communicate with its stakeholders. This communication occurs within the team and between the team and external entities. The Project communication instrument identifies the processes, methods, and tools required to ensure timely and appropriate collection, distribution, and management of project information for all project stakeholders. It also describes the team's strategy for communicating internally among team members and company personnel, as well as externally with vendors and contractors. In the construction industry, there are some communication instruments that are basically used among the stakeholders. This types of communication includes estimation, cost plan, payment advice, cost report, escalation costing presentation, final accounts, standard document, contract document and as well drawings. All this instruments are given priority by the professionals from inception till a completion of a project. Standardization of documents through a rigid system used by the construction company allows them to work in order and deliver messages at the right time (Le Roux, 1999)

COMMUNICATION STRUCTURE

Structure defines lines of authority and communication, specifies the mechanism by which tasks and programmes are accomplished. The performance depends on the coordination between the parties involved, the system of communication, the culture of the project, the staff members and the communication structure (Aaker, 1992. 331).

Intercultural communication is in many ways far more complicated, e.g. languages, because participants need to be aware of an increased potential of misunderstanding. Project team members are part of different sub-cultures. In a project team there may be communication problems because of these differences and expressions in different professions (Peltoniemi & Jokinen, 2004:3-4).

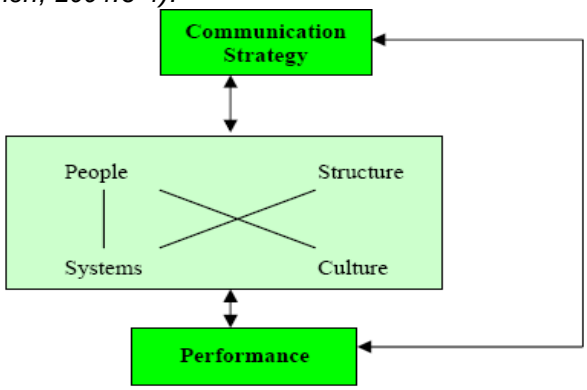

Figure 3. The framework for analyzing projects:
Source :(Adapted from Aaker, 1992)

People, systems, culture and structure may be used as communication strategies to ensure the performance of the project. Every sub-project has a different set of people, systems and culture to that of the main project. This strains the project, increases communication problems and makes it less likely to complete a project without incidents. Basically it's understood that people in the organization will used the proper system which carried out by the organization to communicate effectively, this could be internally or externally. It also helps in improving communication within the organization. Apparently, it plays the vital role among the stakeholders as this brings a good understanding in the organization among the different parties. Last but not least organization structure very much influence on the coordination and flow of the organization system. A proper organization structure should be form in order to encourage a good flow of information and enhance towards an effective communication in the organization as well as in the industry. Good organization structure leads to the practice of better time, quality and cost management as well increasing organization performance (Aaker, 1992).

METHODOLOGY

Research was done among the stakeholders in the construction industry focusing in Ipoh city, located in the state of Perak, Malaysia. The practice of document standardization towards good communication in an organization was determined and interpreted. The efficiency of professional communication and communication instrument, were established when the concept of document standardization were taken into consideration. The survey was conducted to evaluate the current performance of stakeholders in respect of their communication and communication instruments in the construction industry. Professionals (architects, engineers, project managers and quantity surveyors) were requested to respond to the questionnaire.

Around hundred (100) questionnaires were sent out to these stakeholders which are about 20% from the overall population. In this study, random sample approach was used and the result was convenient. Structured questionnaire was administered face to face to the stakeholders through walk in interview and also through postage service. Out of 100 questionnaires, 45 were returned and useable. Before the survey administration, interview and pre-test of the questionnaire with a small group of respondents was conducted to validate the instrument of the survey.

RESULT / DISCUSSION

Quantitative data from the survey responses were coded and entered into an SPSS database. Mean comparison (mean) analysis was conducted on the respondent communication skills and instrument usage. Out of this survey, there are some important findings that can be concluded. It is clearly understood that communication is the most strategic – now more than ever. In information driven age, communication is an integral part of the corporate strategy. Besides that writing is still the core skills for communication, whereby verbal, written and contractual communication was rated almost the same in importance. Respondent profile were taken into consideration in this survey, which include type of organization (client, contractor, consultant, others), respondent position (architect, project manager, engineers, quantity surveyor), respondent and company experience in construction field and last but not least numbers of construction projects involved by the respondents. The following is a discussion of the findings for the two separate types of communication information (skills and instruments) by the stakeholders.

Communication Skills

Result from the survey indicates (Table 10.1) that the three communication skill which is verbal, written and contractual has almost the same importance in the construction industry. For the verbal communication, the usage of this communication skill is higher among the quantity surveyor with the highest mean 3.81 with total of 12 respondents. This shows that verbal communication are higher in usage among the quantity surveyor as they need to communicate more often to the entire project team member internal and externally throughout the whole project running. Meanwhile for written communication, the mean are higher among the engineers which is about 3.81 compared to other stakeholders. Project engineer is responsible for providing guidance, managing the project and coordinating the engineering teams and for this written communication plays an important role. The engineers hold the higher mean for contractual communication which is 3.72. This is because they are responsible for obtaining all necessary permits and licenses and, depending upon the contractual arrangements, for directing or monitoring compliance with building and safety codes, other regulations and requirements set by the project insurers. They also oversee the delivery and use materials, tools, and equipment; worker safety and productivity; and the quality of construction. It is understood verbal communication is the most vital skill for communication. Overall we can see that verbal, written and contractual was rated almost the same in importance.

Table 1. Respondent's ratings for verbal, written and contractual communication skills

Types of Position		Verbal Communication	Rank	Written Communication	Rank	Contractual Communication	Rank
Architect	Mean	3.63	4	3.63	2	3.00	4
	N	11		11		11	
	Std. Deviation	.809		.809		1.34	
Project Manager	Mean	3.75	2	3.41	4	3.08	3
	N	12		12		12	
	Std. Deviation	.965		.792		1.31	
Engineers	Mean	3.72	3	3.81	1	3.72	1
	N	11		11		11	
	Std. Deviation	.904		.981		1.00	
Quantity Surveyor	Mean	3.81	1	3.54	3	3.36	2
	N	11		11		11	
	Std. Deviation	.873		.820		1.02	
Total	Mean	3.73		3.60		3.28	
	N	45		45		45	
	Std. Deviation	.863		.826		1.17	

Communication Instruments

Table 10.2.1 above shows the survey results on the important of communication instrument used by the professional. Among the instrument used are including estimation, cost plan, payment advice, cost report, escalation costing presentation, final accounts, standard system documents, contract condition document, preliminaries document, preambles of trade document, and finally drawings. For estimation, the quantity surveyor has the highest importance compared to other stakeholders which the mean is 4.18. This is because the quantity surveyors control construction costs by accurate measurement of the work required, the application of expert knowledge of costs and prices of work, labour, materials and plant required, an understanding of the implications of design decisions at an early stage to ensure that good value is obtained for the money to be used and spend in most appropriate way.

Table 2. Importance of Communication Instrument used by Professional

Types of Position	Architect			Project Manager			Engineer			Quantity Surveyor			Total		
Types of Communication Instruments	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank	Mean	SD	Rank
Estimation	4.00	.894	2	3.66	.778	4	3.81	.981	5	4.18	.404	1	3.97	.792	1
Cost Plan	3.00	.774	2	2.91	.792	3	3.36	.924	1	3.00	1.00	2	3.06	.863	7
Payment Advice	3.36	1.28	2	3.16	1.114	4	3.72	1.190	1	3.35	1.361	3	3.40	1.21	2
Cost Report	3.00	.632	4	3.33	.778	3	3.54	1.128	1	3.36	1.026	2	3.31	.900	3
Escalation Costing Presentation	3.18	.404	1	3.25	.452	2	3.18	.539	1	3.09	.404	3	3.17	.441	5
Final Accounts	3.18	.603	2	3.16	.577	3	3.09	.539	4	3.27	.786	1	3.17	.613	5
Standard System Documents	3.09	.831	1	3.00	.953	2	3.00	.632	2	3.00	.632	2	3.02	.753	8
Contract Condition Document	2.72	.646	4	3.25	.866	2	3.09	.831	3	3.27	.904	1	3.08	.820	6
Preliminaries Document	3.27	.467	1	2.91	.900	2	3.27	.646	1	3.27	.786	1	3.17	.716	5
Preambles of Trade Document	3.09	.831	2	3.08	.514	3	2.90	1.300	4	3.27	1.190	1	3.08	.972	6
Drawings	3.45	.700	1	3.25	1.215	2	3.00	.632	4	3.09	1.128	3	3.20	.943	4

Meanwhile for cost plan, the engineers rated with the highest mean which is 3.36. Engineers needs to control projects with highest degree of efficiency whereby cost plan establishes the base line of the project cost at different stages of development of the project. For payment advice, the engineers ranked the top means with 3.36. Payment should be verified carefully before it was done. The mean for cost report is rated as 3.54 and highest among the engineers. Escalation costing presentation instrument among the project manager rated as highest mean which is 3.25.

For final account, the quantity surveyor holds the highest mean 3.27. Quantity surveyors control final accounts by accurate measurement of the work required, the application of expert knowledge of costs and prices of work, labour, materials and plant required, an understanding of the implications of design decisions at an early stage to ensure that good value is obtained for the money to be spend. Standard system document is one of the most important tools in the lines of communication instrument. For this, the result shows that the architect rated with highest mean which is 3.09. There is specific standard system tools such as Computer Aided Design or Computer Aided Drafting (AutoCAD) used by this professional. However this instrument is still popular among other stakeholders. System documentation should be reasonably self contained; however it will often be a component of a wider collection of documentation and it is reasonable for it to reference other documents. The result above shows that all the stakeholders needs and using this systemized standard document no matter verbally, written or contractually.

For contract condition document, quantity surveyor has the highest mean of 3.27 where they need to arrange a final contract documents through a brief discussion from the client. Meanwhile for preliminaries document, architect, engineers and the quantity surveyor has the same importance. They are responsible for providing best practice guidance on the content, form and preparation of construction production information throughout the whole project cycle. For preambles of trade document, the quantity surveyor has the top ranking with 3.27 mean. The quantity surveyor will ensure that the whole quantity of each product and material required to complete the work is of consistent kind, size, quality and overall appearance. Products incorporated into the work will be handled, stored and fixed with care.

Last but not least, the drawings, the mean are highest among the architect which is 3.45. This would include articulating the architectural vision, conceptualizing and experimenting with alternative architectural approaches, creating building models and component and interface specification documents, and validating the architecture against requirements and assumptions. All the result above indicate that effective communication contribute towards a success of a project.

CONCLUSION AND IMPLICATION

In every project, it is important that the project-related information is fully documented with a proper standardization to ensure that all the people involved understand what has and is happening throughout the project running. Each project has a great deal of communication and documentation. With many projects using the same communication instruments, over and over again, the running of the project will be much easier and more understandable if communication instruments, plans, structure and flows are in a standard process. Standardization will provide a system for effective management that is not too complex, and may contribute towards the effective execution and completion of a project.

The improvement of project communication processes and technologies on different functional levels may change the organization of future projects and how its business activities and work routines are designed, planned and performed. This can for example help enabling just-in-time deliveries and the more industrialized and rational business processes that the construction industry in fact is striving for. On-demand access and mobility of information, enhanced communication tools together with new ways of organizing and performing collaborative work could be

important components of this development process. The full recognition and determination to improve collaborative communication and information exchange throughout all project phases will probably have considerable effects on the industrialization process of construction projects. These issues have lately started to become a focal point for the construction industry. That is a welcomed change of attitude in a project based industry that historically has seemed to have taken appropriate project communication practices for granted.

The findings of this research revealed that a good document standardization and the usage of communication instruments helps to facilitate a better understanding among the stakeholders in the industry. Meanwhile a good standardization process will ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information. The findings also indicate that the stakeholders are more likely dependent to each other through communication process. This is supported by the existing literatures on communication instruments.

Implication from this research on general practice is to create awareness on the importance of communication tools and instruments are important in the field of construction. Many organizations are offering more and more communication awareness courses that address the skills and that take place to create interactive environments. This study suggests that involving stakeholders in the construction industry should adopt the usage of good communication tools and instruments that will ensure each team member will successfully communicate to deliver a good end product. It is understood that this tools provide fast, accurate, constant feedback and clear direction are fulfilling whereby one of the most important conditions that help stakeholders to improve their work progress.

Managerial implication from this study suggests that the standardization of document and communication process is important for more effective implementation of construction contract. This suggests that stakeholders in the construction industry should be able to communicate efficiently and effectively during project implementation. Analyzing communication tools and instruments criteria is not enough, it is important to examine which factors and patterns contribute to efficiency and whether they differ across different organization and environment. Therefore, to be more compatible with today's global market, appropriate communication tools and instrument are needed for better communication practice. Also, they will be able to develop communication strategies by deriving a best communication tools. Meanwhile construction professionals should try to acquire new knowledge in communication skills and standardization as a whole in practice towards the need of the market.

The limitation of this research is that the data collected is limited in scope. This study was carried out in Ipoh, Perak, a city with a population of slightly more than 600,000 people, which might not representing the whole country. Thus, further research on the other parts of the country need to be carried out in order for generalisation can be possible

FUTHER RESEARCH

Since the degree of acceptance of communication skills in construction industry is still very low, there are some recommendation to improve the awareness and usage of communication skills and standardization in construction industry. Related organization can establish more seminars or training program in advance usage of communication skills to introduce what is all about communication and its importance towards standardization and its application in construction industry. Meanwhile the organization needs to encourage and promote the use of better communication skills in construction industry where the top management of any organization need to exposed, support and apply good communication skills in their organization. This is important to educate with a proper method to their employees and their partnership organization. Finally organization needs to have a proper standard as a guideline, procedure and policy regarding work process to encourage good communication implementation during any project planning.

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RADIATION EFFECTS ON UNSTEADY MOVING SEMI-INFINITE VERTICAL PLATE IN THE PRESENCE OF CHEMICAL REACTION

ABSTRACT:
Finite difference solution of the homogeneous first order chemical reaction on unsteady flow past an impulsively started semi-infinite vertical plate in the presence of thermal radiation have been studied. The fluid considered is a gray, absorbing-emitting radiation but non-scattering medium. The dimensionless governing equations are solved by an efficient, more accurate, unconditionally stable and fast converging implicit scheme. The effect of velocity and temperature for different parameters like chemical reaction parameter, radiation parameter, Schmidt number, thermal Grashof number, mass Grashof number and time are studied. The velocity profiles are compared with available exact solution in the literature and are found be in good agreement.

KEYWORDS:
radiation, chemical reaction, vertical plate, finite-difference

INTRODUCTION

Radiative convective flows are encountered in countless industrial and environment processes e.g. heating and cooling chambers, fossil fuel combustion energy processes, evaporation from large open water reservoirs, astrophysical flows, solar power technology and space vehicle re-entry. Radiative heat and mass transfer play an important role in manufacturing industries for the design of reliable equipment. Nuclear power plants, gas turbines and various propulsion device for aircraft, missiles, satellites and space vehicles are examples of such engineering applications.

England and Emery (1994) have studied the thermal radiation effects of a optically thin gray gas bounded by a stationary vertical plate. Soundalgekar and Takhar (1993) have considered the radiative free convective flow of an optically thin gray-gas past a semi-infinite vertical plate. Radiation effect on mixed convection along a isothermal vertical plate were studied by Hossain and Takhar (1996). In all above studies, the stationary vertical plate is considered. Raptis and Perdikis (1999) have studied the effects of thermal radiation and free convection flow past a moving infinite vertical plate. Again, Raptis and Perdikis (2003) studied thermal radiation effects on moving infinite vertical plate in the presence of mass diffusion. The governing equations were solved by the Laplace transform technique.

Chemical reactions can be codified as either heterogeneous or homogeneous processes. This depends on whether they occur at an interface or as a single phase volume reaction. Many transport processes exist in nature and in industrial applications in which the simultaneous heat and mass transfer as a result of combined buoyancy effects of thermal diffusion and diffusion of chemical species.

In many chemical engineering processes, there does occur the chemical reaction between a foreign mass and the fluid in which the plate is moving. These processes take place in numerous industrial applications, e.g., polymer production, manufacturing of ceramics or glassware and food processing.

Apelblat[1] studied analytical solution for mass transfer with a chemical reaction of the first order. Chambre and Young (1958) have analyzed a first order chemical reaction in the neighborhood of a horizontal plate. Das et al (1994) have studied the effect of homogeneous first order chemical reaction on the flow past an impulsively started infinite vertical plate with uniform heat flux and mass transfer. The dimensionless governing equations were solved by the usual Laplace-transform technique and the solutions are valid only at lower time level.

Analytical or numerical work on transient natural convection along an impulsively started vertical plate under the combined buoyancy effects of heat and mass diffusion in the presence of thermal radiation and

chemical reaction has not received attention of any researcher. Hence, the present study is to investigate first order chemical reaction on flow past an impulsively started semi-infinite vertical plate in the presence of thermal radiation by an implicit finite-difference scheme of Crank-Nicolson type.

MATHEMATICAL ANALYSIS

A transient, laminar, unsteady natural convection flow of a viscous incompressible fluid past an impulsively started semi-infinite vertical plate has been considered. The fluid considered is a gray, absorbing-emitting radiation but non-scattering medium. It is assumed that there is a first order chemical reaction between the diffusing species and the fluid. Here, the x-axis is taken along the plate in the vertically upward direction and the y-axis is taken normal to the plate. Initially, it is assumed that the plate and the fluid are of the same temperature and concentration. The plate starts moving impulsively in the vertical direction with constant velocity u_0 against gravitational field and the temperature of the plate and the concentration level are also raised to T'_w and C'_w. They are maintained at the same level for all time $t' > 0$. Then under the above assumptions, the governing boundary layer equations of mass, momentum and concentration for free convective flow with usual Boussinesq's approximation are as follows:

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0 \qquad (1)$$

$$\frac{\partial u}{\partial t'}+u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}=g\beta(T'-T'_\infty)+g\beta^*(C'-C'_\infty)+\nu\frac{\partial^2 u}{\partial y^2} \qquad (2)$$

$$\rho C_p\left(\frac{\partial T'}{\partial t'}+u\frac{\partial T'}{\partial x}+v\frac{\partial T'}{\partial y}\right)=\frac{\partial^2 T'}{\partial y^2}-\frac{\partial q_r}{\partial y} \qquad (3)$$

$$\frac{\partial C'}{\partial t'}+u\frac{\partial C'}{\partial x}+v\frac{\partial C'}{\partial y}=D\frac{\partial^2 C'}{\partial y^2}-K_l\,C' \qquad (4)$$

The initial and boundary conditions are

$$\begin{aligned} t'\le 0:\ & u=0,\quad v=0,\quad T'=T'_\infty,\quad C'=C'_\infty \\ t'>0:\ & u=u_0,\quad v=0,\quad T'=T'_w,\quad C'=C'_w \quad aty=0 \\ & u=0,\quad T'=T'_\infty,\quad C'=C'_\infty \quad atx=0 \\ & u\to 0,\quad T'\to T'_\infty,\quad C'\to C'_\infty \quad asy\to\infty \end{aligned} \qquad (5)$$

For the case of an optically thin gray gas the local radiant absorption is expressed by

$$\frac{\partial q_r}{\partial y}=-4a\,\sigma\left(T'^4_\infty-T'^4\right) \qquad (6)$$

We assume that the temperature differences within the flow are sufficiently small such that T^4 may be expressed as a linear function of the temperature. This is accomplished by expanding T^4 in a Taylor series about T_∞ and neglecting higher-order terms, thus

$$T'^4\cong 4T'^3_\infty\,T'-3T'^4_\infty \qquad (7)$$

By using equations (6) and (7), equation (3) reduces to

$$\rho C_p\frac{\partial T'}{\partial t'}=k\frac{\partial^2 T}{\partial y^2}-16\,a\,\sigma T'^3_\infty\,(T'-T'_\infty) \qquad (8)$$

On introducing the following non-dimensional quantities: ,

$$\begin{aligned} X&=\frac{xu_0}{\nu},\ Y=\frac{yu_0}{\nu},\ U=\frac{u}{u_0},\ V=\frac{v}{u_0},\ t=\frac{t'u_0^2}{\nu} \\ T&=\frac{T'-T'_\infty}{T'_w-T'_\infty},\ Gr=\frac{\nu g\beta(T'_w-T'_\infty)}{u_0^3}, \\ C&=\frac{C'-C'_\infty}{C'_w-C'_\infty},\ Gc=\frac{\nu g\beta^*(C'_w-C'_\infty)}{u_0^3}, \\ Pr&=\frac{\nu}{\alpha},\ Sc=\frac{\nu}{D},\ R=\frac{16a^*\nu^2\sigma T_\infty^3}{ku_0^2},\ K=\frac{\nu K_l}{u_0^2} \end{aligned} \qquad (9)$$

Equations (1) to (4) are reduced to the following non-dimensional form

$$\frac{\partial U}{\partial X}+\frac{\partial V}{\partial Y}=0 \qquad (10)$$

$$\frac{\partial U}{\partial t}+U\frac{\partial U}{\partial X}+V\frac{\partial U}{\partial Y}=Gr\,T+Gc\,C+\frac{\partial^2 U}{\partial Y^2} \qquad (11)$$

$$\frac{\partial T}{\partial t}+U\frac{\partial T}{\partial X}+V\frac{\partial T}{\partial Y}=\frac{1}{Pr}\frac{\partial^2 T}{\partial Y^2}-\frac{R}{Pr}T \qquad (12)$$

$$\frac{\partial C}{\partial t}+U\frac{\partial C}{\partial X}+V\frac{\partial C}{\partial Y}=\frac{1}{Sc}\frac{\partial^2 C}{\partial Y^2}-KC \qquad (13)$$

The corresponding initial and boundary conditions in non-dimensional quantities are

$$\begin{aligned} t\le 0:\ & U=0,\quad V=0,\quad T=0,\quad C=0 \\ t>0:\ & U=1,\quad V=0,\quad T=1,\quad C=1 \quad atY=0 \\ & U=0,\quad T=0,\quad C=0, \quad atX=0 \\ & U\to 0,\quad T\to 0,\quad C\to 0 \quad asY\to\infty \end{aligned} \qquad (14)$$

NUMERICAL TECHNIQUE

In order to solve these unsteady, non-linear coupled equations (10) to (13) under the conditions (14), an implicit finite difference scheme of Crank-Nicolson type has been employed. The finite difference equations corresponding to equations (10) to (13) are as follows:

$$\frac{\left[U^{n+1}_{i,j}-U^{n+1}_{i-1,j}+U^{n}_{i,j}-U^{n}_{i-1,j}+U^{n+1}_{i,j-1}-U^{n+1}_{i-1,j-1}+U^{n}_{i,j-1}-U^{n}_{i-1,j-1}\right]}{4\Delta X}+\frac{\left[V^{n+1}_{i,j}-V^{n+1}_{i,j-1}+V^{n}_{i,j}-V^{n}_{i,j-1}\right]}{2\Delta Y}=0 \qquad (15)$$

$$\frac{\left[U^{n+1}_{i,j}-U^{n}_{i,j}\right]}{\Delta t}+U^{n}_{i,j}\frac{\left[U^{n+1}_{i,j}-U^{n+1}_{i-1,j}+U^{n}_{i,j}-U^{n}_{i-1,j}\right]}{2\Delta X}+V^{n}_{i,j}\frac{\left[U^{n+1}_{i,j+1}-U^{n+1}_{i,j-1}+U^{n}_{i,j+1}-U^{n}_{i,j-1}\right]}{4\Delta Y} =\frac{Gr}{2}\left[T^{n+1}_{i,j}+T^{n}_{i,j}\right]+\frac{Gc}{2}\left[C^{n+1}_{i,j}+C^{n}_{i,j}\right] +\frac{\left[U^{n+1}_{i,j-1}-2U^{n+1}_{i,j}+U^{n+1}_{i,j+1}+U^{n}_{i,j-1}-2U^{n}_{i,j}+U^{n}_{i,j+1}\right]}{2(\Delta Y)^2} \qquad (16)$$

$$\frac{\left[T_{i,j}^{n+1}-T_{i,j}^{n}\right]}{\Delta t}+U_{i,j}^{n}\frac{\left[T_{i,j}^{n+1}-T_{i-1,j}^{n+1}+T_{i,j}^{n}-T_{i-1,j}^{n}\right]}{2\Delta X}$$
$$+V_{i,j}^{n}\frac{\left[T_{i,j+1}^{n+1}-T_{i,j-1}^{n+1}+T_{i,j+1}^{n}-T_{i,j-1}^{n}\right]}{4\Delta Y}$$
$$=\frac{1}{Pr}\frac{\left[T_{i,j-1}^{n+1}-2T_{i,j}^{n+1}+T_{i,j+1}^{n+1}+T_{i,j-1}^{n}-2T_{i,j}^{n}+T_{i,j+1}^{n}\right]}{2(\Delta Y)^{2}} \quad (17)$$
$$-\frac{(T_{i,j}^{n+1}+T_{i,j}^{n})}{2Pr}$$

$$\frac{\left[C_{i,j}^{n+1}-C_{i,j}^{n}\right]}{\Delta t}+U_{i,j}^{n}\frac{\left[C_{i,j}^{n+1}-C_{i-1,j}^{n+1}+C_{i,j}^{n}-C_{i-1,j}^{n}\right]}{2\Delta X}$$
$$+V_{i,j}^{n}\frac{\left[C_{i,j+1}^{n+1}-C_{i,j-1}^{n+1}+C_{i,j+1}^{n}-C_{i,j-1}^{n}\right]}{4\Delta Y}$$
$$=\frac{1}{Sc}\frac{\left[C_{i,j-1}^{n+1}-2C_{i,j}^{n+1}+C_{i,j+1}^{n+1}+C_{i,j-1}^{n}-2C_{i,j}^{n}+C_{i,j+1}^{n}\right]}{2(\Delta Y)^{2}} \quad (18)$$
$$-\frac{K}{2}(C_{i,j}^{n+1}+C_{i,j}^{n})$$

Here the region of integration is considered as a rectangle with sides $X_{max}(=1)$ and $Y_{max}(=14)$, where Y_{max} corresponds to $Y=\infty$ which lies very well outside both the momentum and energy boundary layers. The maximum of Y was chosen as 14 after some preliminary investigations so that the last two of the boundary conditions (14) are satisfied with in the tolerance limit 10^{-5}.

After experimenting with a few set of mesh sizes, the mesh sizes have been fixed at the level $\Delta X=0.05$, $\Delta Y=0.25$ with time step $\Delta t=0.01$. In this case, the spatial mesh sizes are reduced by 50% in one direction, and later in both directions, and the results are compared. It is observed that, when the mesh size is reduced by 50% in the Y-direction, the results differ in the fifth decimal place while the mesh sizes are reduced by 50% in X-direction or in both directions, the results are comparable to three decimal places. Hence, the above mesh sizes have been considered as appropriate for calculation. The coefficients $U_{i,j}^{n}$ and $V_{i,j}^{n}$ appearing in the finite-difference equations are treated as constants in any one time step. Here i-designates the grid point along the X-direction, j along the Y-direction and k to the t-time.The values of U, V and T are known at all grid points at $t=0$ from the initial conditions.

The computations of U,V,T and C at time level $(n+1)$ using the values at previous time level (n) are carried out as follows: The finite difference Equation (18) at every internal nodal point on a particular i-level constitute a tridiagonal system of equations. Such a system of equations are solved by using Thomas algorithm as discussed in Carnahan et al [1].

Thus, the values of C are found at every nodal point for a particular i at $(n+1)^{th}$ time level. Similarly, the values of T are calculated from Equation (17). Using the values of C and T at $(n+1)^{th}$ time level in the equation (16), the values of U at $(n+1)^{th}$ time level are found in a similar manner. Thus, the values of C,T and U are known on a particular i-level. Finally, the values of V are calculated explicitly using the Equation (15) at every nodal point on a particular i-level at $(n+1)^{th}$ time level. This process is repeated for various i-levels. Thus the values of C,T,U and V are known, at all grid points in the rectangular region at $(n+1)^{th}$ time level.

In a similar manner computations are carried out by moving along the i-direction. After computing values corresponding to each i at a time level, the values at the next time level are determined in a similar manner. Computations are repeated until the steady-state is reached. The steady-state solution is assumed to have been reached, when the absolute difference between the values of U, as well as temperature T and concentration C at two consecutive time steps are less than 10^{-5} at all grid points.

STABILITY ANALYSIS

The stability criterion of the finite difference scheme for constant mesh sizes are examined using Von-Neumann technique as explained by Carnahan et al (1980). The general term of the Fourier expansion for U,T and C at a time arbitrarily called $t=0$, are assumed to be of the form $\exp(i\alpha X)\exp(i\beta Y)$ (here $i=\sqrt{-1}$). At a later time t, these terms will become,

$$U=F(t)\exp(i\alpha X)\exp(i\beta Y)$$
$$T=G(t)\exp(i\alpha X)\exp(i\beta Y) \quad (19)$$
$$C=H(t)\exp(i\alpha X)\exp(i\beta Y)$$

Substituting (19) in Equations (16) to (18); under the assumption that the coefficients U,T and C are constants over any one time step and denoting the values after one time step by F',G' and H'. After simplification, we get

$$\frac{(F'-F)}{\Delta t}+\frac{U}{2}\frac{(F'+F)(1-\exp(-i\alpha\Delta X))}{\Delta X}$$
$$+\frac{V}{2}\frac{(F'+F)\,i\sin\beta\Delta Y}{\Delta Y} \quad (20)$$
$$=\frac{(G'+G)Gr+(H'+H)Gc}{2}+\frac{(F'+F)(\cos\beta\Delta Y-1)}{(\Delta Y)^{2}}$$

$$\frac{(G'-G)}{\Delta t}+\frac{U}{2}\frac{(G'+G)(1-\exp(-i\alpha\Delta X))}{\Delta X}$$
$$+\frac{V}{2}\frac{(G'+G)\,i\sin\beta\Delta Y}{\Delta Y} \quad (21)$$
$$=\frac{1}{Pr}\frac{(G'+G)(\cos\beta\Delta Y-1)}{(\Delta Y)^{2}}-\frac{R}{2Pr}(G'+G)$$

$$\frac{(H'-H)}{\Delta t} + \frac{U}{2}\frac{(H'+H)(1-\exp(-i\alpha\Delta X))}{\Delta X} + \frac{V}{2}\frac{(H'+H)\,i\sin\beta\Delta Y}{\Delta Y} = \frac{1}{Sc}\frac{(H'+H)(\cos\beta\Delta Y-1)}{(\Delta Y)^2} - \frac{K}{2}(H'+H) \quad (22)$$

Equations (20) to (22) can be rewritten as,

$$(1+A)F' = (1-A)F + \frac{Gr}{2}(G'+G)\Delta t + \frac{Gc}{2}(H'+H)\Delta t \quad (23)$$

$$(1+B)G' = (1-B)G$$

$$(1+E)H' = (1-E)H$$

where,

$$A = \frac{U}{2}\frac{\Delta t}{\Delta X}(1-\exp(-i\alpha\Delta X)) + \frac{V}{2}\frac{\Delta t}{\Delta Y} i\sin(\beta\Delta Y) - (\cos\beta\Delta Y - 1)\frac{\Delta t}{(\Delta Y)^2}$$

$$B = \frac{U}{2}\frac{\Delta t}{\Delta X}(1-\exp(-i\alpha\Delta X)) + \frac{V}{2}\frac{\Delta t}{\Delta Y} i\sin(\beta\Delta Y) - \frac{(\cos\beta\Delta Y-1)}{Pr}\frac{\Delta t}{(\Delta Y)^2} + \frac{R\Delta t}{2\,Pr}$$

$$E = \frac{U}{2}\frac{\Delta t}{\Delta X}(1-\exp(-i\alpha\Delta X)) + \frac{V}{2}\frac{\Delta t}{\Delta Y} i\sin(\beta\Delta Y) - \frac{(\cos\beta\Delta Y-1)}{Sc}\frac{\Delta t}{(\Delta Y)^2} + \frac{K\Delta t}{2}$$

After eliminating G' and H' in Equation (23) using Equations (24) and (25), the resultant equation is given by,

$$(1+A)F' = (1-A)F + G\frac{Gr\,\Delta t}{(1+B)} + H\frac{Gc\Delta t}{(1+E)} \quad (24)$$

Equations (23) to (25) can be written in matrix form as follows:

$$\begin{bmatrix} F' \\ G' \\ H' \end{bmatrix} = \begin{bmatrix} \frac{1-A}{1+A} & D_1 & D_2 \\ 0 & \frac{1-B}{1+B} & 0 \\ 0 & 0 & \frac{1-E}{1+E} \end{bmatrix} \begin{bmatrix} F \\ G \\ H \end{bmatrix} \quad (25)$$

where, $D_1 = \frac{Gr\,\Delta t}{(1+A)(1+B)}, D_2 = \frac{Gc\,\Delta t}{(1+A)(1+E)}$

Now, for stability of the finite difference scheme, the modulus of each eigen value of the amplification matrix does not exceed unity. Since the matrix Equation (25) is triangular, the eigen values are its diagonal elements. The eigen values of the amplification matrix are $(1-A)/(1+A)$, $(1-B)/(1+B)$ and $(1-E)/(1+E)$. Assuming that, U is everywhere non-negative and V is everywhere non-positive, we get

$$A = 2a\sin^2\left(\frac{\alpha\Delta X}{2}\right) + 2c\sin^2\left(\frac{\beta\Delta Y}{2}\right) + i(a\sin\alpha\Delta X - b\sin\beta\Delta Y)$$

Where,

$$a = \frac{U}{2}\frac{\Delta t}{\Delta X}, b = \frac{|V|}{2}\frac{\Delta t}{\Delta Y}, c = \frac{\Delta t}{(\Delta Y)^2}$$

Since the real part of A is greater than or equal to zero, $|(1-A)/(1+A)| \le 1$ always. Similarly, $|(1-B)/(1+B)| \le 1$ and $|(1-E)/(1+E)| \le 1$. Hence the finite difference scheme is unconditionally stable. The local truncation error is $O(\Delta t^2 + \Delta Y^2 + \Delta X)$ and it tends to zero as $\Delta t, \Delta X$ and ΔY tend to zero. Hence the scheme is compatible. Stability and compatibility ensures convergence.

Results And Discussion

Representative numerical results for the uniform heat and mass diffusion in the presence of radiation and chemical reaction will be discussed in this section. In order to ascertain the accuracy of the numerical results, the present study is compared with the available exact solution in the literature. The velocity profiles for $K = 0.2$, $Sc = 0.16, 0.2$, $Gr = 2, 5$, $Gc = 2, 5$ and $Pr = 0.71$ (corresponding to $\eta = Y/2\sqrt{t}$) are compared with the available exact solution of Das et al (1994) at $t = 0.2$ in figure 1 and they are found to be in good agreement. It is observed that the present results are in good agreement with the available theoretical solution at lower time level.

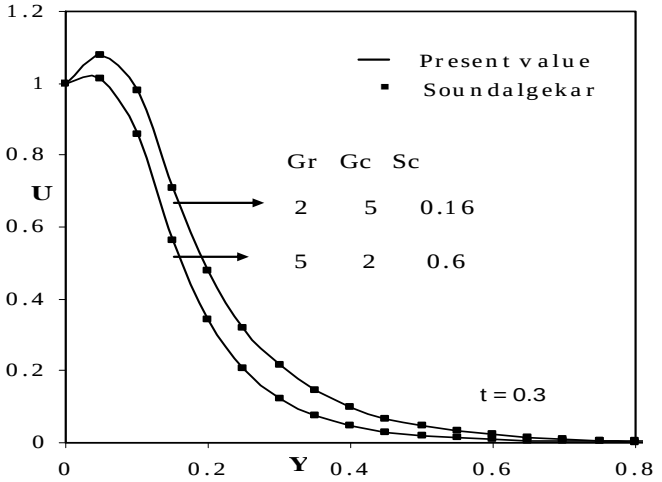

Figure 1. Comparison of velocity profiles

The effect of steady-state velocity profiles for different radiation parameters ($R = 0, 2, 5$), $Gr = 5$, $Gc = 5$, $K = 0.2$, $Pr = 0.71$ and $Sc = 0.6$ are shown in figure 2. It is observed that the velocity increases with decreasing radiation parameter. This shows that velocity decreases in the presence of high thermal radiation. However, the time required for the velocity to reach steady-state depends upon the radiation parameter.

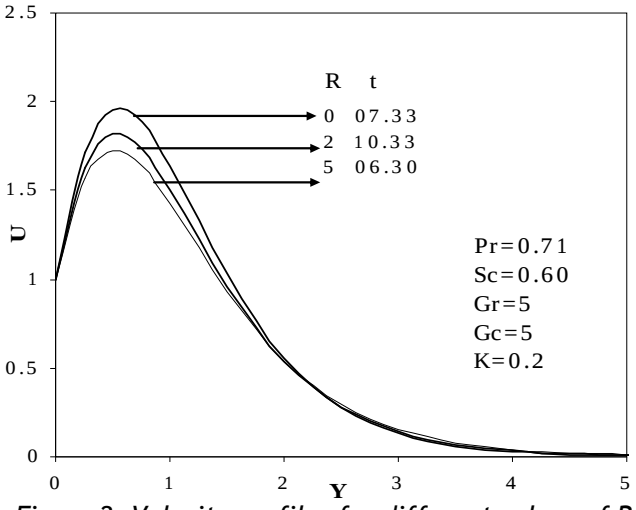

Figure 2. Velocity profiles for different values of R

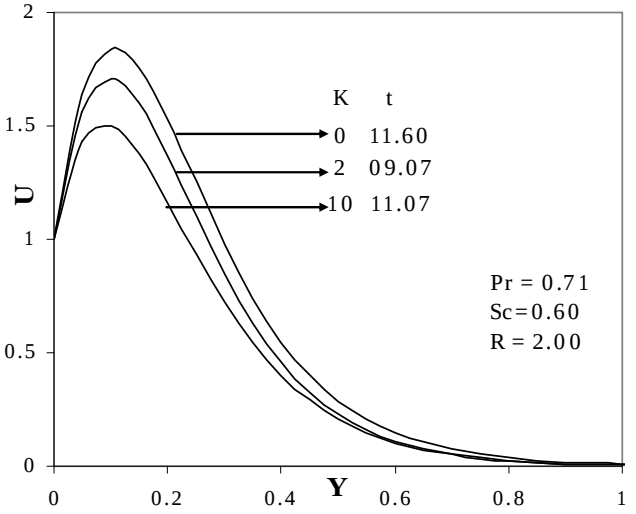

Figure 3. Velocity profiles for different values of K

The effect of velocity for different chemical reaction parameter $(K = 0,2,10)$, $Gr = 5, Gc = 5, R = 2, Pr = 0.71$ *and* $Sc = 0.6$ *are shown in figure 3. It is observed that the velocity increases with decreasing chemical reaction parameter.*

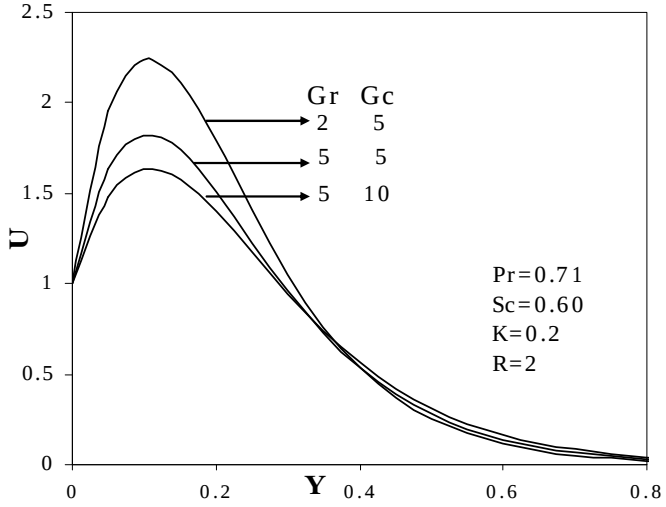

Figure 4. Velocity profiles for different values Gr, Gc

In figure 4, the velocity profiles for different thermal Grashof number $(Gr = 2,5)$, *mass Grashof number* $(Gc = 5,10)$, $Sc = 0.6$, $R = 2$, $K = 0.2$ *and* $Pr = 0.71$ *are shown graphically. This shows that the velocity increases with increasing thermal Grashof number or mass Grashof number. As thermal Grashof number or mass Grashof number increases, the buoyancy effect becomes more significant, as expected, it implies that, more fluid is entrained from the free stream due to the strong buoyancy effects as* Gr *or* Gc *increases.*

The transient temperature profiles for different values of the thermal radiation parameter $(R = 0,2,5)$, $Gr = Gc = 5$ *and* $K = 0.2$ *are shown in figure 5. It is observed that the temperature increases with decreasing* R. *This shows that the buoyancy effect on the temperature distribution is very significant in air* $(Pr = 0.71)$. *It is known that the radiation parameter and Prandtl number plays an important role in flow phenomena because, it is a measure of the relative magnitude of viscous boundary layer thickness to the thermal boundary layer thickness.*

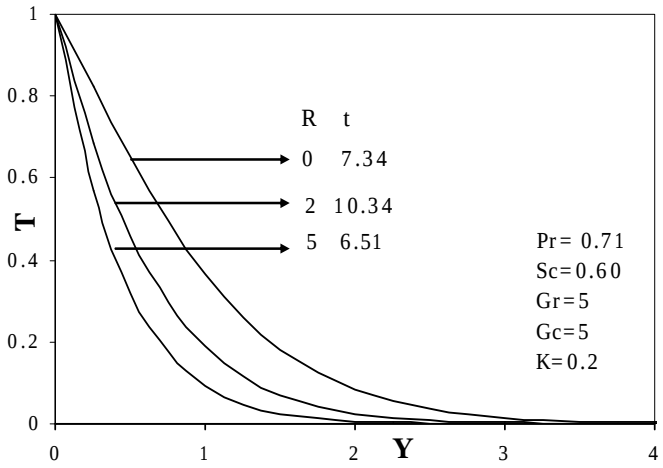

Figure 5. Temperature profiles for different values of R

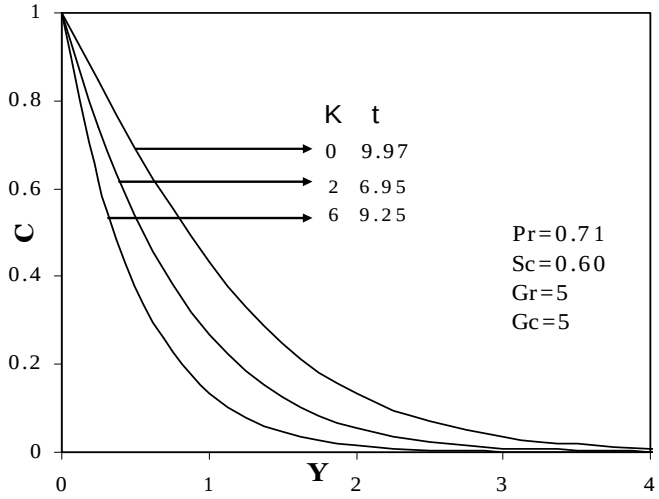

Figure 6. Concentration profiles for different values of K

The steady-state concentration profiles for different chemical reaction parameter $(K = 0,2,6), Gr = Gc = 5$ *and* $Sc = 0.6$ *are shown in figure 6. The effect of chemical reaction parameter play an important role in concentration field. There is a fall in concentration due to increasing the values of the chemical reaction parameter.*

Knowing the velocity and temperature field, it is customary to study the skin-friction and the Nusselt number. The local as well as average values of skin-friction and Nusselt number in dimensionless form are as follows:

$$\tau_X = -\left(\frac{\partial U}{\partial Y}\right)_{Y=0} \quad (28)$$

$$\bar{\tau} = -\int_0^1 \left(\frac{\partial U}{\partial Y}\right)_{Y=0} dX \quad (29)$$

$$Nu_X = -X\left[\frac{\left(\frac{\partial T}{\partial Y}\right)_{Y=0}}{T_{Y=0}}\right] \quad (30)$$

$$\overline{Nu} = -\int_0^1 \left[\frac{\left(\frac{\partial T}{\partial Y}\right)_{Y=0}}{T_{Y=0}}\right] dX \quad (31)$$

$$Sh_X = -X\left(\frac{\partial C}{\partial Y}\right)_{Y=0} \quad (32)$$

$$\overline{Sh} = -\int_0^1 \left(\frac{\partial C}{\partial Y}\right)_{Y=0} dX \quad (33)$$

The derivatives involved in the Equations (28) to (33) are evaluated using five-point approximation formula and then the integrals are evaluated using Newton-Cotes closed integration formula.

The Local values of the skin-friction, Nusselt number and Sherwood number for fixed parameters $Gr = Gc = 5, Pr = 0.71, R = 2, K = 0.2$ *and* $Sc = 0.6$ *are plotted in figures 7, 8 and 9 respectively. Local skin-friction values are evaluated from equation (28) and plotted in figure 7 as a function of the axial coordinate. The local wall shear stress increases with increasing chemical reaction parameter or chemical reaction parameter. It is clear that there is a fall in local skin-friction with decreasing radiation parameter. Such effect is predominant with respect to radiation parameter than for chemical reaction parameter. This is because, the velocity is affected more by* R *than by* K*. The value of the skin-friction becomes negative, which implies, that after some time there occurs a reverse type of flow near the moving plate. Physically this is also true as the motion of the fluid is due to plate moving in the vertical direction against the gravitational field. The rate of heat transfer increases with decreasing values of the radiation parameter.*

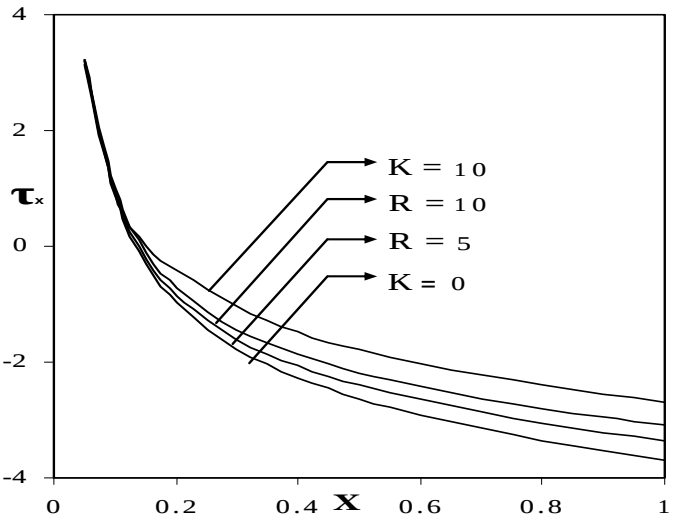

Figure 7. Local skin-friction

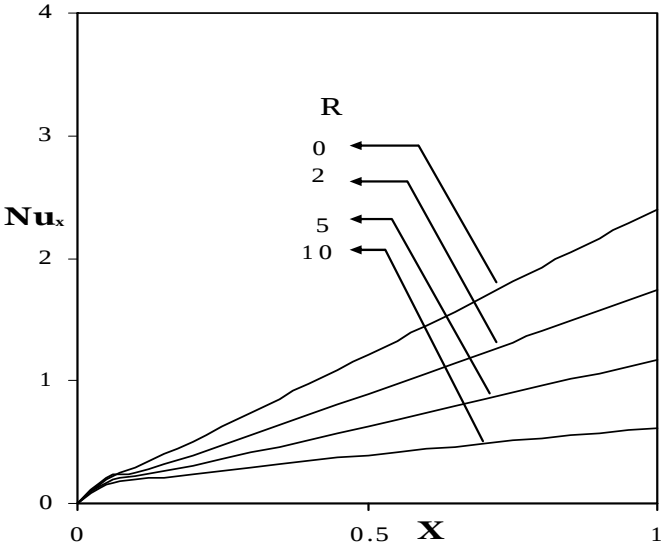

Figure 8. Local Nusselt number

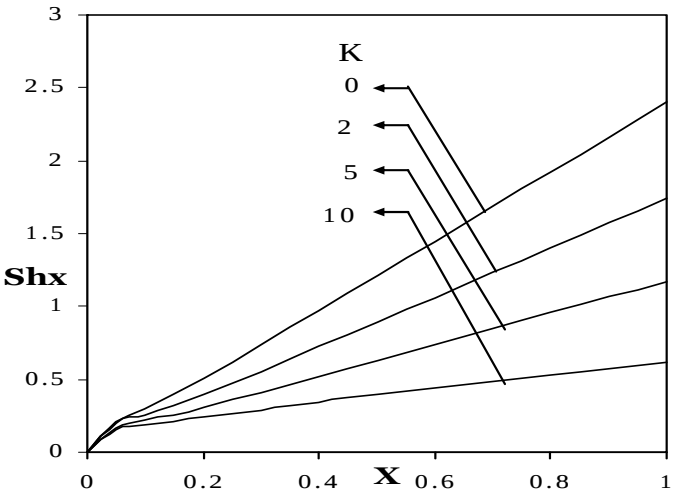

Figure 9. Local Sherwood number

The Local Sherwood number for different values of the chemical reaction parameter are shown in figure 9. The trend shows that the rate of concentration decreases the presence of chemical reaction than its absence.

The average values of the skin-friction, Nusselt number and Sherwood number are shown in figures 10, 11 and 12 respectively. The effects of the radiation parameter on the average values of the skin-friction are shown in figure 10. The average skin-friction decreases with decreasing radiation parameter. The average Nusselt number increases with increasing radiation parameter. The average Sherwood number increases with increasing values of the chemical reaction parameter.

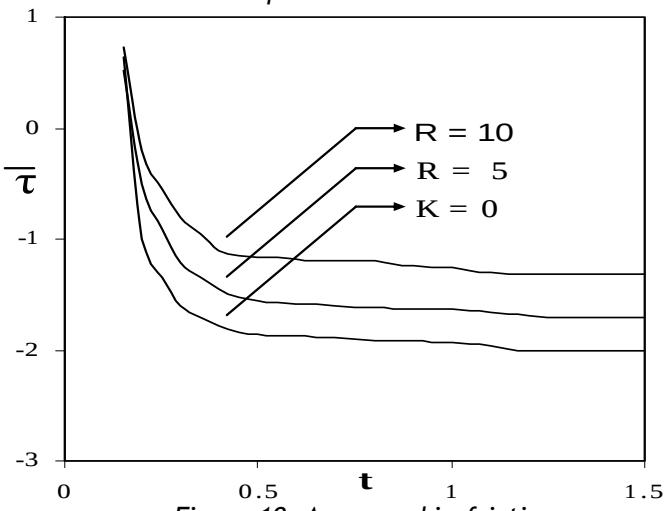

Figure 10. Average skin-friction

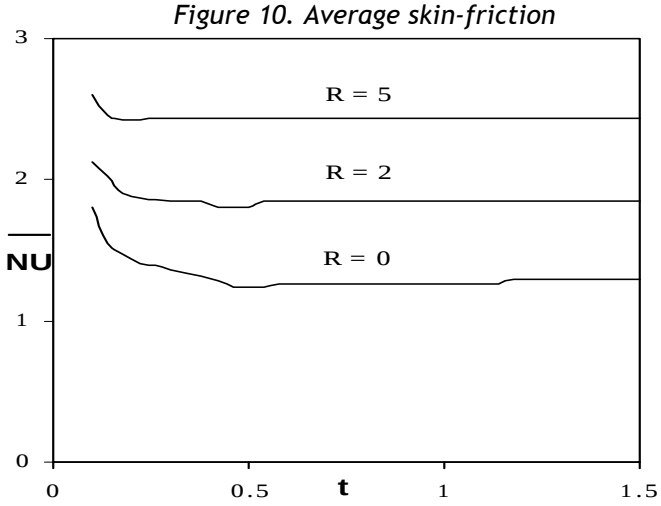

Figure 11. Average Nusselt number

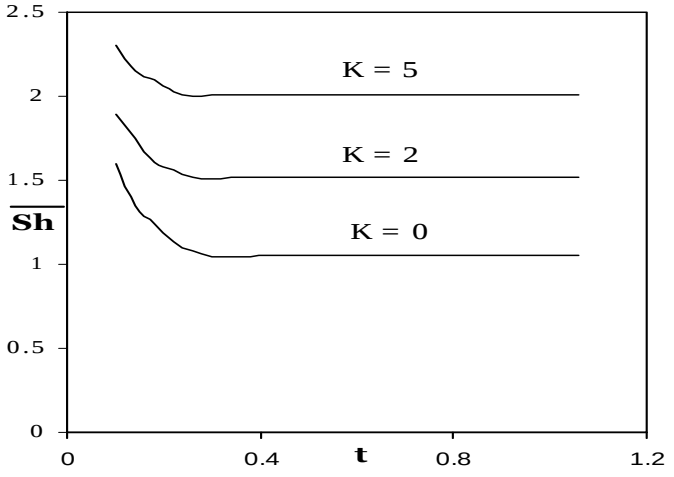

Figure 12. Average Sherwood number

CONCLUSION

Finite difference study has been carried out for unsteady thermal radiation effects on flow past an impulsively started semi-infinite vertical plate in the presence of chemical reaction of first order. The dimensionless governing equations are solved by an implicit scheme of Crank-Nicolson type. A comparison between the present numerical results and available theoretical solution in the presence of chemical reaction are also made. The agreement between the two is found to be very good. The effect of velocity, temperature and temperature for different parameter are studied. The local as well as average skin-friction and Nusselt number are shown graphically. It is observed that the contribution of mass diffusion to the buoyancy force increases the maximum velocity significantly. It is also observed that the velocity decreases in the presence of thermal radiation or chemical reaction. The study shows that the number of time steps to reach steady-state depends strongly on the radiation parameter and chemical reaction parameter.

NOMENCLATURE

*a** absorption coefficient
C' species concentration in the fluid
C dimensionless concentration
D mass diffusion coefficient
g acceleration due to gravity
Gr thermal Grashof number
Gc mass Grashof number
K thermal conductivity of the fluid
K_l chemical reaction parameter
Nu_X dimensionless local Nusselt number
$\overline{Nu}$ dimensionless average Nusselt number
Pr Prandtl number
R radiation parameter
Sc Schmit number
Sh_X dimensionless local Sherwood number
$\overline{Sh}$ dimensionless average Sherwood number
T' temperature
T dimensionless temperature
t ' time
t dimensionless time
u_0 velocity of the plate
u,v velocity components of the fluid in X,Y-directions respectively
U,V dimensionless velocity components in X,Y-directions respectively
x spatial coordinate along the plate
X dimensionless spatial coordinate along the plate
y spatial coordinate normal to the plate
Y dimensionless spatial coordinate normal to the plate

Greek symbols

α thermal diffusivity
β coefficient of volume expansion
β^* volumetric coefficient of expansion with concentration
μ coefficient of viscosity

υ kinematic viscosity
τ_x dimensionless local skin-friction
$\overline{\tau}$ dimensionless average skin-friction

Subscripts
w conditions at the wall
∞ conditions in the free stream

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ASSUMPTION OF TOTAL ASSEMBLY PROCESS CONTROL (TAPC) IMPLEMENTATION

ABSTRACT:
Studies under the TAPC system have been undertaken in order to develop the system which allows the companies of automotive industry for broad and detailed assembly process control and development. The system is to incorporate existing tools like SPC, CAPP, MA but also it will introduce some new elements or modifications of the aforementioned, regardless whether it would be the tools themselves, procedures for tools utilization in company or introduction of new departments purposely created to maintain the TAPC in the company. Studies towards TAPC invention will range from searching for simple and cheap solution, like human based MA introduction or SPC worksheets for data gathering, to more advanced and expensive areas like error proofing device for example, vision systems readings data transfer for capability studies purposes or studies under central computer database for dynamic, generative CAPP proper utilization. The studies will be carried out in two ways, theoretical activities and practical tests at Thule Company.

KEYWORDS:
Process Planning, SPC, CAPP, Changeover, Automotive

INTRODUCTION

In the modern automotive industry, where the will to be better than competitors and meeting specific customer demands are so important, the fact of having products of highest quality is extremely important, but not only that, the general income of the company is one of the main interest as well therefore within the automotive industry both technological and quality issues should stand on the same level for the process controlling engineer or manager. In order to achieve that, production process must be flawless, fully controlled and predictable which can be translated for example into detection of any abnormal process behavior well in advance before such a situation occurs. That gives time to the designated personnel to take preventive actions in order to maintain whole process in line.

Having said that it wouldn't be in place not to mention that different control tools and techniques already exist and are in common use within automotive industry, but many of them have been introduced to the companies only because of the demands of ISO-TS 16949.

ISO-TS 16949 certificate is a must for a company that wants to be recognized on the international market. That demand creates a situation which is an obvious paradox, as the managers who want to obtain and maintain that certificate for their companies, have to initiate new procedures for documentation keeping, broad the volume of necessary documentation and introduce new tools to the production process and many more obviously. That is unquestionably good, but nine times out of ten it ends with stacks of data on the shelves or computers with no one to make a proper use of it and that is a whole point of gathering that information, to use it in order to analyze and control the process. It could be well used for example for SPC, which should be a standard way of process control in automotive industry of twenty-first century or dynamic process planning, based on computer software and existing process data outcome, like generative or dynamic CAPP [3, 4]. Further to that, another dangerous situation may occur.

As mentioned before there are many tools, techniques available for managers and engineers to make the process reliable, predictable, cost-effective, that would give a high quality product [8, 11]. This is the point where all problems begin. ISO-TS 16949 can explain what should be controlled, what areas need special attention, but that is about that. It doesn't say what tools should be used, in what areas of technological process, what exact information should be gathered, what should be analyzed, how the outcome of analysis should be translated into the improvements. It won't help with the choice of tools combination, as one process control tool is never

enough and last but not least it won't help with establishing the procedures of how, where and by whom all those tools and techniques should be used.
Technological process, for example an assembly process is only a part of whole production process, but many areas should be watched over there, like, workforce use, equipment efficiency, breakdowns, maintenance time, process flow and all product related quality issues like nominal measurements keeping. Nowadays, each department has their own tools and own ways of controlling or detecting and gathering that information as well as translating it into the actions that need to be taken to preserve uninterrupted process flow. Many departments, many tools, many employees, there is no common language within the company, the coordination of actions and information exchange is in the best case sufficient. That situation isn't that bad as the one, when a manager decides to introduce some tool, with all the good intentions, but the fact of lack of experience, mismatched judgment of usefulness of the that tool, could bring an enormous waist of time and money and the implementation wouldn't succeed or the tool wouldn't meet the expected outcome. It is not a problem to introduce, for example a SPC, the problem is what to do with all that information that it would collect, shall it be used for DoE (Design of Experiments), and shall it be used for process control or maybe for process planning and what kind of process planning, CAPP maybe, or Dynamic or Generative CAPP? How the information should be transferred and who should it be transferred to, the managers, agents, maybe a multi agent system should be introduced and if yes, shall it be human based or computer based. How all that information should be stored and compute in order to obtain the final action plan that needs to be undertaken? The questions like those are endless.
An answer to that question is simple and so obvious that other systems used that before. For example TQM, it is a set of rules and procedures that describes the responsibilities of different bodies within the company in order to achieve the goal of highest quality product and customer satisfaction. It also explains what available tools should be used, how, when and by whom. It couldn't be simpler.
Therefore, why not create the similar system for assembly process control, where, advisable tools are described, the way of using them, who should use them, how the information should be gathered, stored, transferred, analyzed, optimized and how the outcome should be implemented in the main goal of having the process fully controlled and of highest quality. That is the intention for creating Total Assembly Process Control (TAPC)that can be fully implemented as a uniform system and that would, in a few words, control and optimize the process in order to predict abnormalities for flawless, cost effective production and to maintain high quality of products, meeting customer demands.
TAPC system will be designed as a process control and process planning aid.

TOOLS AND TECHNIQUES FOR TAPC SYSTEM AND ITS STRUCTURE

One of the main problems that stand on the way of creating total assembly process control system is frankly very obvious. It is a decision on what tools, techniques, engineering rules or solutions in general, should become a part of that system. In order to make an appropriate choice some investigation within the automotive industry must be undertaken. For example, the quality demands which are so specific for this area of production must be considered vital for future system structure.
All the tools should be individually analyzed as well, in respect of having their usefulness and areas of application as understandable as possible. Only such an approach could bring an answer, what should be applied into the structure of the TAPC system.

AUTOMOTIVE INDUSTRY – MAIN ASPECTS AND CONTROLLED PARAMETERS

Quite easy to spot are of highest interest for the companies of aforementioned industry. They can be recognized as: time, money and quality. All the other aspects result from those three. It is vital to understand that those three usually stand in opposition to each other, and that is a problem which process control unit has to work with and work it out. Now, it is important to dig deep down to get to those less obvious aspects or not so obvious at all. Let's pay a little more attention to that. For example what could be directly connected to quality in automotive industry, well, the answer would be: demands of APQP (Advanced Product Quality Planning), ISO-TS 16949 and customer specific demands [2]. Following that thought, what could be connected to those, let's name them. Firstly, final products must comply with all conditions stated in the signed PPAP (Production Parts Approval Process), like measurements, materials, shape, performance and many more. In order to achieve that the process itself must provide solutions that will secure the correctness of final product assembly. There are four basic matters to be focused on, which divide into many others of course, but in general there are four, like people, equipment, materials and information. To be able of keeping first three in hand the fourth must be properly gathered, analyzed, optimized and the outcome perfectly implemented. Having said that, it must be declared now that, for example the machines itself are not so much important as the control over them, for that purpose the constant information flow must be provided. Readjustments of the sensors, re-programming, re-layout, etc are not a requirements, those are results, that happen as a result of a need to do so, but an information about such an need must come to a proper person and in due time. Apart from the quality, there is a profitability aspect, which can be easily disrupted by poor work cell or line layout, poor material flow, time consuming changeovers and set-ups and other.

What can be done about that, well, yet again, good information from inside the process is a must, from operators, from and about the equipment and materials. So it is all about information.
A good system which helps with direct and streamed data gathering speeds up the next step of the analysis and optimization. It helps to transfer the data to the person who is designated by the system to work with that particular matter and finally it allows for swift reaction, desirably preventive not corrective.
To summarize, the most important aspects to be controlled are people, machines, materials in order to provide high quality final product that complies with customer demands and all of that needs to be controlled with well designed and functional system which allows for proper data gathering, data analysis, data optimization and outcome implementation. That system allows the company to become more profitable.

PERFECT CANDIDATES AND THEIR ROLE IN TAPC SYSTEM

- *As aforementioned, work towards creating the TAPC system is in the very early stage, but never the less some tools and techniques for process control and planning are being closely analyzed. Process planning matters are under the scope together with inseparable CAPP (Computer Aided Process Planning) nowadays. Next would be statistical methods like SPC (Statistical Process Control), DoE (Design of Experiments) and other statistical analysis [1, 6, 9]. That can be a very powerful tool when properly used, not to mention that for customers within an automotive industry it is highly desirable that a supplying company has got them implemented into their system. The MA (Multi Agent) system will be looked closer at in the near future, as it forces the different way of problem solving, and in definition excludes one person as an ultimate problem solver.*

Apart from that many other smaller, in a way subjects will be approached, like error proofing devices, vision systems, laser systems, PLCs, Kaizen rules and solutions, information technologies as well. All of that is necessary to be studied, to be able to create any process control system what so ever.
One might thing that any of aforementioned tools is nothing new well could not be more correct, but the example of IVHS (Intelligent Vehicle/Highway System) on the central artery/tunnel project in Boston, Massachusetts, USA proves that the key is a perfect combination of existing tools, which leads to a creation of state of the art control system [10]. Of course some of the tools implemented into that system were improved, which is a logical behaviour from system creators, and so shall TAPC system elements develop for improvements, in order to maximize the benefits running from their implementation into the system. The best example is a ATMS (Advanced Traffic Management System), it uses computers, sensors, basically electronics to control signal system, ramp meters, automated toll collection facilities, all of that have already existed, but now it is combined together and overlooked by common ATMS, which further more is a part of bigger IVHS.
Now, the question is which tools and how combined could benefit best and how to the company. Let's briefly describe the advantages of having certain tools working within the system and a vision of tools combination and specific way of their usage within TAPC system.

- *Firstly, the statistical tools, how they can benefit? In order to maintain flawless technological process, we need to prevent and foresee rather than carry out corrective actions [5, 7]. Also, we need not to interrupt the process, so the optimization hypothesis could be tested; there is no time and money for that. Statistical tools can help us, plan, optimize and test the process in a virtual way without any interruptions into the workfloor. For example, information gathered from the process like changeover and set-up rates, followed by other information like how many materials on pallets or plastic boxes had to be delivered into the work cell or line, information about the timings of that operations, how many operators were involved in those operations, all of that can be analyzed in order to find correlations between them and prepare input for statistical experiments. By doing so we can find out what can be changed to help us improve the operations of changeover, which particular elements should be taken care of, minimized or maybe maximized etc. Let's take a real life example from Thule Sp. z o.o. where on some workcells there are up to five changeovers per shift each taking forty-five minutes, a waist of time and money in the process is more than obvious. The DoE run by an appropriate engineer could bring him an answer what to do to shorten that time without having to field test many solutions in order to chose the best one to do the try out. In that way the production run is not interrupted but the optimization activities are being performed. Then, when decisions are made, it is only the matter of time for final implementation of the best solution statistically chosen and verification of the feedback from production. Data for statistical analysis and control can come from many places within the process, mentioned changeovers, product measurements, machine performance; OEE (Overall Equipment Effectiveness) needed data in general etc. [5, 7]. Each and single aspect can be controlled in order to find variations within the process and after some time of data analysis many situations can be prevented from occurring, as the statistical probability of something to happen in certain time and place in the process is already known. For example, let's assume that after analysis of certain product assembly process, we found out that fixtures with laser sensors of the workbench gets worn after time 'X', so we can inform the Maintenance Department about that in order to plan adjustment activities in time 'X-1' when, the workbench is not needed for production. This is very simple example, but it describes the idea of statistical tools usage. We can find bottle necks, we can define periods of time after which something*

wrong may happen, we can basically control any measurable characteristics and we can use them for existing process alterations and new processes planning. Such a broad spectrum of data collection, analysis and optimization requires a designated unit that would be responsible for process control, optimization and planning.

A unit that would base their actions on gathered, measurable data and an analyzed output of that. The unit would plan process improvements regardless whether they would apply to workforce, equipment, documentation or materials and their handling, it would analyze everything connected directly to the assembly process taking great advantage of many statistical tools. The unit propositions for process improvements would be directed to the appropriate departments, like to a Maintenance Department if improvements need to be applied to the equipment or Production Manager when it comes to changes of workforce usage etc. The unit would have a status of process design and advisory department of kind and at the stage of implementations the role of coordinator for designed improving actions. To summarize the Unit's main goal would be continuous process scanning for any variations in order to prevent them before they occur, distribution of certain data from the process to interested departments, work on process improvements projects based on gathered information from inside the assembly process and deeply analyzed with advanced tools, not only based on human experience, coordination of development actions and last but not least main part in new process planning projects. The implementation of such a unit into the company is one of the ideas of TAPC system, as it would be the coordinating body for TAPC system.

- *Second element of the system is process planning. Sounds very straight forward but it is not. The process planning procedures and sequencing is very complicated activity, if a company wishes to have well designed process that will meet all requirements. One of the tools that can be of the great advantage in this respect is CAPP (Computer Aided Process Planning), especially for the manufacturers with significant number of products, like in case of Thule Plant in Poland which has over 200 different types of products. Manufacturers have been pursuing the path to improve and computerize process planning, and as for now the five stages are recognizable, stage I – manual classification, stage II – computer maintained process plans, stage III – variant CAPP, stage IV – generative CAPP and last, stage V – dynamic, generative CAPP. Although the studies in this area are well advanced, many companies in the automotive industry still work at stage I or II. The Thule Company, that will be treated as a test field for TAPC development and implementation has its process planning at stage I, therefore it is a perfect choice for studies purposes. Manual process used in there is based on a manufacturing engineer's experience and knowledge of production facilities, equipment, their capabilities, processes and tooling. That kind of process planning is very time-consuming and the results vary depending on the person doing the planning. The studies under TAPC system assumes that at least stage II of process planning shall be used, but the system will be designed to be flexible in respect of implementing any of the higher stages of CAPP with stage IV and V as desirable. The basic improvement for process planning is parts coding and standardized process plans records in the database, when system can do 90% of work and remaining 10% is done by appropriate persons with their experience and knowledge. Further to that is a development of the system, where at process planning stage, system considers plant and machine capacities, tooling abilities, work centers and equipment loads and equipment status, for example maintenance downtime. It has been mentioned here, because all of that information shall be gathered, analyzed and maintained by designated Process Control United, described in previous indentation of this paper. The unit would provide data input for the CAPP system, which could work with the fully analyzed, therefore trustworthy information when planning for a new process.*
- *In order to combine the work of the Process Control Unit and CAPP system, a third element is required; a central computer system must be implemented into the company. A system that would have all information stored inside, measured, analyzed and optimized, where dynamic CAPP system could take particular data from. The maintenance of that central computer system, which is correctness of data stored in there or that all necessary data is available and in right place and form in the system would be also a responsibility of Process Control Unit. That is the basic idea for TAPC system but still in the very early stage; therefore much work must be done in this area.*

Fourth element that is considered to be involved in the TAPC system is MA (Multi Agent). The TAPC system is being designed to have Process Control Unit as a leading department in this area of expertise, like TQM is overseen by Quality Department for example. Due to the central computer system, which will store huge amount of data and the fact that process plans shall be designed based on that data, possibility of data input should be restricted and the best way to do so is by assigning designated persons in different departments, which would be called agents. It will also simplify the communication between the coordinating Process Control Unit and other departments, as those agents will be fully engaged in the TAPC system activities. Some of the agents can be of non-human nature, using artificial intelligence, but due to the fact of development stage of that subject, costs of implementation it will be a possibility to be used for TAPC system but not a must. Some information can be gathered by sensors, transferred directly to the computer, an agent, where data shall be analyzed and stored into the central computer system automatically, right after analysis, without human interaction.

ADDITIONAL STUDIES FOR TAPC SYSTEM

Described, in previous paragraph, were four basic tools that should be a used within the TAPC system. The next step after the full analysis of their usefulness, shall be the definition of where, whom by and in what range they shall be used. In order to make that all clear for downstream users, the list of system requirements and implementation procedures shall be described as well. The cost analysis of system implementation will be performed for Thule Company, as the testing company, so the clear view for further benefits analysis of the introduced system can be accurately calculated.

Additionally, the technologies of equipment's error proofing devices will be studied to understand what information and how can be gathered form them or using them for process control purposes. The PLC, vision systems, laser systems and others will be approached in the process of TAPC system creation.

To achieve that point, certain resources will be more than necessary, like cross-functional team or at least consultants in the areas of CAPP, MA, Quality Planning, IT and automation, company to run the test at and obviously time.

CONCLUSIONS

The TAPC system in definition is about helping company's personnel control and plan assembly process. It is still a long way before it will obtain the close structure, as studies started in October 2009, but once it is done and tested its introduction into the automotive industry shall be translated into less time waste, more uninterrupted processes, better equipment usage and operators deployment on the shopfloor. Due to the fact that all described data will be analyzed and optimized with advanced tools, the human error will be drastically decreased and the new process plans will be more accurate for any particular introduced product. The improvement actions will not cause long production stops as development actions will be designed using DoE and the communication between departments will be tighter and more precise, which will be possible due to the fact of MA implementation. Advanced tools and introduction of Process Control Unit will help spotting bottlenecks and any process variations, in order to maintain flawless process and best quality products.

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EVALUATION THE QUALITY OF MACHINED SURFACE AFTER MACHINING WITH USING BARKHAUSEN NOISE

ABSTRACT:
This paper deals with application of Barkhausen noise for analysis of surface integrity in turning and grinding operations. The stress state is analyzed in relation to tool wear. The results of measurements show that the residual stresses are not homogenous on the machined surface. This homogeneity depends on tool wear and stability of cutting process. Application of non-destructive testing through the Barkhausen noise is more suitable for grinding operations. Application of Barkhausen noise testing for turning operation will require the next research.

KEYWORDS:
Barkhausen noise, grinding, turning, residual stress

INTRODUCTION

There are many methods applied for measurement of residual stresses induced in the surfaces. Micro magnetic and X - rays methods are non - destructive methods for measurement of these stresses. Micromagnetic methods based on the Barkhausen noise are suitable for evaluation of surfaře integrity. This method is based on the continuous rotation of magnetic field that results into the non continuous magnetization of material. This discontinuity is named as the Barkhausen noise.

Barkhausen noise is damped with increasing depth. The main reason is the damping effect of eddy current influencing electromagnetic fields of the moved Bloch walls. The Bloch walls rotate under the external load to the orientation of magnetic flow. The compressive stresses decreases intensity of Barkhausen noise and the tensile stresses increase this movement [2,1,6,7] (Figure 2.). Hardness of structure influences intensity of Barkhausen noise too, this influence represents Figure 1.

Barkhausen noise is the suitable tool for investigation of surface integrity, especially for analysis of the thermally induced damage. Surface integrity is very important in the scope of finishing operations on parts. Nowadays, there is tendency to replace the final grinding operation on hardened parts with turning process.

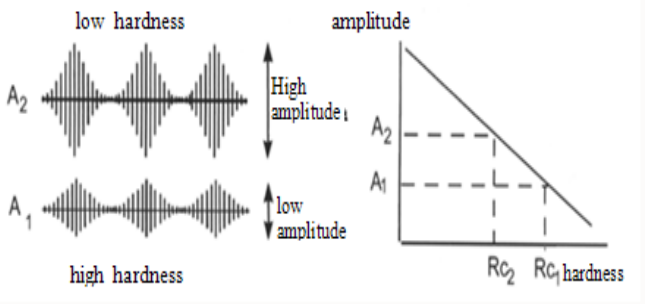

Figure 1. Influence of hardness on character of Barkhausen noise [2,3,4,5]

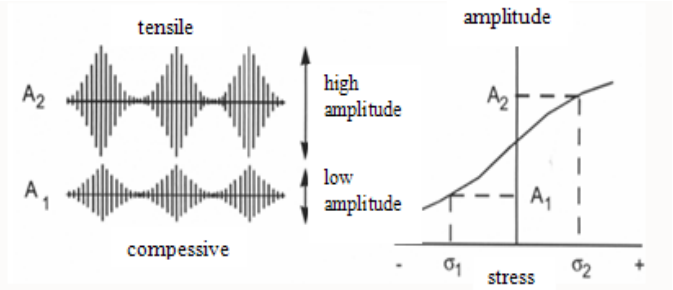

Figure 2. Influence of stress on character of Barkhausen noise [2,3,4,5]

This enables to reduce the cutting time and machining cost for some operations. Technologies of turning and grinding have some advantages and disadvantages concerning the technical, economy and ecology aspects of machining. There is no problem to produce the surface of the same roughness or of the same precision. On the other hand, the final surface after

grinding differ form the final surface produced through the turning in the scope of thermal and mechanical load and in relation to the tool wear. And so, this paper deals with analysis of these aspects. Measurement of residual stresses, surface roughness and dimension stability was carried out on the parts after grinding and turning in this paper.

CONDITIONS OF EXPERIMENTS

Experiments were carried out on the roll bearing steel 100Cr6 of hardness 62 HRC. There were made the rings of external diameter 48 mm, internal diameter 40 mm and width 7 mm. These rings were ground and turned under the constant cutting conditions in relations to cutting time, respective the related removed material. Series of the 3 ring were inspected after the certain passes of tool (these passes relate to material removal and cutting time are in Table 1.).

Table 1. Intervals of measurements of rings and related removed material

time (min.)	0	2,5	7	13	20	30	36	44
Removed material (cm^3)	2	6,2	19	37	56	87	105	130

Cutting conditions for turning operations:
Lathe SUI 40, dry machining, mixed ceramic tool DNGA 150408S015256050 with TiN Coating a_p=0,25mm, f = 0,09 mm, v_c = 90 $m.min^{-1}$.
Grinding machine: 2BuD, Grinding wheel A 98 80 K9V, Cutting fluid - Emulzín H (2%), a_p = 0,025 mm (10 passes + 3 spark out passes),v_f = 6,7 $m.min^{-1}$, v_w = 0,44 $m.min^{-1}$, v_c = 28 $m.s^{-1}$, single crystal diamond dresser.
Tool wear in turning operations were measured on the laboratory microscope BK5. Analysis of stress state was analyzed on 24 rings (3 rings per each 8 series) in 8 points on the periphery of the rings. There was analyzed area of the envelope curve of Barkhausen noise MBN (related to stress state of surface) and the maximum amplitude of the noise MBN max (related to the hardness of the rings).

THE EXPERIMENTAL RESULTS. Grinding process

Figure 3. illustrates than influence of grinding wheel tool on residual stress. Residual stresses are significantly increasing with grinding wheel tool (Figure 3.) and the stress state can lead to formation of cracks on the surface.

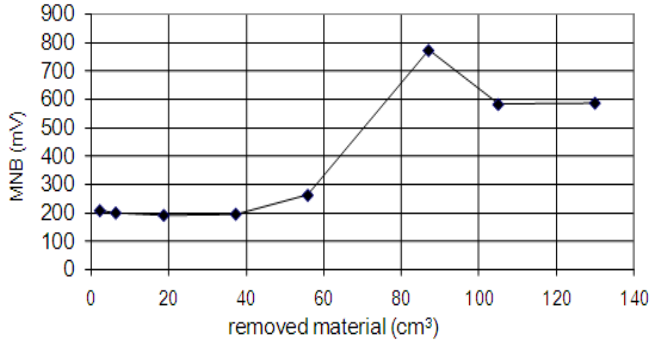

Figure 3. Influence of grinding wheel wear on area of Barkhausen noise after grinding

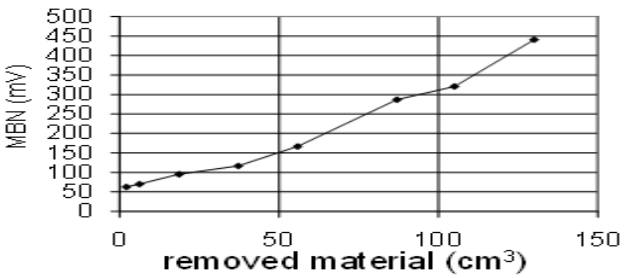

Figure 4. Variance of stress distribution around the ground parts

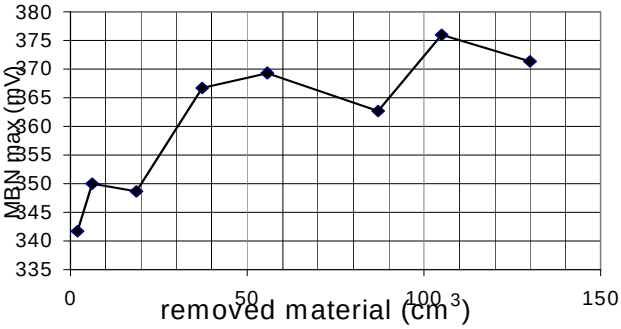

Figure 5. Influence of grinding wheel wear on amplitude of Barkhausen noise after grinding

Intensive thermal load causes surface burn and decreasing of hardness of ground parts, Figure 5. Increasing amplitude of Barkhausen noise is connected with softer structure because of the more intensive activity of Bloch walls. The decreasing stability of grinding process decreases homogeneity of the stress state on the periphery of ground part, Figure 4. (difference between the higher and the lower values of residual stress - calculated on the base of 8 points around the periphery of machined part). Figure 4. shows that distribution of residual stress is much more homogenous after the dressing that that in the last stage of the experiment, Figure 6 and 7.

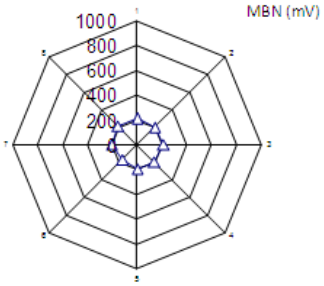

Figure 6. Distribution of stress around the periphery of ground part, ring number 1

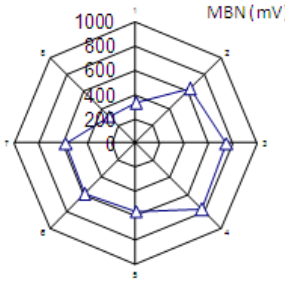

Figure 7. Distribution of stress around the periphery of ground part, ring number 24.

THE EXPERIMENTAL RESULTS. Turning process

Application of this micromagnetic method in the hard turning operation differs from the grinding process. There is the significant aspect of tool wear. There is formation of white layers of the machined surface. The thickness of these layers is increasing with increasing tool wear VB [9, 10]. Structure and hardness of this layer differ from the deeper layers under the surface. Formation of white layers is caused by intensive material flow under the cutting edge and its intensive mechanical and thermal load. Character of this white layer differs from white layers formed in grinding process [9, 10]. The structure consists of martensite and austenite and hardness of this structure can overcome 1000HV and increases with tool wear VB. Figure 9. illustrates the slow decreasing of the amplitude of Barkhausen noise with material removal and so with the increasing tool wear.

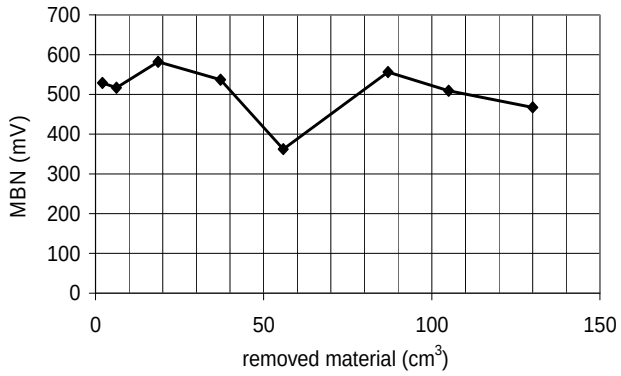

Figure 8. Influence of tool wear on area of Barkhausen noise after turning

This slow decreasing indicates the increasing hardness of the inspected structure. Despite of the higher thermal load of surface, there is no visible burn of the surface after turning. The thermal and mechanical exposure of the machined surface is very short in the contrary to grinding process.

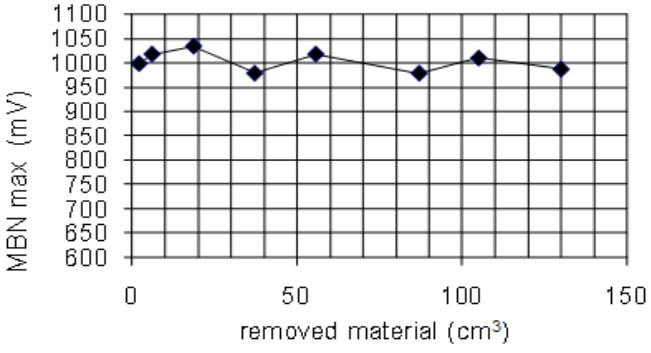

Figure 9. Influence of grinding wheel wear on amplitude of Barkhausen noise after turning

Monitoring of the stress state after hard turning through the Barkhausen noise (related area of Barkhausen noise envelop curve) is difficult, Figure 8. There is formation of the compressive stress in the thin layer under the surface and the tensile stress in the deeper layers under the surface [10]. The compressive stresses are shifted to the tensile zone with increasing tool wear and increasing thickness of white layers. Transformation of compressive stresses to tensile stresses should increases area of Barkhausen noise, but increasing hardness of machined surface eliminates this rise. And so, the curve of stress state represented by Figure 8. is not monotonous and is given by superposition of the increasing tensile stresses and hardness of the structure.

The turning process of hardened parts is less stable in comparison with grinding. Grinding operations are realized through the repeated passes and removal of thin layers. The turning process is realized per one pass and stability of cutting process is affected by deformations of parts caused by the previous heat treatment process [8]. Distribution of stresses around the periphery of turned parts is less homogenous than after grinding in the first stages of material removal, Figure 10, 11.

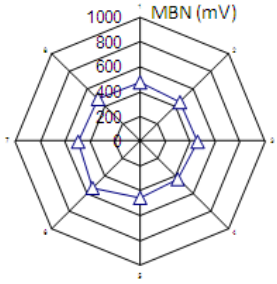

Figure 10. Distribution of stresses around the periphery of turned part, ring number 2

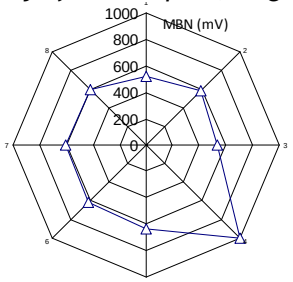

Figure 11. Distribution of stresses around the periphery of turned part, ring number 18

CONCLUSIONS

The results of measurement show that:

- *application of Barkhausen noise is very suitable for monitoring of thermally affected surfaces after grinding,*
- *application of Barkhausen noise for monitoring surface integrity after turning will requires the next research because of the contrary influence of stress state and hardness in the structure,*
- *there is decreasing homogeneity of stress state in relation to tool wear for both applied technologies.*

The higher presented conclusion should be related to the cutting conditions applied in the experimental part of this paper. Turning and grinding process are affected by many factors and their influence can modify obtained results of measurements.

Application of Barkhausen noise for investigation of surface integrity seems to be very suitable, but will require the next research focused on more detail analysis of Barkhausen noise envelope curves. The results of these experiments will be presented in the near future.

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ANALYSIS OF SQUEEZE FILM PERFORMANCE IN POROUS ROUGH RECTANGULAR PLATES UNDER THE PRESENCE OF A MAGNETIC FLUID LUBRICANT

ABSTRACT:
Efforts have been a foot to study and analyze the performance of magnetic fluid based squeeze film between porous infinitely long rough rectangular plates. A magnetic fluid is used as lubricant and the external magnetic field is oblique to the lower plate. The random roughness of the bearing system is modeled by stochastic random variable with non-zero mean, variance and skewness. The associated stochastically averaged Reynolds equation is solved with suitable boundary conditions in dimensionless form to obtain the pressure distribution resulting in the calculation of load carrying capacity. This investigation indicates that the bearing system registers an improved performance as compared to that of bearing system working with conventional lubricant. It is observed that the bearing suffers owing to transverse surface roughness in general. However, the present study reveals that the negative effect of the standard deviation and porosity can be compensated to some extent by the positive effect of magnetization parameters in the case of negatively skewed roughness by suitably choosing the aspect ratio. Further, this compensation becomes more evident when negative variance is involved.

KEYWORDS:
Surface Roughness, Magnetic Fluid, Porosity, Reynolds Equation, Pressure, Load Carrying Capacity

INTRODUCTION

It was Archibald [3] who presented the classical theory of squeeze film between plane parallel surfaces. The squeeze film behavior of a porous bearing was analysed by Wu [22][23][24] for mainly annular and rectangular geometries. Later on, Prakash and Vij [17] investigated the squeeze film performance between porous plates of different shapes resorting to Morgan Cameron approximation. Interestingly, it was proved here that amongst the various geometries of equivalent surface area for the plates, circular plates recorded the highest transient load carrying capacity other parameters remaining same.

All these above analysis considered the bearing surfaces to be smooth. It is a well known fact that bearing surfaces after having some run-in and wear developed roughness. Sometimes even the contamination of lubricants and chemical degradation of the surfaces contribute to roughness. The roughness appears to be random in character which does not appear to follow a particular structural pattern. This request that while modeling the roughness stochastic method must be invoked.

In order to study and analyzed the effect of roughness of bearing system on the performance of squeeze film bearing various methods have been considered. Several investigators have proposed a stochastic approach to mathematically model the random character of the roughness [Tzeng and Saibel [20], Christensen and Tonder [7-9]]. In fact, the method adopted by Tzeng and Saibel was modified and developed by Christensen and Tonder [7-9] in order to present a comprehensive general analysis both for transverse as well as longitudinal surface roughness. Subsequently, the investigation carried out by Ting [19], Prakash and Tiwari [18], Prajapati [15], Guha [11], Gupta and Deheri [12] was based on the approach of Christensen and Tonder. Andharia, Gupta and Deheri [2] dealt with the analysis of the effect of surface roughness on the performance of squeeze film bearings using more general stochastic analysis for characterization the roughness.

In all the above studies, the squeeze film was based on conventional lubricants. The use of magnetic fluid as a lubricant modified the performance of bearing system has been very well recognized. Verma [21] studied the applications of magnetic fluid as a lubricant taking in to account the tangential slip velocity at the porous

matrix lubricant interface while Agrawal [1] observed the effect of magnetic fluid by considering no slip conditions.

Oil based or other lubricant fluid based magnetic fluid can be used as a lubricant. The advantage of magnetic fluid as a lubricant over the conventional ones is that the former can be retained at the desired location by an external magnetic fluid. The magnetic fluid is prepared by suspending fine magnetic grains coated with surfactants and dispersing it in non-conducting magnetically passive solvent such as kerosene, hydrocarbons and fluorocarbons when magnetic field is applied each particle experiences a body force thereby causing a drag to flow.

Bhat and Deheri [4][5] analyzed the performance of a magnetic fluid based squeeze film behaviors between porous annular disks and curved porous circular plates and found that its performance with the magnetic fluid as a lubricant was relatively better than with a conventional lubricant. Patel and Deheri [13] discussed the performance of a squeeze film based on magnetic fluid in rough annular plates.

All the above studies established that the performance of bearing system gets improved due to the presence of magnetic fluid lubricant and the effect of transverse surface roughness is adverse in general. However, the investigation of Patel and Deheri [13] reported that the negatively skewed roughness resulted in increased load carrying capacity. Therefore, it was deemed approach to launch the investigation in to the performance of a magnetic fluid based squeeze film between infinitely long porous rough rectangular plates.

THE ANALYSIS

Figure 1 shows the configuration of the bearing system consisting of rectangular plates.

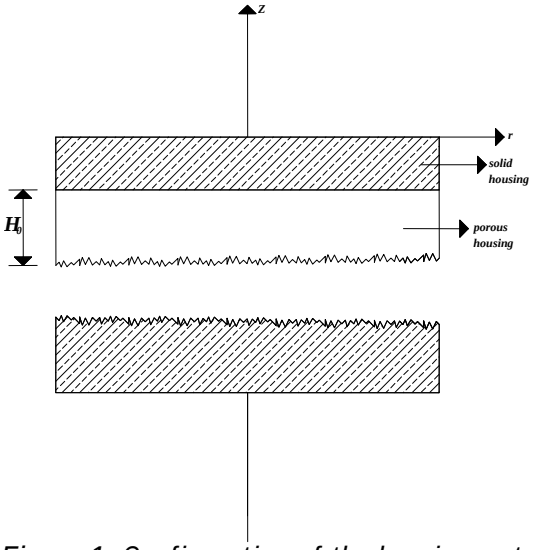

Figure 1. Configuration of the bearing system

The upper plate moves normally towards the lower plate with uniform velocity $-\frac{dh}{dt}$. Both the plates are considered to a transversely rough surface and a magnetic fluid used as the lubricant. Following Christensen and Tonder [7-9] the film thickness of the lubricant film is taken as

$$h = \bar{h} + h_s$$

where $\bar{h}$ is the mean film thickness and h_s is the deviation from the mean film thickness characterizing the random roughness of the bearing surfaces. h_s is considered to be stochastic in nature and governed by the probability density function

$$f(h_s) = \begin{cases} \frac{35}{32}\left(1-\frac{h_s^2}{c^2}\right)^3, & -c \le h_s \le c \\ 0, & otherwise \end{cases}$$

where c is the maximum deviation from the mean film thickness. The mean α, the standard deviation σ and the parameter ε, which is the measure of symmetry of random variable h_s are defined by the relationships

$$\alpha = E(h_s)$$
$$\sigma^2 = E[(h_s - \alpha)^2]$$

and $\varepsilon = E[(h_s - \alpha)^3]$

where E denotes the expected value defined by

$$E(R) = \int_c^c R\, f(h_s)\, ds$$

From the performance point of view several forms of the magnetic field have been discussed in Prajapati [15]. Following Prajapati and ignoring the self field created by magnetization it has been preferred to consider the form of magnitude as

$$M^2 = kb^2\left[1 - \cos\left(\frac{4\pi z}{b}\right)\right]$$

where k is suitably chosen so as to have a magnetic field of strength over 10^5 [Bhat [6]]. Assuming axially symmetric flow of the magnetic fluid between the rectangular plates under an oblique magnetic field

$$\bar{H} = (H(r)\cos\phi(r,z), 0, H(r)\sin\phi(r,z))$$

whose magnitude H vanishes at $z = \pm\frac{b}{2}$, the modified Reynolds equation governing the film pressure p is obtained as [Prajapati [15], Patel et. al. [13], Gupta and Deheri [12]]

$$\frac{d^2}{dz^2}[p - 0.5\mu_0 \bar{\mu} M^2] = \frac{12\mu \dot{h}}{h^3 + 3\alpha h^2 + 3\alpha^2 h + 3\sigma^2 h + 3\sigma^2\alpha + \alpha^3 + \varepsilon + 12\phi H}$$

where μ_0 is permeability of free space, $\bar{\mu}$ is the magnetic susceptibility of particles and μ is the viscosity of the lubricant, ϕ is the permeability of porous facing, H is the thickness of porous medium.

Solving the above equation under the boundary conditions:

$$P\left(\pm\frac{b}{2}\right) = 0$$

And with the usual assumptions of hydromagnetic lubrication, the modified Reynolds equation governing the film pressure p turns out to be

$$P = 0.5\,\mu_0 \bar{\mu} M^2 + \frac{6\mu\dot{h}}{h^3 g(\bar{h})}\left[z^2 - \frac{b^2}{4}\right] \quad (1)$$

where

$$g(\bar{h}) = 1 + 3\bar{\alpha} + 3\bar{\sigma}^2 + 3\bar{\sigma}^2\bar{\alpha} + 3\bar{\alpha}^2 + \bar{\alpha}^3 + \bar{\varepsilon} + 12\psi$$

Introducing the non-dimensional quantities

$$P = -\frac{h^2 p}{\mu a^2 \lambda}, \quad \bar{z} = \frac{z}{b},$$

$$\beta = \frac{a}{b}, \quad \psi = \frac{\phi H^3}{h^3}, \quad \alpha = (12\,\psi_0)^{\frac{1}{3}}$$

$$\psi_0 = \frac{\phi H^3}{h_0^3}, \quad \mu^* = -\frac{k h_0^3 \mu_0 \bar{\mu}}{\mu h^2}, \quad \bar{\sigma} = \frac{\sigma}{h},$$

$$\bar{\alpha} = \frac{\alpha}{h}, \quad \bar{\varepsilon} = \frac{\varepsilon}{h^3};$$

In view of the non-dimensional quantities introduced above, the associated non-dimensional Reynolds equation governing the dimensionless pressure P *is obtained as*

$$P = \frac{\mu^*}{2}\left[1 - \cos\left(\frac{4\pi z}{b}\right)\right] + \frac{6}{g(\bar{h})}\left[\frac{1}{4} - \bar{z}^2\right] \quad (2)$$

The load carrying capacity W *is given as*

$$W = a\int_{-\frac{b}{2}}^{\frac{b}{2}} p(z)dz = ab^3\left[0.5\,\mu_0 \bar{\mu} k - \frac{\mu h^2}{h^3 g(\bar{h})}\right]$$

Thus, the load carrying capacity in non-dimensional form can be expressed as

$$W = -\frac{h^3 W}{\mu\, h b^4} = \bar{\beta}\left[\frac{\mu^*}{2} + \frac{1}{g(\bar{h})}\right] \quad (3)$$

RESULTS AND DISCUSSION

The dimensionless pressure distribution is presented by Equation (2) while Equation (3) determines the load carrying capacity. The corresponding non-magnetic case regarding a smooth bearing [Prakash and Vij [16]] can be obtained by taking the magnetization and roughness parameters to be zero in these above expressions. This analysis also tends to suggest that the performance of the associated rough bearing system can be analysed by considering μ^* *to be zero. It is clear from Equation (2) that the pressure increase by*

$$\frac{\mu^*}{2}\left[1 - \cos\left(\frac{4\pi z}{b}\right)\right]$$

while the increase in load carrying capacity recorded here is $\frac{a\mu^*}{2b}$

A comparison of this investigation with the discussion carried out by Deheri, Patel and Patel [10] indicates that is at least approximately six times increase in load carrying capacity.

Figures [2-6] depicting the variation of load carrying capacity with respect to the magnetization parameter μ^* *for different values of* $\bar{\sigma}, \bar{\varepsilon}, \bar{\alpha}, \bar{\beta}$ *and* ψ *indicate that the load carrying capacity increases sharply due to the magnetic fluid lubricant. However, the effect of* $\bar{\sigma}$ *and* ψ *at the initial stage appear to be negligible.*

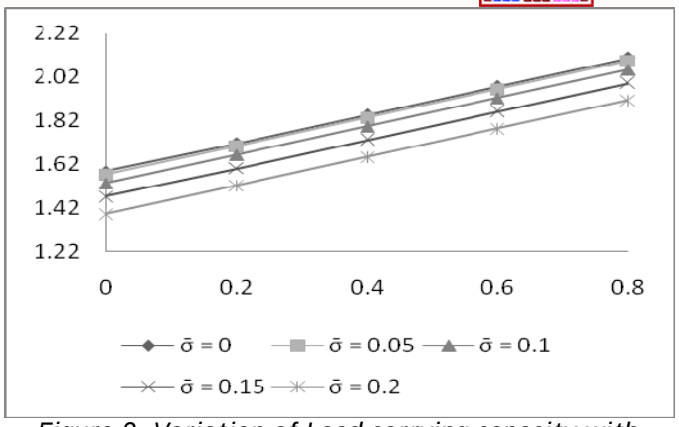

Figure 2. Variation of Load carrying capacity with respect to μ^* *and* $\bar{\sigma}$

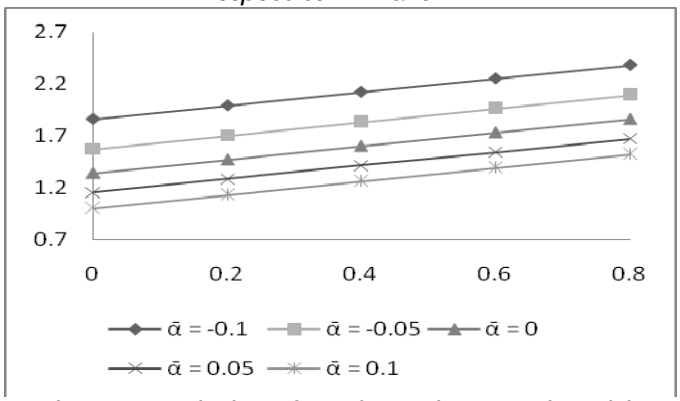

Figure 3. Variation of Load carrying capacity with respect to μ^* *and* $\bar{\alpha}$

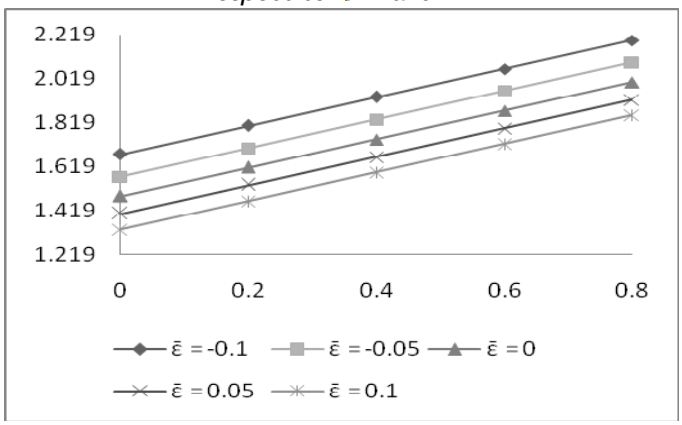

Figure 4. Variation of Load carrying capacity with respect to μ^* *and* $\bar{\varepsilon}$

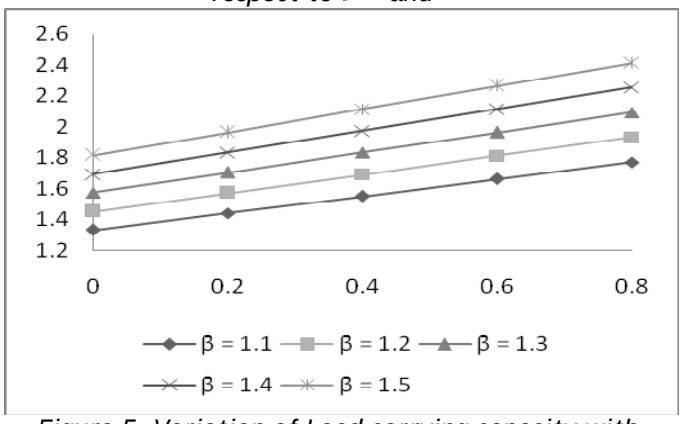

Figure 5. Variation of Load carrying capacity with respect to μ^* *and* $\bar{\beta}$

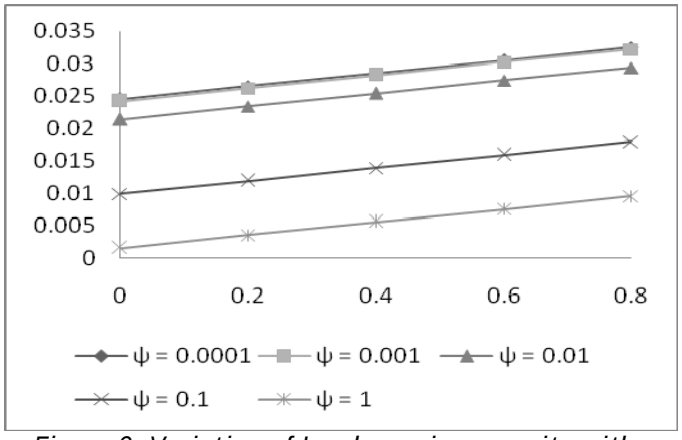

Figure 6. Variation of Load carrying capacity with respect to μ^* and ψ

In Figures [7-10], one can visualize the effect of the standard deviation on the distribution of load carrying capacity with respect to various values of variance $\bar{\alpha}$, skewness $\bar{\varepsilon}$, aspect ratio $\bar{\beta}$ and porosity ψ respectively. These figures assert that the load carrying capacity decreases considerably due to the standard deviation. But the effect of porosity with respect to standard deviation is negligible up to the values of $\psi = 0.001$.

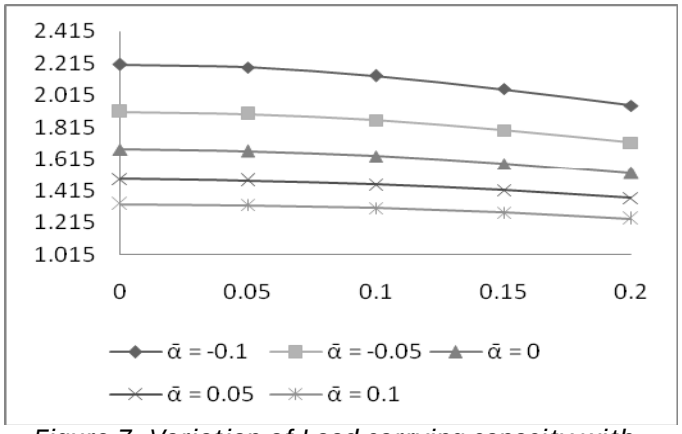

Figure 7. Variation of Load carrying capacity with respect to $\bar{\sigma}$ and $\bar{\alpha}$

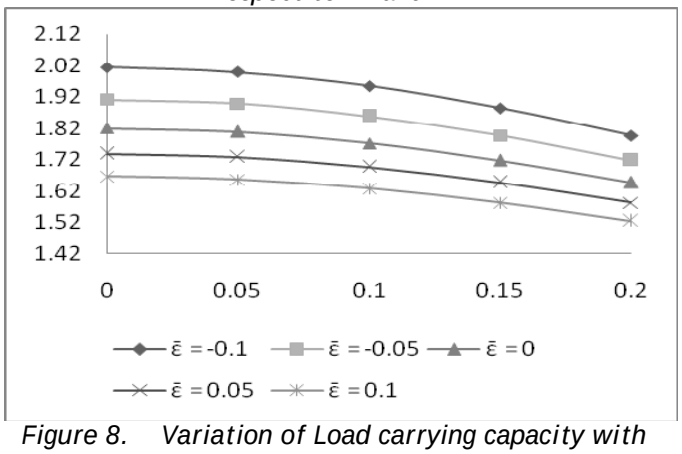

Figure 8. Variation of Load carrying capacity with respect to $\bar{\sigma}$ and $\bar{\varepsilon}$

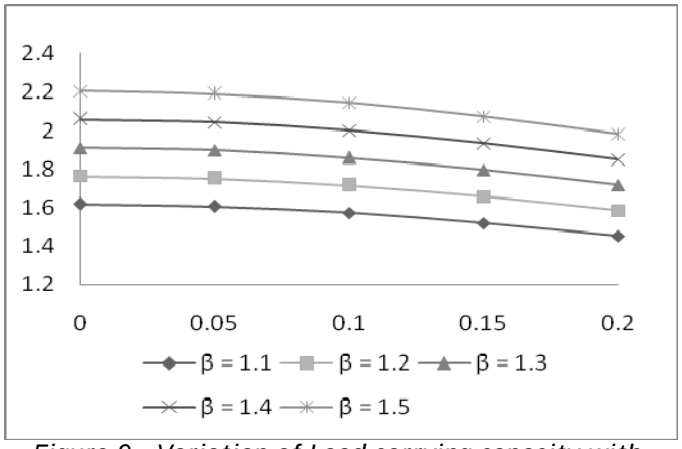

Figure 9. Variation of Load carrying capacity with respect to $\bar{\sigma}$ and $\bar{\beta}$

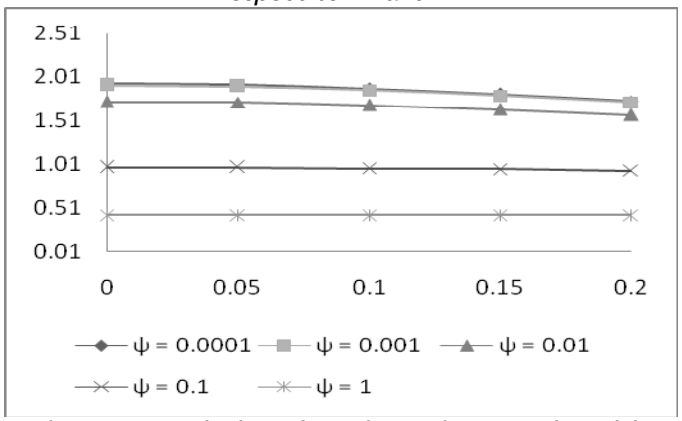

Figure 10. Variation of Load carrying capacity with respect to $\bar{\sigma}$ and ψ

Figures [11-13], describe the variation of the load carrying capacity with respect to the variance for different values of skewness $\bar{\varepsilon}$, aspect ratio $\bar{\beta}$ and porosity ψ respectively. It is clear from these figures that variance $\bar{\alpha}$ (+ ve) decreases the load carrying capacity while the load carrying capacity increases due to variance $\bar{\alpha}$ (- ve). As before, the effect of ψ with respect to $\bar{\alpha}$ is negligible from the values of ψ less than 0.001.

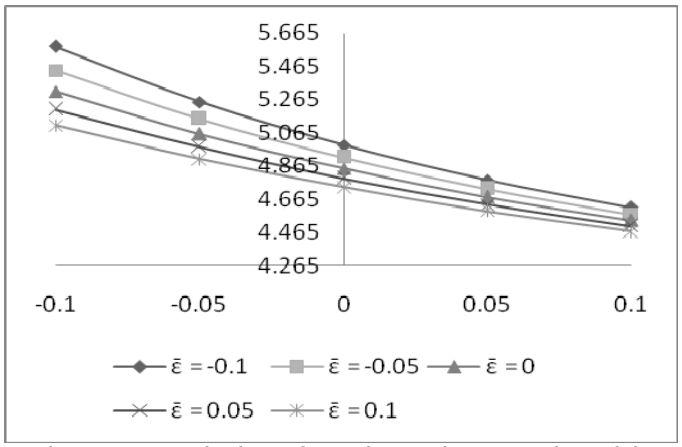

Figure 11. Variation of Load carrying capacity with respect to $\bar{\alpha}$ and $\bar{\varepsilon}$

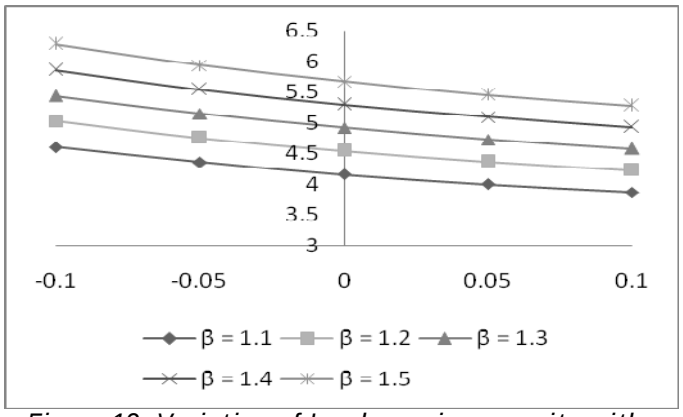

Figure 12. Variation of Load carrying capacity with respect to $\bar{\alpha}$ and $\bar{\beta}$

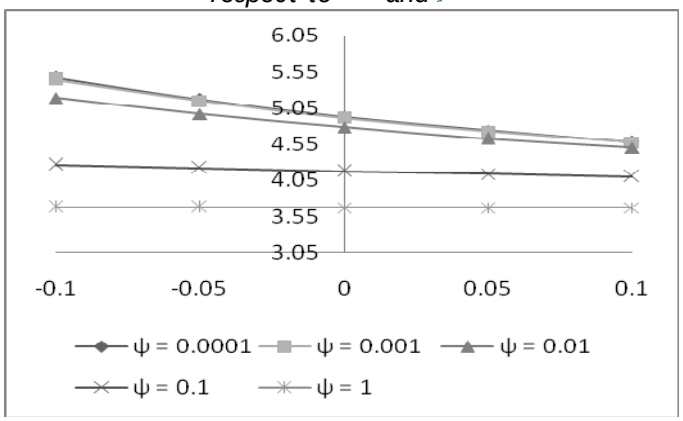

Figure 13. Variation of Load carrying capacity with respect to $\bar{\alpha}$ and ψ

Figures [14-15], present the distribution of load carrying capacity with respect to skewness for different values of $\bar{\beta}$ and ψ respectively. It is clearly seen that the skewness follows the trends of the variance. The fact that, the combined effect of $\bar{\beta}$ and ψ is considerably adverse is manifest in Figure 16.

The variation of load carrying capacity for different values of standard deviation with respect to other two roughness parameters is negligible up to the value of 0.05 so far as the distribution of load carrying capacity is concern.

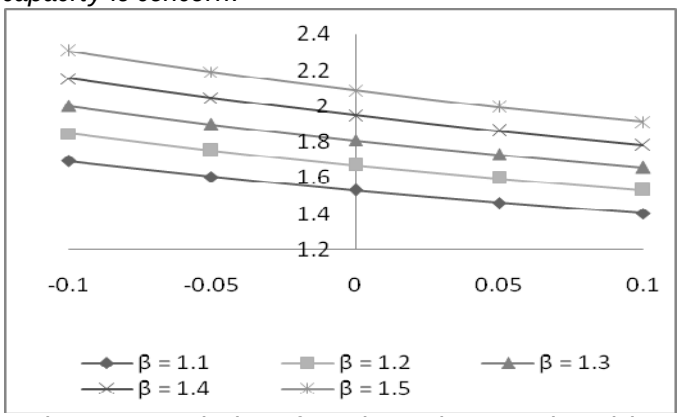

Figure 14. Variation of Load carrying capacity with respect to $\bar{\varepsilon}$ and $\bar{\beta}$

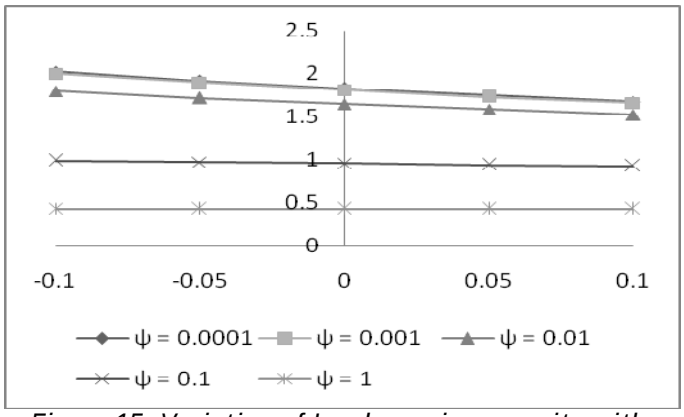

Figure 15. Variation of Load carrying capacity with respect to ε and ψ

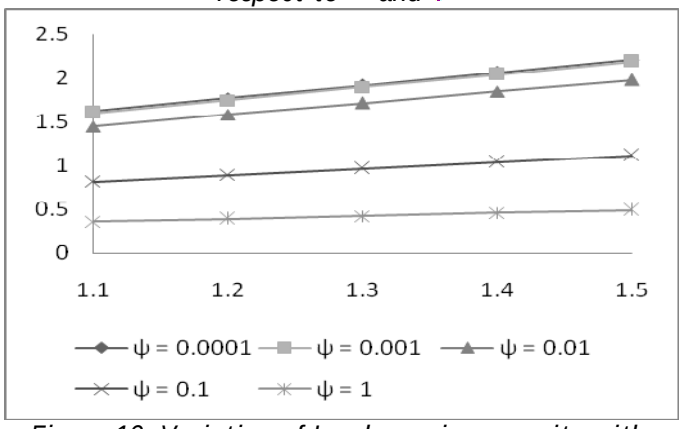

Figure 16. Variation of Load carrying capacity with respect to $\bar{\beta}$ and ψ

It is needless to say that the porosity decreases the load carrying capacity. Besides, if becomes clear that the combined effect of standard deviation and porosity is considerably adverse. Some of these figures indicate that this negative effect of porosity and standard deviation can be reduced by the positive effect of magnetization parameters in the case of negatively skewed roughness by suitably choosing the aspect ratio $\bar{\beta}$. This reduction becomes all the more evident when variance (-ve) occurs

CONCLUSION

It is noticed that the bearing can support a load even when there is no flow. Further, it is found that the roughness needs to be accounted for while designing the bearing system even if the suitable form of magnitude of magnetic field has been considered.

This is all the more necessary especially; from bearings life period point of view. Besides, this investigation offers an additional degree of freedom in the form of magnitude of magnetic field from design point of view.

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THE INFLUENCE OF OVERHUNG AND AXIAL LOADS AT OUTPUT SHAFT OF UNIVERSAL WORM AND HELICAL-WORM GEAR UNITS ON THEIR THERMAL POWER CAPACITY

ABSTRACT:
Universal worm and helical-worm gear units are among the mechanisms that operate with a relatively low level of efficiency for which their thermal power capacity is paid extremely high attention. Value of thermal power limit for gearboxes with free input shaft is particularly defined in the catalogue, enabling their correct choice, i.e. enables the timely assessment of the needs of taking certain procedures in order to overcome problems that may arise due to excessive heating of reducers. Thermal power capacity of motor gear reducer is taken into account when defining a range, i.e. when combining (connecting) the motor and gearbox which is made according to the catalogue, so that the problem is not noticeable to the customer. Today, in an era of tough competition, it is necessary to consider the impact of external overhung and axial loads applied to output shaft on the thermal power capacity of gearbox, so that it could be eventually taken into account when gear reducer is selected. This paper deals with the problem of reducing of thermal power capacity of gearboxes due to external loads of output shaft, i.e. it deals with additional heating due to increased power loss in the bearings. At the end it is concluded (as expected) that the effect of those loads is negligible and there is no need to take them into account when selecting the gear unit, because it does not achieve any effect.

KEYWORDS:
worm and helical-worm gear units, thermal power capacity

INTRODUCTION

When choosing a universal worm and helical-worm gear reducer, service factor is selected from the catalogs of almost all manufacturers of gearboxes according to the service nature (uniform, medium and heavy), operating time during a day (0 to 24 hours), starting frequency - number starting during an hour (from 0 upwards), ambient temperature, the effective operating of reducer in an hour (so called ED factor), permissive overhung and axial loads of the output shaft (and input shaft for gear reducers with solid shaft) and thermal power capacity, accounting that the electric motor drives gearboxes. However, when the large overhung and axial loads are applied, in this case, only on the output shaft, it comes to additional heat generating of gear reducer and thus reducing its thermal capacity. This can cause excessive heating of gear unit (usually above 80°C, or even 100°C), which may, mainly due to changes in size, have bad influence on their operating. Therefore, it is necessary to consider the influence of external load on the thermal capacity of the gear unit and, perhaps, suggest ways to not occur problems due to excessive heating of gearbox.

THE AIM OF THE STUDY

The main objective of this paper is to point out the importance of thermal capacity of worm and helical-worm gear units, as well as the influence of the external overhung and axial loads on the output shaft to the value of this capacity.

PROBLEM INTERPRETATIONS

Universal worm and helical-warm gear units can be delivered with motor or with free input shaft. If they are delivered with electric motors, they can be delivered with special motors, so called geared motors, or with standard (IEC) motors. What electric motors will be used depends on the attitude of the manufacturers company as well as specific demands of the customer [1].

If gear units are delivered with free input shaft, they can have usual solid input shaft and with IEC motors interface.

Large manufacturers usually use special motors, which are characterized by special flanges, special diameters of output shafts, stronger bearings and better sealing solution, so they have a number of advantages (easier, cheaper and more compact design, the possibility of

achieving higher gear ratios, greater permitted force of the motor shaft and better tightness). Since they are buying large quantities of such motors, they get them quickly and at almost a price of standard motors, so that this procedure is completely payable to manufacturer. In addition, these manufacturers usually have their own factory of electric motors, so that they do not have practically this problem.

Small and medium manufacturers of gear units usually use standard IEC motors, although it is not the rule, mainly because of lower cost and short delivery time, and all the benefits of special motors they try to compensate by suitable way of installing motor to the gear unit. Since it is difficult to make up a lot of advantages of special motor, in practice there are different construction solutions of installing gear unit with standard IEC motors that are directly, or with IEC motors interface, connected for the housing of gear unit.

Gear units with standard IEC motors are delivered by large manufacturers, who use special geared motors, especially when customers require. For example, when customer wants to install motors on purchased gear units by himself. It is usually case when they think they can do cheaper or faster service of their motors, or in case of export of gear units in the country, where there are factories of electric motors, which wants with a large taxes on motors to protect their products from foreign competition, and customers are payable to buy electric motors, so they buy gear units with free input shaft motor, usually, with IEC motors interface, which allow them much easier and more secure mounting IEC motors, so that there is no possibility to install motor incorrectly.

Regardless of the type of the applied electric motor, it must consider that power losses originated in the gearbox must be delivered to the surroundings [1]:

$$P_L = P_{in}(1-\eta) = Q \le Q_o = \alpha A \Delta\Theta \qquad (1)$$

where:

P_L - losses in the gearbox,

P_{in} - input power of gear reducer,

η - efficiency of gear reducer,

Q - heat flux caused by originated losses,

Q_o - maximum heat flux that can be transmitted to the ambient,

a - coefficient of heat transmission,

A - the surface area of housing of gear reducer that can exchange heat,

$\Delta\Theta$ - temperature difference, where $\Delta\Theta = \Theta - \Theta_o$,

where: Θ - the temperature of surface of reducer housing, usually it is considered that $\Theta = 80...100^\circ C$ [3] and Θ_o - temperature of ambient where the gearbox operates.

From equation (1) it follows that the value of the thermal power capacity (P_Q) is [1]

$$P_{in} \le P_Q = \frac{\alpha A \Delta\Theta}{1-\eta} \qquad (2)$$

This means that thermal power limit is the greatest power in the input at which, in a permanent operating, obtained losses in the gearbox can be transferred around without excessive heating of gear reducer (Fig.1).

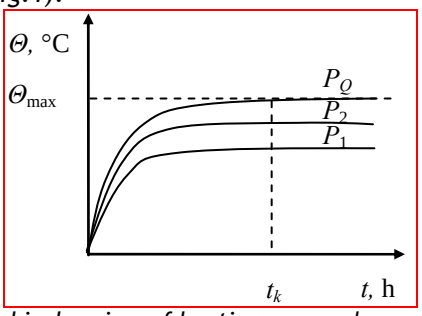

Fig.1. Graphical review of heating gear reducers depending on the input power (where t - time of heating, t_k - critical time when maximum permissive temperature is achieved (Θ_{max}), Θ - temperature of the gearbox housing, P - input power of gearbox)

We should take into account that the speed of heating depends exclusively on operating regime, input power, thermal inertia of gear reducer (of its mass) and selected cooling method.

So, when choosing gear, among other requirements it must be met the following condition: $P_{in} \le P_O$.

When developing a catalog of geared motor, i.e. when the manufacturers compose the assembly of driving and gear unit (geared motor), they concern to fulfill this condition, and they account that the normal temperature of outside air is $\Theta_o = 20^\circ C$. When gear reducer operates at higher ambient temperatures, the value of thermal power capacity is corrected by special coefficient.

However, when selecting gearbox with free input shaft, the customers are referred by manufacturers (in their catalogs) to detailed procedure of gearbox selection, so that problem must be considered by customers (designers) that make procedure for gearbox installation, in order to avoid possible accidents that may occur in the overheated gearboxes.

DESCRIPTION OF WAYS OF SOLVING PROBLEMS

When selecting gear reducer with free input shaft, it must be provided:

$$T_N \ge T_{out} f_B \qquad (3)$$

where:

T_N - nominal torque,

T_{out} - output torque,

f_B - minimum value of the service factor.

When selecting motor gear reducer it is indirectly defined by service factors [2, 4, 5]

$$f_{B\text{perm}} \ge f_B \qquad (4)$$

where:

$f_{B\text{perm}}$ - permissive value of service factors given in the catalogs for each motor power, speed and size of reducer (it is determined by expression $f_{B\text{perm}} = T_N / T_{out}$),

f_B - service factor defined according to the type of loading, operating time in hours during a day, the number of cycles during an hour, the ambient temperature, the effective operative duration during an hour and, eventually, the desired life of gearbox.

So, the choice of gear reducer with solid input shaft is based on its load torque (T_N), or motor service factor (equat.5), as well as the permissive values of radial ($F_{Ri\ perm}$) and axial ($F_{Ai\ perm}$) loads of the free input shaft of gearbox (for gearboxes with solid input shaft) and radial ($F_{Ro\ perm}$) and axial ($F_{Ao\ perm}$) loads of the output shaft (for both types of gear units), Fig.2.

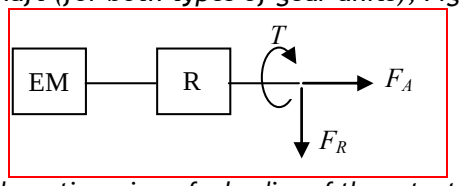

Fig.2. Schematic review of a loading of the output shaft of geared motor (EM - electric motor, R - reducer,F_R - overhung load, F_A - axial load)

Additionally, the choice of gear reducer is also based on thermal capacity (equation 2), where it should take into account that thermal capacity depends on the ambient temperature, as well as on the size (and sometimes the shape and position of mounting) of gear reducer. Its values can be obtained as a table or a diagram (Fig.3).

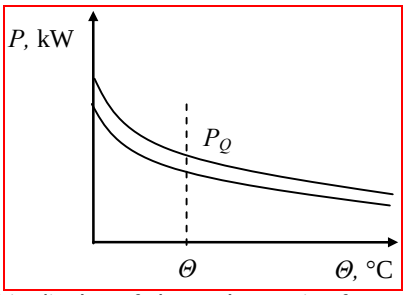

Fig.3. Graphic display of thermal capacity for particular size of gear reducer

Thermal capacity is a little different for geared motor and gear reducer with solid shaft (with classic input or with input for IEC motors), because the fan of electric motor of geared reducer provides some greater air circulation and thus better cooling of reducer, while, due to the heating of electric motor, gearbox is subjected to somewhat larger heating from the motor. Sometimes these cooling and heating quantities can be canceled, and sometimes unfortunately not, so they should be separately shown in the diagram (or table).

In order to reduce the production cost of electric motors, it is going on a maximum reduction of material consumption, which causes faster heating of the motor, so that today insulation material of class F is installed in motors (which allows their heating up to 150°C). Of course, the fan of electric motor does not allow reaching this temperature, but certainly because of higher temperatures of motor it comes to a stronger heating of gear unit, especially if the motor has bigger number of starting during an hour, and particularly if it is a motor with a brake which additionally heats the reducer.

Manufacturers of gear reducers are aware of this problem and take into account the thermal capacity of their gearboxes and try to increase it. They usually manage this by increasing the surface area of housing (i.e. by placing ribs on the surface of housing of gear unit), or by increasing the coefficient of heat transmission by defining of such forms of housing that will provide better air circulation around it, which is driven by a fan of electric motor (this is only applied for geared motor), or by placing a special fan (by manufacturers) on the worm shaft of worm and helical-worm gear reducer.

Operating regime of gear units has also major impact on their thermal capacity. For example, service nature, operating time and number of starting can strongly affect on the heating and thus the thermal capacity of gear reducer. Especially different combinations of these parameters can strongly affect on the heating which is considered by service factor. The calculation of their actual impact is quite complex and can not be accurately described by mathematics, but very accurate values can be obtained by concrete measurements.

In the case that condition is not satisfied (equation 2), it is necessary to adopt a larger (stronger) gearbox, with a larger surface area participating in the exchange of heat, or it is need to use the system for cooling oil. For smaller sizes of gear reducers it is cheaper to select larger gearbox, while in medium and large size of reducer it is rational to use oil cooling system. The system consists of filter, circulating pumps, overflow and several classic valves, piping and heat exchanger with fan and electric motors.

The existence of an external overhung and axial load on the output shaft, which permissive limit values can be found in the catalogs of manufacturers of gear reducers, causes additional load of bearings of gearbox and the occurrence of additional friction in them (whose approximate value amounts $F_{\mu R} = \mu\ F_{Rperm}$ - friction in the bearing due to the external overhung force, $F_{\mu A} = \mu\ F_{Aperm} = 0.4\ \mu\ F_{Rperm}$ - friction in the bearing due to the external axial force) and it causes additional heating of gear unit. Since there are overhung and axial loads simultaneously acting, bearing load must not exceed 0.4, so there is $F_{Aperm} = 0.4\ F_{Rperm}$.

Additional losses of power in the bearing (P_L) can be calculated by the equation:

$$P_L = 1.05 \times 10^{-4}\ M\ n \qquad (5)$$

where:

n - number of revolution of output shaft, min^{-1}

M - total frictional moment of bearing

Total frictional moment of bearing depends on several frictional moments as follows:

$$M = M_0 + M_1 + M_2 + M_3 \qquad (6)$$

where:

M_0 - load independent frictional moment, Nmm

M_1 - load-dependent frictional moment, Nmm

M_2 - axial load-dependent frictional moment, Nmm

M_3 - frictional moment of seals, Nmm

The frictional moment (M_0) is not influenced by bearing load but by the hydrodynamic losses in the lubricant and depends on the viscosity and quantity of the lubricant and also the rolling velocity. It dominates in high-speed, lightly loaded bearings and is calculated using:

$$M_0 = 10^{-7} f_0 (\nu n)^{2/3} d_m^3 \quad (7)$$

if $\nu n \geq 2000$ *or using*

$$M_0 = 160 \times 10^{-7} f_0 d_m^3 \quad (8)$$

if $\nu n < 2000$, *where:*

d_m *- mean diameter of bearing (for particular bearing* $d_m = 0.5 (d + D) = 0.5 (30 + 72) = 51$ *mm)*

f_0 *- a factor depending on bearing type and lubrication (for particular bearing* $f_0 = 1$*)*

ν *- kinematic viscosity of the lubricant at the operating temperature,* mm^2/s *(for usual operating temperature* $\Theta = 40^\circ C$*)*

Table 1. Results of calculation of a typical worm gear reducer without a fan with shaft height 80 mm

Thermal capacity - P_Q, W	1500	920	280
Permissive overhung force of output shaft - $F_{R\,perm}$, N	3260	5370	5300
Permissive axial force of output shaft - $F_{A\,perm}$, N	5520	7800	7800
Actual permissive axial force when overhung and axial loads simultaneously acting on output shaft - $F_{Aa\,perm}$, N	1304	2148	2120
Speed ratio - u	5.4	26	79
Revolution number of output shaft - n, min^{-1}	259	54	18
Mean diameter of bearing - d_m, mm	51	51	51
Kinematic viscosity of the lubricant at the operating temperature - ν, mm^2/s	53,6	210	544
Load independent frictional moment - M_0, Nmm	7.66	6.7	6.07
Load-dependent frictional moment - M_1, Nmm	68.62	148.73	145.74
Axial load-dependent frictional moment - M_2, Nmm	399.02	657.29	648.72
Frictional moment of seals - M_3, Nmm	18	18	18
Total frictional moment of bearing - M, Nmm	493.3	830.71	818.53
Additional power losses in gear reducer - P_L, W	13.41	4.71	1.55
Percent ratio of power losses - $\frac{P_L}{P_Q} \cdot 100$, %	0.89	0.51	0.55

The load dependent frictional moment (M_1) *arises from elastic deformations and partial sliding in the contacts and predominates in slowly rotating, heavily loaded bearings. It can be calculated from:*

$$M_1 = f_1 P_1 d_m \quad (9)$$

where:

f_1 *- a factor depending on bearing type and load for particular bearing and load:*

$$f_1 = (0.0006 \ldots 0.0009) \left(\frac{F_{R\,perm}}{C_0} \right)^{0.55} \quad (10)$$

P_1 *- the load determining the frictional moment, N for particular bearing and load:*

$$P_1 = 3\, F_{Aa\,perm} - 0.1\, F_{R\,perm} \quad (11)$$

Frictional moment (M_2) *which depends mostly on the axial load can be calculated as follows:*

$$M_2 = f_2\, F_{Aa\,perm}\, d_m \quad (12)$$

where:

f_2 *- a factor depending on bearing design and lubrication (for particular bearing design and lubrication* $f_2 = 0.006$*)*

The frictional moment (M_3) *of the seals for a sealed bearing can be estimated and for particular bearing it is calculated as* $M_3 = 18$ *Nmm.*

For a smaller size of gear reducer (with shaft height h = 80 mm) orientation values of frictional moments and additional losses of power in worm and helical-worm reducer are calculated and shown in Table. 1.

Based on carried out calculation it follows that the additional power losses in the gearbox, with the maximum permissive overhung and axial loads of the output shaft, amounts about 1%, so that they can be completely ignored. On the basis of this, it is quite justified that manufacturers of gear reducers, when make the instruction for selecting gearbox, ignore the influence of external loads on the thermal capacity of gear unit and thus considerably simplify their selection of gear reducer.

CONCLUSION

Based on the conducted analysis it can be seen that the external overhung and axial loads of the output shaft of worm and helical-worm gear reducers have a small influence on the change of thermal capacity, about 1%, so that manufacturers of gear reducers ignore it with a full right, i.e. they do not take external forces into account when selecting gearbox and do not make correction in thermal capacity. Also, it would be interesting to see what influence has only axial force at the output shaft, because in this analysis axial load is 0.4 of permissive overhung load, but when just axial force is applied, it can be much bigger.

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THE ROLE OF THE MECHATRONICS IN TECHNOLOGICAL DEVELOPMENT OF THE CONTEMPORARY AGRICULTURAL TRACTORS

ABSTRACT:
In past few decades significant changes happened in the field of technological development of agricultural tractors, leading to great improvements in different aspects of their operation. This is enabled, above all, by introducing of electronic control systems and their wide application in different systems of the tractor. Due to these changes, agricultural tractor has evolved from rough and robust heavy duty machine to high-tech system capable of executing fully new functions and achieving much higher level of overall working results. A few main examples can be named, such as higher energy efficiency, lower emission, higher quality of agrotechnical operations, better soil protection and enhanced working conditions for human operator. New technologies, whose application has led to achieved results, are mostly based on mechatronic systems. This paper will give a basic overview of current achievements and discuss possibilities for future development.

KEYWORDS:
agricultural tractor, mechatronics

INTRODUCTION

Agriculture recently became area with significant application of high technology. Intelligent systems have been developed and applied enabling efficient agricultural production, contributing at the same time to promotion of ecological and social effects. Contemporary tractor development is in accordance with current principles of agriculture production, which are given through the aim for increase of amount, variety and quality of products, together with the more efficient use of energetic resources and reduction of all kind of negative environmental influences. In this scope there is also tendency for further decrease in the level of the load of the human operator and full automation of the field operations. Contemporary trends in agriculture are also characterized by quality and traceability assurance procedures, including creation of appropriate documents which is demanded by law. Further, there is importance of the issues such as machine park monitoring, telemetry service, error detection and recognition etc. Possibility of tractors and their use to fulfill such demands and follow development trends is given above all by intensive breakthrough of electronic components into all their segments.

Numerous electronic measuring and control systems and their integration into already present mechanic and hydraulic components are introduced. In such configuration the data management has a key role in the function realization. This makes contemporary agricultural tractor product comprising great number of mechatronic systems. Many of these can be connected or integrated. Functions they control are e.g. tractor motion, realization and monitoring of agrotechnical operations, communication with environment etc. Despite of interconnection or integration of such systems, this paper is focused mostly on these related to tractor as mobile machine, i.e. vehicle. Necessity of such partial approach is a result of variety and complexity of the topic considered.

INTEGRATED CONTROL OF ENGINE AND TRANSMISSION

Energy efficiency optimization of vehicle powertrain, including mobile machines and tractors, is for a long time subject of intensive activities of researchers and developers. For the power transfer from diesel engine to drive wheels, continuously variable transmission can be seen as one of the most promising solutions. This concept is especially appropriate for the realization of the potentials for working parameters enhancement accompanied by energy efficiency increase. For this to be achieved, one of the key parts is a right use of engine and transmission electronic control.

System of integrated control of engine and transmission opens further possibilities for optimization, provided appropriate control strategy is used. Such configuration enables work of the engine in the area of low rotational speed, which is accompanied by favorable values of specific fuel consumption. This also gives a higher engine torque while working on actual constant power hyperbole. Lower rotational speed and higher torque as power transmission input values further contribute to energy consumption reduction by enabling transmission to work with higher efficiency. Total fuel consumption can be significantly reduced by utilization of such possibilities. Working load fluctuations, which can be significant, are compensated by control system through variation of fuel amount and transmission ratio. Without such control strategy, engine has to be kept in the area of the high speed in order to keep stability in the non-steady state conditions. The result of this is higher consumption, noise and wear. Paper [9] gives one possible solution for consumption reduction in the way described, ensuring at the same time working regime stability.

According to importance of the powertrain system, its further technological development can be expected, which also includes introduction of new concepts. Utilization of the in-wheel concept can be expected as one of development trends. For the realization of such system a hydrostatic power transmission can be used. Still, since introduction of electric and hybrid-electric powers in tractors is highly probable [1, 2], electric wheel hub motor concept could be utilized in series vehicles, and not only in research and investigation.

Individual motor for each wheel enables, as compared to centralized power, enables several advantages, such as:

- *there is no mechanical connection between powered wheels; therefore optimal values of torque, wheel slip and rotational speed can be determined for each wheel for current working or driving conditions; on agricultural surfaces this contributes to optimal utilization of adhesion and enhancement of tractive properties, fuel consumption reduction, better soil protection and reduction of tire wear; on hard surfaces, vehicle dynamic performance characteristics can be optimized and therefore active safety of nowadays high-speed driving tractors improved;*
- *individual control of torque and rotational speeds enhances drive ability and maneuverability of the tractor.*

For realization of advantages named, appropriate control system is required that utilizes adequate control strategy. One concept, that should be realized, is descried in the paper [7]. In this concept, a cyclic communication of control software with sensors and actuators via CAN-bus is provided. On the basis of the driver input and information about dynamic state of the system, appropriate values of hub motors control parameters are determined.

TRACTOR DRIVING AND BRAKING SYSTEMS

One of the main problems in the exploitation of agricultural machinery is deteriorating influence of normal and tangential forces through which the vehicle acts on the soil. These forces lead to soil compaction, which has a numerous negative impacts. Soil protection from compaction has been significant research topic for a long time. It is a complex phenomena still leading to unanswered questions and therefore offering potential for further improvements in this topic. A possibility for the more significant prosperity in this field could be seen in utilization of the system of the tractor chassis control according to the values of the soil parameters that are in connection with the compaction phenomena. Such possibility is above all connected with the development of the sensor technology and data management. One possible way is to develop a system that can monitor soil humidity as key compaction parameter [4]. Together with the information on tire penetration depth acquired by laser sensor [13] giving an insight into soil stress state, this could be used for the control system for automatic tire inflation pressure regulation and its optimization as the function of soil compaction parameter values.

Due to impact of the tire inflation pressure onto the numerous exploitation characteristic of the tire and tractor itself [3], integration of the system for automatic tire inflation pressure regulation could contribute to enhancement of many parameters such as:

- *energy efficiency and realization of the tractive forces through adapting tire characteristic to the current soil conditions;*
- *driver comfort, through impact on tire vibrational characteristics;*
- *active safety of the tractor on public roads through impact on tractor dynamics performance characteristics;*
- *reduction of the tire wear and damage possibility, etc.*

When the track mechanism is used for realization of the tractor motion, there is a possibility for enhancement of their characteristics e.g. by optimizing of vertical load distribution. This is achieved by active suspension of the wheels as described in [6]. This paper introduces innovative concept of mechanical configuration and hydraulic suspension that enables optimal contact of the track with the soil through the actions of the control system. This ensures optimal performance characteristic of the tractor in a tillage as well as enhanced maneuverability and driveability while driving on the curved trajectory.

Due to increased speeds of tractors, their braking system has been significantly enhanced. Introducing of control systems such as ABS is, however, not yet to be expected. Electronic control still has an application in the braking action, through the driver assistance systems. One of them is uphill start assistance.

The other can act while driving downhill towing a trailer, having function of "jack-knifing" prevention [14]. Risk of such event exists when driver tries to decrease speed without using brake pedal, but only through gas pedal release and transmission ratio increase. Then the wheel slip is increased so much that lateral adhesion is almost lost and therefore driveability and stability of the towing train is endangered. This phenomenon is especially pronounced for the case of continuously variable transmission, widely used today, due to their possibility of fast reaction on the driver input.

AUTOMATISATION OF TRACTOR GUIDING AND IMPLEMENT CONTROL

Automatization of the tractor guiding and realization of working tasks as well is a field where recently greatest development of mechatronics and automatic control systems has happened. As a result, this is probably an area with the most intense development in contemporary tractors. Regarding tractor together with the coupled implement, full automatization of the field work is state of art. There are also aftermarket systems available that can be integrated into tractors originally not equipped with such solutions. This state of development is enabled through wide application of the control systems on different systems of tractor and implement and their networking, through use of different navigation systems and through developing appropriate software solutions as well. When tractor operates in the conditions of low reception of navigation satellite signal, or when there are additional requirements for the precision of guidance, laser sensors are used. There are also laser and ultrasound sensors detecting the position of individual plants or their parts [11]. Further development of this system will contribute in enabling mechanical weed control.

It is necessary to design automatization systems in user-friendly way, in order to enable user to fully exploit their potentials, but also to avoid possible user resistance should the complex learning procedure be needed to be able to use the system.

Tractor work in the field is characterized by a series of actions periodically repeated. For example, when the tractor comes to the end of the field and turns around to begin a new row, there are operations such as: lifting, turning and setting the plough down; turning power take-off, differential lock and all-wheel drive off and on; control of the engine and transmission to change speed, etc. Electronic control system can automatize such procedures in order to decrease level of operator load and therefore to increase productivity and work quality. This can be realized through programming of operations to adapt automated work to individual needs. Such automatization requires networking of control systems of engine, transmission and hydraulic system and their common control. Beside all this, navigation system data can be use to automatically turn tractor around at the end of the row. Utilization of navigation system data is also basis for precise guiding the tractor along the path required. This provides numerous advantages, such as [15]: getting precise position of the tractor and implement or the next row; reduction of row overlap; reduction of human error possibility; lower level of operator training required, etc. Result of all this is productivity and quality increase, as well as consumption reduction of the fuel and other materials such as fertilizers or pesticides.

SUSPENSION SYSTEM AND VIBROISOLATION

Although elastic wheel suspension is getting more and more involved in the tractor chassis, protection of the operator from the harmful impact of the vibrations (according to EU directive 2002/44/EEC) is still mainly done of the basis of seat and/or cabin suspension. Semi-active and active system can give best results for wide spectrum of excitation frequencies. Semi-active systems are characterized by the possibility of damping control, usually done by controlled cushion valves or by use of magneto-rheological fluids. Active systems use actuators that give force / displacement output according to excitation. Paper [10] describes a concept of active suspended seat with pneumatic actuator. Significant property of the system enabling its use is low energy consumption. This also enables system to use its own energy source instead of being coupled with that of the tractor, which gives a possibility for aftermarket use on arbitrary tractor model. For determining of excitation parameters acceleration and displacement sensors are used. Air spring stiffness is controlled by electro-pneumatic valve for regulation of active air volume. Control algorithm must take into account that excitation has continuous spectrum, which makes the task of proper vibroisolation more demanding.

OTHER SYSTEMS

Besides mechatronic systems of tractor as vehicle, which are the main topic of this paper, other systems should also be briefly mentioned for their importance. Amongst them there are different communication systems enabling the transfer of data used for control and monitoring. For networking of electronic system components and local data exchange and management CAN-bus system is used. Communication of tractor and implement electronic via ISO-bus connection enables further automatization of work and tractor control according to implement requirements (concept called „implement-controls-tractor“).

Wireless data transfer to greater distances has importance for the teleservice. This assumes transfer of diagnostic parameters to remote server computer, including use of internet [12], used for planning of maintenance operations as needed according to the system state. This way system faults can be prevented, which is especially important by high specialized mobile machines, for their standstill can cause bigger problems such as e.g. logistic chain break [8]. Data acquired serves also for establishing of required documentation.

At the end an important role of the mechatronic in the tractor hydraulic system should be mentioned, because of great influence it has on the agrotechnical operations. Many of achievements described above also would not be possible to realize without it.

CONCLUSION

On the basis of literature research, this paper gives a presentation of the current state of mechatronic systems application in agricultural tractors, together with the consideration of the possibilities for future development. Due to versatility and wideness of the topic treated, the paper is focused mostly on these parts of tractor making it a vehicle. Therefore other important electronic and mechatronic systems found on contemporary tractors are not covered. From the same reason closer and more detailed technical description of the systems mentioned is also not given.

It can be concluded that mechatronic systems have led to high level of tractors technological development, which is a general trend in overall agriculture production as well as in other fields of human activities. Optimal integration of mechanical, hydraulic and electronic systems enables exact process control, which is a basis for all advantages achieved this way. The main amongst them to be mentioned are saving of all kinds of resources and improvements in productivity, quality, environmental protection and working conditions, etc.

As basic features of future trends, further development of sensors and intelligent data management systems can be anticipated. These can be e.g. picture processing, sensors for measuring soil parameters such as soil humidity or electrical conductivity etc. Such development contributes to precise farming, because of the possibility to adapt working process to the local needs and specifications. Data acquired can also be utilized for creation of required documentation.

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IMPROVEMENT OF THERMAL COMFORT IN A PASSENGER CAR BY LOCALIZED AIR DISTRIBUTION

ABSTRACT:
The thermal environment and air quality in a passenger car can affect driver's and passengers' health, performance and comfort. Due to spatial and temporal variation of state variables and boundary conditions in the vehicle cab, the heating, ventilating and air-conditioning (HVAC) does not have to be designed to provide a uniform environment, especially because of individual differences regarding to physiological and psychological response, clothing insulation, activity, air temperature and air movement preference, etc. Therefore the system should be able to generate preferred local environmental conditions, even on individual body part level. Comfortable thermal conditions in the vehicle are easier to achieve in cold conditions than in warm conditions, therefore this paper focuses on human thermal sensation in warm ambient. Vehicle HVAC system delivers conditioned air into the cab space, and human body is cooled by convection and sweat evaporation. The heat loss from the body will mainly depend on air velocity and temperature over the individual body part. The resulting distribution of skin temperature over the body surface will dictate human thermal sensation and thermal comfort.
The aim of this paper is to provide an overview of local microclimate parameters which HVAC system should achieve in vehicle cab in warm ambient, regarding thermal sensitivity of individual parts of human body obtained from empirical data. Required conditions are prerequisite for air distribution design that would have optimized performance from the point of view of thermal comfort as well as energy consumption, in comparison with the conventional approach.

KEYWORDS:
cab, thermal comfort, thermal sensation, air distribution, air-conditioning

INTRODUCTION

Thermal environment in passenger cars differs from those in buildings and is often highly non-uniform and asymmetric, from the following reasons:

- *interior volume is small, compared with the number of persons;*
- *changing of microclimate parameters could be rapid (vehicle is changing the orientation to the sun, etc);*
- *the shape of the cab interior is complex;*
- *glazing area is large in comparison to cab surface;*
- *passengers seat near surfaces with temperatures which could be significantly higher or lower than interior air temperatures;*
- *passengers are not able to change position within the cab, and changes of body posture are limited;*
- *the air-conditioning is usually not activated when there is nobody in the car or when the engine is not running, resulting in occurrence of extreme microclimate conditions.*

Nevertheless, conditions for human thermal comfort should be the same as in buildings. Standards for thermal comfort suggest that combination of microclimatic parameters of indoor environment (air and radiant temperature, air velocity and relative humidity) and individual parameters (clothing and activity) should be within certain limits, spatially homogeneous and steady state. Vehicle HVAC system obtains desired interior environment by introducing the cooled/heated/dried air into the cab air through the system's outlets, usually placed on the instrument panel and in the front footwell region. From these reasons, obtaining both the uniform and comfortable conditions in the cab is not a simple task. Other restrictive factors will be shape and dimensions of the cab interior, demands for visibility, and other technological features regarding air distribution system. Considering the preferred microclimatic conditions under the different outdoor conditions, there are also inter- and intra-individual differences within the passengers, for example age, gender, mood

etc. Furthermore, passenger's clothing is set according to outdoor conditions. Consequently, desired local microclimatic parameters within the cab could be very different among the passengers.

As the system control is based on the change of airflow characteristics (temperature, velocity and direction), this paper is dealing with local air temperature and velocity as controllable microclimate parameters around the head and upper body as the thermally most sensitive parts of human body. Obtaining the preferable environment in warm ambient inside the vehicle cab with proper distribution of conditioned air would lead to improvement of the efficiency of vehicle HVAC system, owing to higher comfortable operative temperature and higher air velocities and to less dependency from size and shape of the cab. In order to determine these values, it is necessary to be familiar with human thermal sensation, thermal characteristics of human body and human thermoregulatory system.

PASSENGER THERMAL SENSATION AND THERMAL COMFORT

Even in moderate outdoor conditions, vehicle passenger compartment is subjected to various heat loads, such as direct and reflected solar radiation, heat transfer through the cab walls due to the temperature difference, heat released by the passengers (sensible and latent), and heat gain from the powertrain. This can lead to the rise of the interior air and surfaces temperatures above the acceptable values, making the ambient uncomfortable, decreasing the driving performance, possibly leading to the risk of hyperthermia.

To prevent the rise of body temperature and therefore the risk of hyperthermia, it is necessary to release heat from the body or to make ambient comfortable by cooling. Both of these methods can be used in vehicles, especially in transient (cool-down) conditions. Largest part of heat loss from the body surface in warm conditions is consisted of convective heat loss and heat loss by sweat evaporation from the skin [8, 17]. These modes of heat transfer are more intense if difference between skin surface temperature and air temperature is increased and with increase of local air velocity. For that reason, local and overall thermal sensation of the human body should be the reference for determination of suitable microclimate condition in the cab generated by vehicle HVAC system.

Human senses the warmth of an environment through thermoreceptors located in the skin and body core, which send signals about thermal sensation to the brain. Thermal sensation of individual body parts is different due to different properties and different sweating rate [1, 9, 24]. Consequently, individual body parts have different sensibility for thermal sensations [24]:

- *Back, chest, and pelvis strongly influence overall thermal sensation, which closely follows the local sensation of these parts during local cooling.*
- *Head region, arms and legs have an intermediate influence on the overall thermal sensation.*
- *Hands and feet have the least impact on overall sensation.*

PREFERABLE LOCAL MICROCLIMATE CONDITIONS

Main requirements regarding preferable combination of local air velocity and temperature the system should meet are:

- *to attain and keep local skin temperature within comfort range, which will give sensation of thermal comfort,*
- *to penetrate natural airflow around the body,*
- *to avoid draught or eye irritation,*
- *to supply the breathing zone with fresh clean air.*

In other words, avoiding the discomfort is not guarantee that thermal comfort will be obtained, and vice versa. Preferable and allowed values for combination of local air/operative temperature and velocity given in this paper are collected from the overview of the relevant literature.

According to Standard ISO 7730, the local discomfort can be evaluated by the index of predicted percentage of people dissatisfied due to draught (DR). This index is applicable in steady-state moderate indoor environment for sedentary (~1 Met), thermally neutral persons dressed in normal indoor clothing, but without possibility of control over the air velocity/ temperature. Percentage of dissatisfied of 20% is stated as upper allowable limit. DR is calculated from local air temperature t_a (°C), local air velocity v_a (m/s) and turbulence intensity TU (%) [8, 12]:

$$DR = (34 - t_a)(v_a - 0.05)^{0.62}(3.14 + 0.37 v_a \cdot TU) \ \%$$

However, moderate conditions rarely occur in passenger car during the transients and DR cannot be extrapolated for elevated temperatures, therefore different models and criterions are needed.

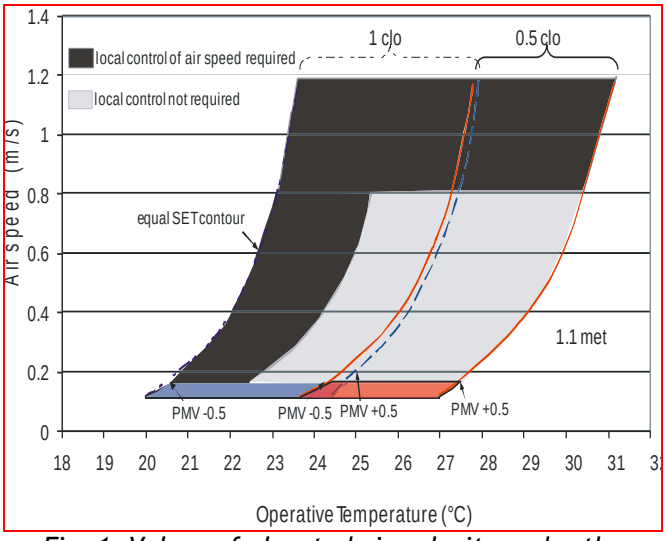

Fig. 1. Values of elevated air velocity under the increased operative temperature, with and without possibility of control, which gives Predicted Mean Vote (PMV) between -0.5 and 0.5 [5]

Standard ASHRAE 55-2009 suggests elevated air velocities up to 1.2 m/s, to increase the maximum temperature for acceptable comfort, if the air speed is under the control of exposed person. These values apply to a lightly clothed sedentary person (0.5 - 0.7 clo) with metabolic rates between 1.0 and 1.3 Met [2, 5] (Fig. 1.).

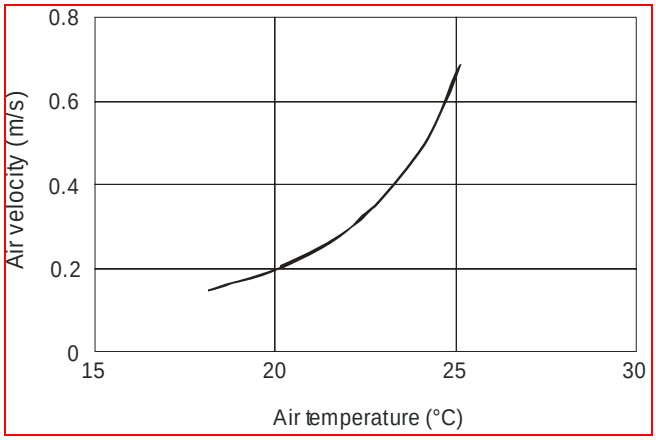

Fig. 2. Recommended air velocities for the range of air temperature inside the cab, according to the standard DIN 1946-3 [6]

Fountain et al. (1994) have performed preferred condition tests on 54 subjects in four different warm isothermal conditions [10]. Temperature of ambient air was set on 25, 26, 27 and 28°C. Subjects were requested to adjust the air velocity (up to 2 m/s), in order to make them comfortable. Localized air was distributed by desk fan, floor-mounted diffuser or desk-mounted diffuser. Regression analysis of the results gave the model of Percentage of satisfied, as function of operative temperature t_o (°C) and local air velocity v (m/s) [10]:

$$PS = 1.13t_o^{0.5} - 0.24t_o + 2.7v^{0.5} - 0.99v \text{ , \%}$$

Arens et al. (1998) have performed the experiments with 119 subjects regarding the preferred air velocities and air temperatures in ambient temperatures from 24 to 31°C, and air velocities within the range of 0.05 to 1.04 m/s. The results showed that in this case neutral thermal sensation, neutral thermal preference and neutral air movement preference followed each other closely, which can be concluded from the respective regression lines [3]:

- $v_a = 0.107t_a - 2.1875$, m/s, for neutral thermal sensation,
- $v_a = 0.1025t_a - 2.0912$, m/s, for neutral thermal preference, and
- $v_a = 0.1126t_a - 2.3587$, m/s, for neutral air movement preference.

The same authors cited the results of Kubo et al., where the influence of air relative humidity (RH) under the similar conditions is given. It was found that with increase of relative humidity from 30% to 80% leads to slightly increase in preferable air velocity.

The preferred air velocities obtained from experiments conducted by Tanabe and Kimura are also given in this paper (Table 1) [3]. Table 2 shows the values from experiments of study of the preferred velocities at the elevated temperatures performed by Toftum [22].

Table 1. Values obtained by Tanabe and Kimura, for horizontal, isothermal air flow and RH= 50% [3]

Air temperature, °C	Air velocity, m/s
28	1
29.6	1.2
31.3	1.6

Table 2. Values obtained by Toftum [22]

Air temperature, °C	Air velocity, m/s
26	0.2
28	0.6
29	1.4

All above-mentioned results from experimental determination of preferred air velocity and temperatures, for isothermal airflow are summarized in the graph on Fig. 3.

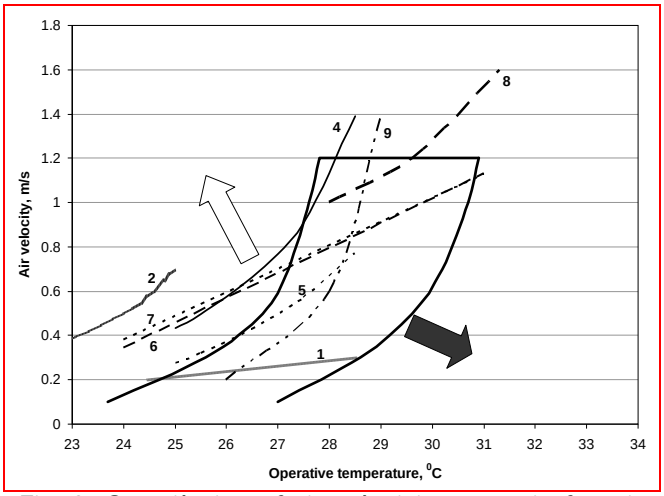

Fig. 3. Compilation of air velocities range in function of operative temperature, for sedentary subject with clothing insulation in range of 0.35 - 0.5 Clo (0.73 Clo with chair) and metabolic activity in range of 1 - 1.2 Met:
1 - DR = 20% of dissatisfied (ISO 7730) calculated for TI = 50%; 2 - Air velocity according to DIN 1946-3 [6]; 3 - Limits for air velocity under control of exposed person for PMV = ±0.5, 1.1 Met and 0.5 Clo (ASHRAE 55-2009) [5]; 4 - PS = 100% by Fountain et al. [10]; 5 - PS = 80% by Fountain et al. [10]; 6 - Regression line for neutral air movement preference by Arens et al. [3]; 7 - Regression line for neutral thermal sensation by Arens et al. [3]; 8 - Preferred velocities by Tanabe and Kimura [3]; 9 - Preferred velocities by Toftum [22]

It could be noted that area recommended by the recent version of Standard ASHRAE 55 gives good guide for setting the local ambient conditions in warm ambient in the area of head and upper body. Limits for discomfort due draught proposed by Standard ISO 7730 is obviously too strict, in comparison with empirical values. Therefore, this criterion is not suitable for vehicle interior in warm conditions. Grey arrow shows the region of conditions of possible complaints due to insufficient air movement and/or high air temperature - corresponding to warm sensation. On the other side, values recommended by DIN 1946-3 are almost in zone that corresponds to the risk of draught due to too cold air stream (white arrow), but these values are stated for lower temperatures (up to 25°C). According to some authors, there is possible to further increase the air velocity under some conditions [3, 22, 25].

In the case of non-isothermal conditions, when there is need to cool interior of the car under hot outdoor conditions, the only way to lower the temperature and humidity of air is the use of air-conditioner. In this case, airflow that is colder than surrounding air will be passing over the body surface. The experiments performed in non-isothermal conditions showed that preferable velocity also increases with increase of surrounding air temperature and/or airflow temperature. On the other hand, the increase in difference between the temperatures of ambient air and (colder) local airflow leads to preference for lower air velocities [11, 25].

CONCLUSION

An overview of preferable microclimate conditions in warm indoor ambient is given in this paper. The data presented here are based on numerous experiments with human subjects under different ambient conditions. Focus was on combination of air temperature and local velocity of airflow in the region of head and upper body, as thermally most sensitive parts of human body.

The results showed that values proposed by standards for thermal comfort, generally used for assessment of indoor thermal environment, could be too restrictive. Preferable conditions are shifted towards higher air velocities. Furthermore, microclimate parameters that will provide thermal balance of the passenger's body with the surrounding (cab interior) and thermal comfort could not be presented by single value, but by the range of values. The chosen combination of the values will be dependent of individual preferences and local and overall microclimate conditions around different parts of the body. This means that the system must allow precise regulation of local air temperature and velocity in several zones around each passenger's body.

Based on the fact that vehicle air-conditioning system should cool the occupant, not the entire passenger compartment, energy saving potentials of individual localized control of airflow parameters could be achieved by increasing the average air temperature in the cab. In the same time, higher air velocities would keep heat loss from the body within the comfortable limits. Of course, air discharge must be under full control of the passenger.

Further investigation should be directed to optimization of local microclimate parameters and to expansion of the research on investigation of the influence of radiation as well as direct local cooling of the body by ventilated seat. Within the scope of these researches, it is necessary to make link among different science disciplines, such are human thermal sensation and physiology, psychology, thermal and fluid engineering.

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EFFECT OF TEMPERATURE ON POSITIONING OF DIFFERENT PAM ACTUATORS

ABSTRACT:
Some researchers have mentioned that temperature creates an important part in the accuracy of positioning of pneumatic artificial muscles (PAMs). However, in literature investigations for measuring temperature inside and outside the PAMs have not been found. This paper presents our robust motion control of these muscle actuators under different temperatures using sliding-mode control.

KEYWORDS:
Temperature, pneumatic artificial muscles (PAMs), robust motion control

INTRODUCTION

The working principle of the pneumatic artificial muscles is well described in literature ([1], [2], [3], [4], [5] and [6]).
There are a lot of advantages of these muscles like the high strength, good power-weight ratio, low price, little maintenance needed, great compliance, compactness, inherent safety and usage in rough environments. However, problems with the control of the highly nonlinear pneumatic systems have prevented their widespread use [7]. For this, a fast and robust control necessary to achieve the desired motion. Several control ways have been applied to control different humanoid or robot arms, manipulators, prosthetic and therapy devices driven by pneumatic artificial muscles. The early control methods were based on classical linear controllers and then some modern control strategies have been developed (e. g. adaptive controller, sliding-mode controller, fuzzy controller, neural network controller and others) [8].
The layout of this paper is as follows. Section 2 (The study) is devoted to display our test-bed and the LabVIEW programs. Section 3 (Results and discussion) presents several experimental results. Finally, section 4 (Conclusions) gives the investigations we plan.
Fluid Muscles DMSP-20-200N-RM-RM (with inner diameter of 20 mm and initial length of 200 mm) and DMSP-10-250N-RM-RM (with inner diameter of 10 mm and initial length of 250 mm) produced by Festo company were selected for our newest study.

THE STUDY

A good background of our test bed and former experimental results of positioning can be found in [9] and [10].
The PAMs were installed horizontally and can be controlled by MPYE-5-M5-010-B type proportional valve made by Festo. Our robust position control method based on sliding-mode control. The linear displacement of the actuator was measured using a LINIMIK MSA 320 type linear incremental encoder with 0.01 mm resolution.
To measure temperature inside and outside the muscle the test-bed was completed two thermocouples type K (Figure 1). Figure 2 shows the block diagram of this positioning system with proportional valve.

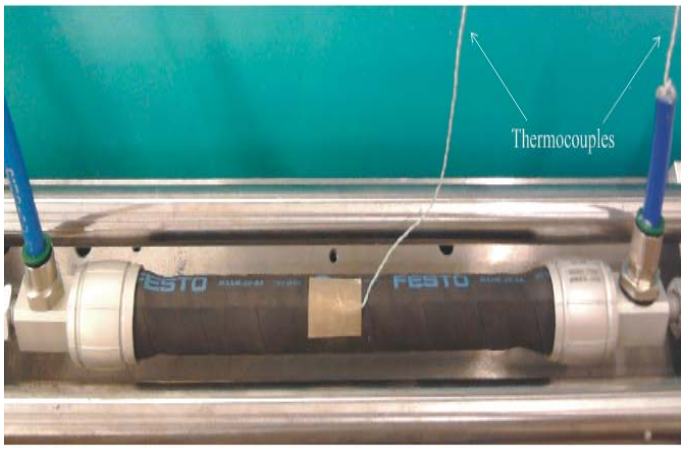

Figure 1 Muscle with two thermocouples

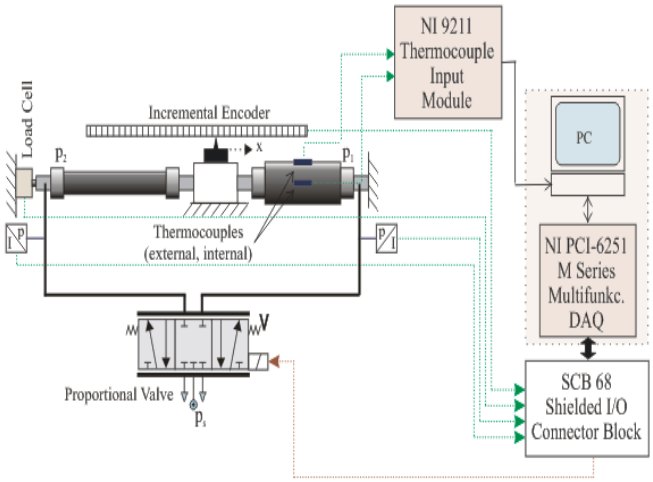

Figure 2 Block diagram of positioning system with proportional valve

The Figure 3 shows data acquisition and positioning that can be achieved in LabVIEW environment. Aside from the desired position the number of samples and the sampling time can also be set. The data can be saved into a text file.

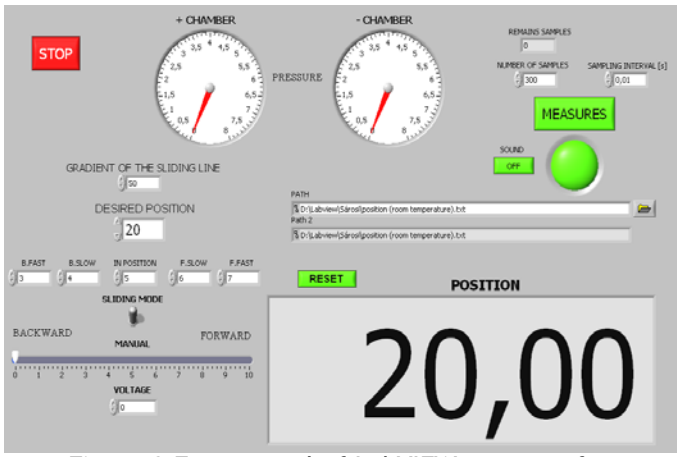

Figure 3 Front panel of LabVIEW program for positioning

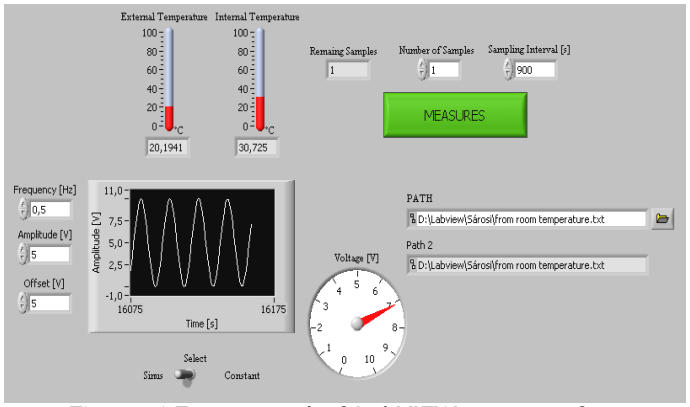

Figure 4 Front panel of LabVIEW program for measuring temperature

The Figure 4 shows the front panel of the LabVIEW program created for temperature measurement. Here the number of samples and sampling time can also be set. During the periodic and automatic working of the muscles the contraction and rate of release can be adjusted with the frequency of the sine wave. The temperature inside and on the surface of the muscle can be read on the indicators on the screen also it is shown as a number. The measured results are saved in a text file for later processing.

RESULTS AND DISCUSSION

Firstly, the positioning was done with DMSP-20-200N-RM-RM type Fluid Muscle in room temperature on the pressure of 6 bar. The desired positioning was set to 20 mm, the number of samples was set to 300, while the sampling rate was set to 10 ms, thus the measurement took 3 s.

Figure 5 shows the positioning as a function of time. It took about 2 s for the position to reach the set value. To show the accuracy of positioning the area around the desired position has been magnified (Figure 6). This Figure shows the accuracy of positioning is within 0.01 mm.

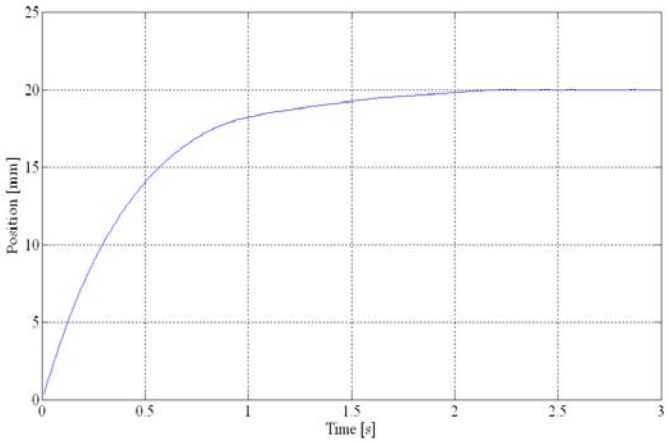

Figure 5 Position as a function of time

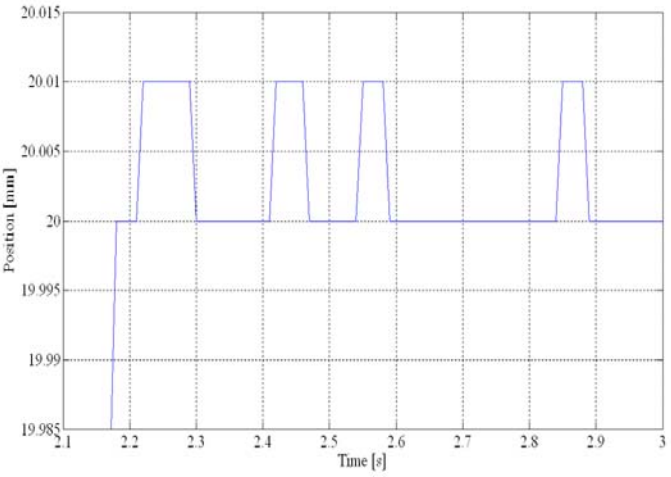

Figure 6 Position as a function of time (enlarged)

The periodic working of the muscles was achieved with a 0.5 Hz frequency sine wave. The measurement took 900 s during which the sampling time was 0.25 s, the acquired data is shown in Figure 7. While the surface temperature reached about 33°C, the internal temperature oscillated a lot during contraction and release, for this reason a spline approximation was used for the internal temperature (Figure 8).

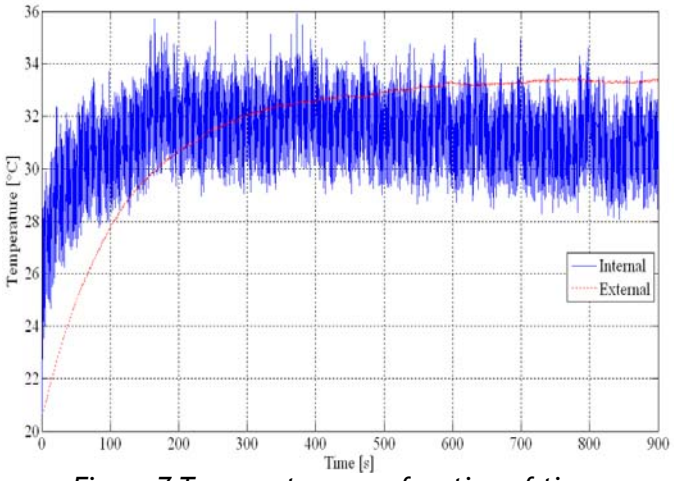

Figure 7 Temperature as a function of time

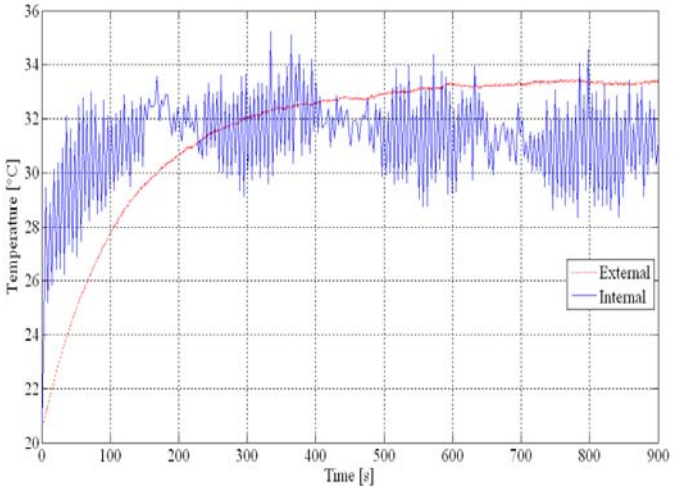

Figure 8 Temperature as a function of time with spline interpolation for internal temperature

After a constant temperature was reached positioning was measured on the pressure of 6 bar, too. The result of it is shown in Figure 9. It shows the desired position was reached within 0.8 s. To show the accuracy of positioning the area around the desired position has been magnified (Figure 10). The accuracy of positioning remained within 0.01 mm.

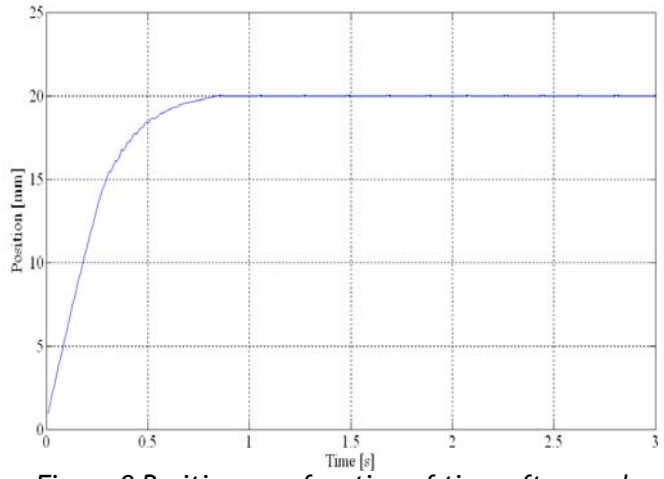

Figure 9 Position as a function of time after work cycle

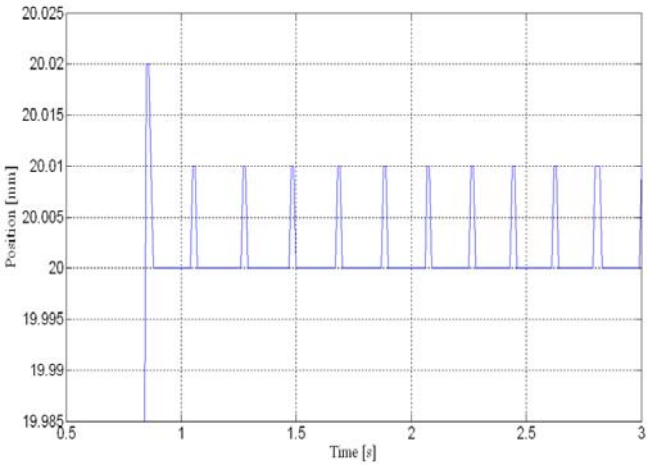

Figure 10 Position as a function of time (enlarged) after work cycle

To compare the previous results the investigations were repeated with DMSP-10-250N-RM-RM type Fluid Muscles. In room temperature the desired positioning was set to 10 mm, the number of samples was set to 300, while the sampling rate was set to 10 ms, thus the measurement took 3 s. Figure 11 and Figure 12 shows the experimental results. It took about 1.05 s for the position to reach the set value and the accuracy of positioning is within 0.01 mm.

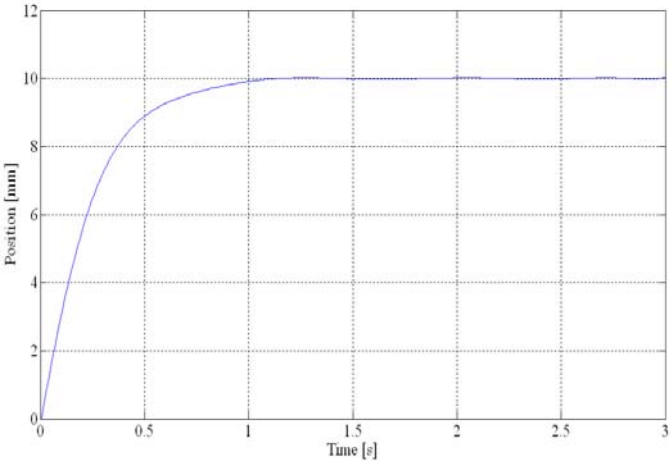

Figure 11 Position as a function of time

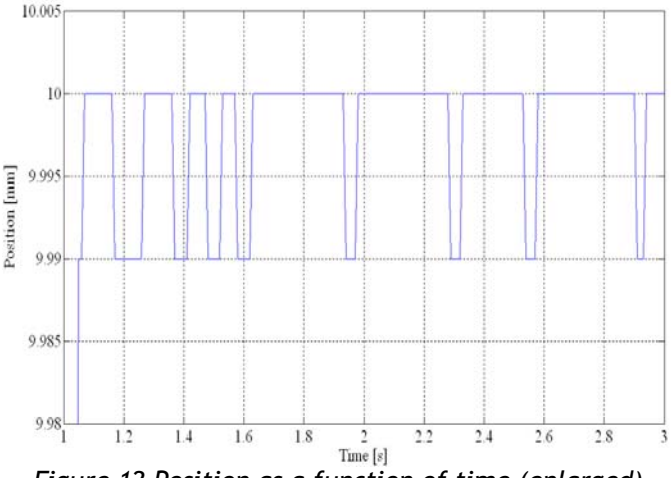

Figure 12 Position as a function of time (enlarged)

The periodic working of the muscles was achieved with a 0.5 Hz frequency sine wave. The measurement took 900 s during which the sampling time was 0.25 s, the acquired data is shown in Figure 13 and Figure 14. While the surface temperature reached about 31 °C, the internal temperature oscillated a lot during contraction and release, for this reason a spline approximation was used for the internal temperature.

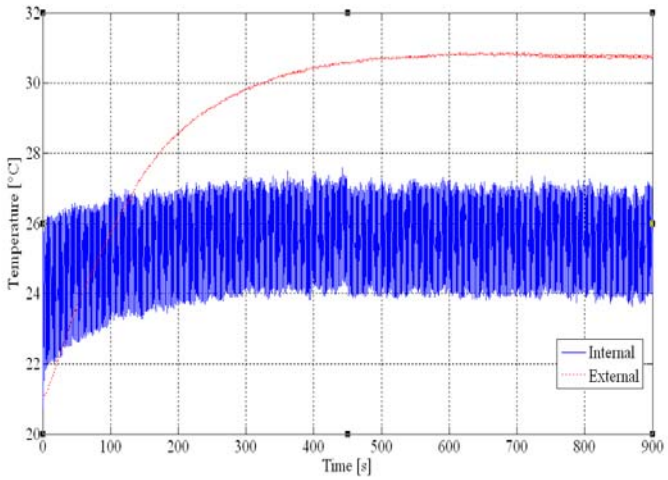

Figure 13 Temperature as a function of time

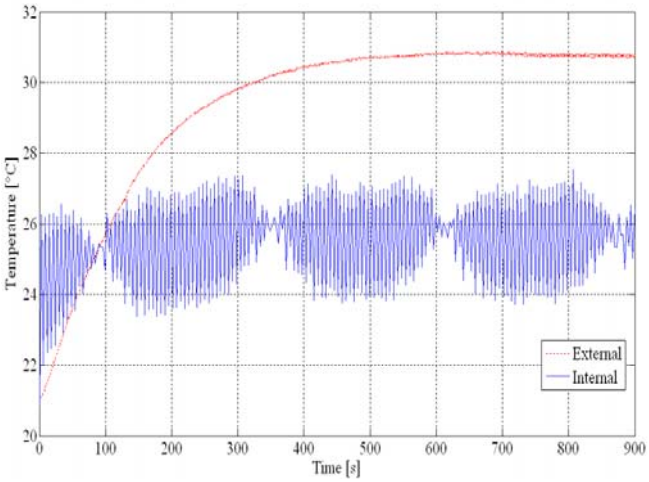

Figure 14 Temperature as a function of time with spline interpolation for internal temperature

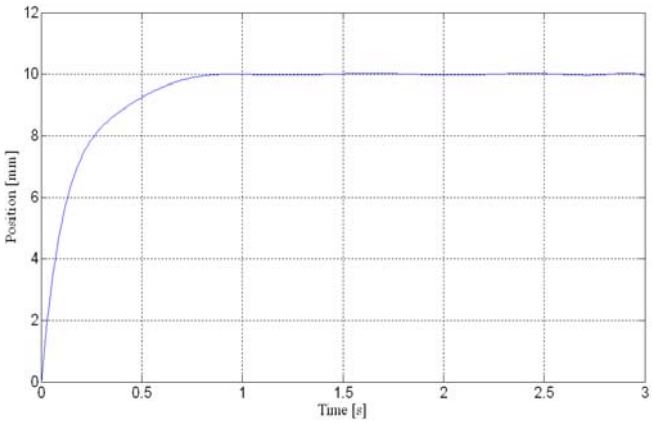

Figure 15 Position as a function of time after work cycle

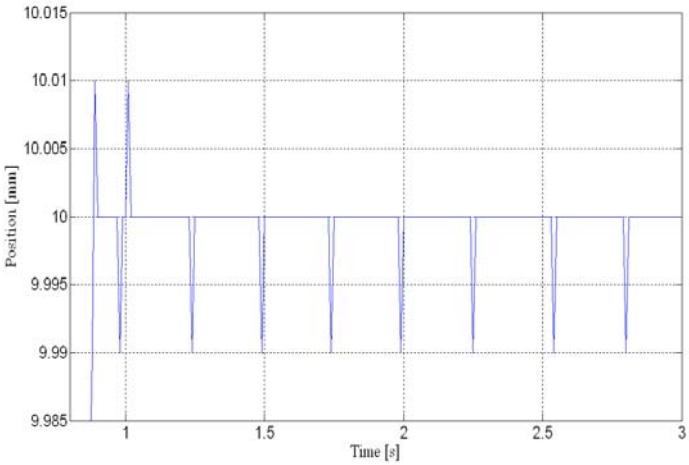

Figure 16 Position as a function of time (enlarged) after work cycle

After a constant temperature was reached positioning was repeated. The results of it are shown in Figure 15 and Figure 16. The desired position was reached within 0.9 s. and the accuracy of positioning remained within 0.01 mm.

CONCLUSIONS

From these measurements the conclusion is that the ideal working temperature of the muscles is not room temperature, but greater than that. The accuracy and time of positioning is more favorable at higher temperature and independent from the geometric properties. We plan these investigations will be repeated with a third Fluid Muscle (DMSP-20-400N-RM-RM type Fluid, with inner diameter of 20 mm and initial length of 400 mm).

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IMPACT OF THE ECONOMIC ASPECTS ON IMPROVING THE QUALITY OF THE ENVIRONMENT

ABSTRACT:
Nowadays in environmental field, it is necessary to concern about the relation between economical expenses and technical level of actions for preserving the environment against negative factors. The following publication gives an overview Economic of the development of environmental protection. The impact of motorization, CO2 emissions and various fuels – fossil as well as biomass based fuels is given – are discussed in brief showing the need for future developments. The environmental requirements do not only have a huge impact on energy generation in industry and society. Environmental protection has generally great influence on everyday life and placed high demands on research, development and infrastructure. However, the economic aspect is very important. In the following, the requirements, influencing factors and effects of environmental protection are presented from the economic point of view, on the example of operating supplies.

KEYWORDS:
Environmental protection, CO_2 emissions, Industry and customer

INTRODUCTION

Environmental protection is a term meaning the entirety of all measures for the protection of the environment, with the aim to maintain the natural basis of live for all creatures by ensuring a functioning balance of nature. The term has become popular only in the last 40 years.

The need to limit or minimise the impact of technical progress to the environment increases with the same speed as the increasing desire for comfort and the increase of world population, both of which is connected with increasing need for energy.

Environmental protection focuses on individual components of the environment, such as the climate, the soil, water and air, as well as on their interactions. Further, damage to the environment caused by human impact in the past shall be corrected.

In the past years, the focus has shifted mainly to energy generation, which is predominantly due to the climate change and to the popular opinion that global warming has been caused by the increasing CO_2 contents in the air. This background implicates that it is necessary to turn away from using fossil fuels. As an aside, such turning away may be also desirable in order to secure supply.

The replacement of the fuels commonly used to date by alternative fuels, for the purposes of CO_2 reduction, will be possible and reasonable only if a whole series of requirements is met.

Significant investments will be required in basically all the steps of production, distribution and consumption, even if every action is taken to adjust all their features of the alternative fuels to the fuels used by now.

The environmental requirements do not only have a huge impact on energy generation in industry and society. Environmental protection has generally great influence on everyday life and placed high demands on research, development and infrastructure.

However, the economic aspect is very important. In the following, the requirements, influencing factors and effects of environmental protection are presented from the economic point of view, on the example of operating supplies.

Does environmental protection "pay off" after all?

THE "VALUE" OF ENVIRONMENTAL PROTECTION

Any reduction of environmental pollution, be it due to CO_2 emissions or other types of pollution, is desirable.

For many decades, the emphasis was placed on the function of machines; emissions were rather treated as an orphan. However, discussions about environmental pollution, particularly those in the USA, have led to a change of mind. For example, in California, air pollution was at some times so severe that the smog massively impaired sight and contributed to health concerns. Already in December 1952, thousands of people died in London from stagnant air pollution caused by heating with coal.

At the latest at those times, people started to reflect about ways how to reduce such emissions. In the late

70-ies and 80-ies, for the first time, exhaust catalysers were installed in vehicles powered by petrol, which was also supported by the government. Minor increases in fuel consumption were tolerated for the good of less unburned hydrocarbons and carbon monoxide being emitted.

The important question when implementing environmental protection measures is, what costs will incur and how much, for example, the emission on a ton CO_2 may cost the national economy. Only the answer to that question can tell whether it will "pay off" to support so-called "climate-friendly" renewable energies or to further the reduction of fuel consumption and motivate vehicle owners to retrofit emission-reducing means, or to even purchase new, more economic vehicles.

But how can we assess what taxes are appropriate on fuel and other sources of energy? By now, the taxes were determined based on the estimated damage to the environment and to public health, for which the general public must pay the costs. However, the costs and the benefits of environmental protection are vaguely defined.

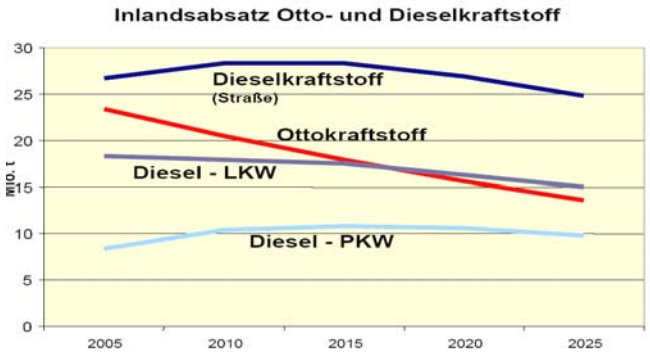
The [German] Federal Environmental Agency has now issued the recommendation, as for ensuing damage to the climate, to establish a cost rate of €70 / ton of CO_2 in all areas of application. The limits are set at €20 to €280 per ton. This background allows for further considerations.

Fuel Consumption and Vehicle Numbers in Germany

The total number of vehicles in Germany is approximately 50 million, divided into 41 million cars, a quarter of which is equipped with diesel engines, 4.5 million trucks and buses, and the rest being other vehicles.

The consumption of diesel fuel in Germany is about 30 million tons p.a., whereas petrol accounts for about 22 million tons p.a.

Approximately 150 million tons of emitted CO_2 are the result of motor traffic.



Title	*Domestic Sales of Petrol and Diesel Fuel*
Dieselkraftstoff	*Diesel Fuel*
Ottokraftstoff	*Petrol*
Diesel-LKW	*Diesel Trucks*
Diesel-PKW	*Diesel Cars*

Economic Reflection about CO_2 Emissions

For the reflection below, the assumption is made that a car has a lifetime of 150,000 km and emits an average of 200 g CO_2/km.

Based on the set €70/ton CO_2, this results in the emission of 30 tons of CO_2 over the lifetime of the vehicle and in total costs of € 2,100.

A 10% reduction of the consumption would reduce the CO_2 costs to € 1,890, which corresponds to a reduction by € 210 over the lifetime of the vehicle. For the operator, the costs for reducing the consumption would be approximately € 1,500 or 1ct/km.

Accordingly, halving the CO_2 emission - which, realistically, can be achieved only in the long term - would result in potential CO_2 savings worth € 1,050 per vehicle, which then could be reinvested into the development of the vehicles. With 1 million vehicles, this would correspond to 1 billion euro in "costs" over the assumed lifetime of 150,000 km per vehicle that could be invested into further development. This is a significant amount, which would certainly make a lot of development work possible.

A 10% decrease in diesel fuel consumption, corresponding to 3 million, would mean a reduction by approximately 9 million tons CO_2. With € 70/ton, this would lead to a cost reduction of € 630 million.

Promoting the installation of the particle filter in only 10% of the existing diesel-fuelled vehicles – i.e. in 1 million vehicles – would result in the payment of 330 million Euro incentives. This, again, corresponds to the costs for 4.7 million tons CO_2 and is therefore, mathematically, equal to the reduction of the consumption of approximately 1.5 million tons diesel fuel. Finally, this would correspond to a 5% reduction in the annual diesel consumption.

When looking at the 22 million tons of petrol for the 30 million vehicles with petrol engine, a 10% reduction of the consumption would correspond to a cost reduction of 154 million Euros, which is a background that provides sufficient scope for justifying sales-promoting measures and, as it was done with the scrappage premium, to also implement it. However, the scrappage premium need to be also viewed from the aspect involving the processing of many tons of raw materials and the energy input required for such production. After all, over 20% of emissions are generated during the production of the vehicle – as compared to the lifetime of the vehicle.

Summa summarum, however, considering other factors such as the energy consumption in the production of new vehicles, it can be said that a reduction of CO_2 emissions is and will remain a worthy goal.

Requirements to Fuels

For the evaluation of the quality of fuels as they are being generally used for combustion engines and especially in vehicles, specifications are applied that have been developed and established by consumers, manufacturers and public authorities over a long period of time.

Any developments within the industry are based on those specifications and, therefore, the use of fuels with different specifications will cause extensive changes in development and also in usage.

For the products demonstrated and specified in detail above, an infrastructure has been created over many

decades which cover all the necessary steps from the exploration and production, refining, storage and distribution, in order to facilitate and secure the continuous supply of large numbers of vehicles.

The development of a different system on the basis of alternative fuels, for environmental reasons, extensive efforts will have to be made, connected with accordingly large economic effects.

Fuels Based on Fossil Raw Materials Customary by Now

The given specifications of currently customary fuels represent the current minimum requirements. Changes can be expected from the further development of combustion engines considering the reduction of emissions.

Thanks to modern engine and fuel developments, consumption is reduced and this results in lower CO_2 emissions. However, it must be examined to what degree necessary modifications of the production process may result in smaller output and, in turn, again cause higher energy consumption.

Therefore, energy balances should be set up for the desired improvements.

The costs for adjusting the by now customary production and distribution system for fuels generated from fossil raw materials should be reflected in the budget with a lower amount than the construction of new production and distribution plants. The situation will be different after a complete switch to alternative products.

Fossil Fuels with Reduced CO_2 Emission

A reduction of CO_2 emissions on the basis of fossil raw materials, as another option, can be achieved only if the by now customary hydrocarbons with C-values of about 8 to 20 are replaced by lower-grade hydrocarbons with C-values such as 1 (methane) or 3 or 4 (propane/butane).

This is being done in different ways in different countries, by powering vehicles with natural gas (Compressed Natural Gas CNG) or petroleum gas (Liquefied Petroleum Gas LPG). In these cases, the CO_2 emission is simply reduced, because more hydrogen is available, as compared to carbon, for the combustion required to generate energy.

Similar reductions of the CO_2 emission are, from the start, also ensured when fuels are produced and combusted on the basis of renewable raw materials.

The costs for switching to hydrocarbons with lower C-values, which means basically to gas, requires not only plant modifications in the production and refining facilities as well as in the distribution channels, but also adjustments in vehicle components.

Renewable Raw Materials

The generation of these raw materials is, by principle, based on the photochemical reaction in plants, also called photosynthesis.

Products generated on this basis will, by principle, contain compounds with higher C-values; however, they have the advantage that they process carbon from the CO_2 contained in the air and, therefore, when combusted, they do not emit more CO_2 than had been extracted from air at an earlier point in time. In such cases, we speak of CO_2-neutral behaviour. However, this approach does not consider the comparison between the time when the raw material was generated, and the time of its later combustion.

Ways to Utilize Renewable Raw Materials

By principle, fuels from renewable materials can be produced according to consumer demand; with that, the advantages and disadvantages always have to be weighed.

Advantages and Disadvantages of the Use of Agricultural Basic Products

Opposed to the benefit of renewable raw materials from agriculture, is a series of disadvantages the largest part of which, however, can be eliminated by means of the corresponding investments and creation of infrastructure. The time factor cannot be neglected, either, as it is clear that these are long-term measures.

Utilizing Sun, Wind and Water Power

The requirement to generate energy without any release of CO_2 can be met if sun energy or its daughter elements, wind and water energy, are transformed into electricity. Provided there are suitable storage media, this energy, generated entirely without CO_2, can be then used for transport and traffic.

Sun power plants, as they have been put up already, focus sun beams on piping systems and heat up the working fluids contained therein which, in turn, overheat water by means of heat exchangers. The generated steam can power steam turbines in the usual manner which, in turn, power generators for electricity production. However, the storage of electric energy generated this way and ensuring its retrieval or usage on demand, still constitutes a problem. This also applies to wind and water power plants with their direct energy generation. Batteries for the storage of very large volumes of electricity are not available yet. A solution to this problem could be the generation and storage of hydrogen H_2.

Electric Vehicles

At this place, reference shall be made to electric vehicles which are powered without CO_2 production and also require CO_2-free generation of electricity.

The transformation of sun, wind and water energy into electricity, as described above, is particularly important in this context.

Adjustment of Industry and Consumer

Automotive Industry

The switch from the by now customary fossil fuels to alternative fuels, in order to reduce CO_2, will cause further developments in the automotive industry.

Despite of the already advanced state of technology, especially the application of electric drives, and there especially energy storage, still requires further extensive development.

Transportation Industry

The transportation industry, in particular the heavy goods traffic by trucks, will not be able to profit from the developments towards CO_2-reduced operation to the same extent as the car industry does, as the

development of electrically powered trucks in particular is still in its infancy.
However, as it is also the case for all diesel-powered vehicles, the operation with bio fuels can be relatively easily implemented, and is therefore worthwhile. The connected costs are reasonable.
Fuel Production
Large efforts will be required for setting up production of the same extent as currently exists for fossil fuels. A general question that arises is the availability of renewable raw materials, as some of them are foods, too, as we all know, which means that opposed interests need to be met.
Infrastructure
With regards to infrastructure, the existing infrastructure can be used for the application of bio fuels, too. However, it must be considered that, beside the storage and filling possibilities for the by date customary fuels, the same infrastructure must be created for additional fuels, which is connected with costs.
Transport and Distribution
The transport and the distribution can be secured via the existing distribution channels without any major investments, as these facilities require modernisation in regular intervals anyway.
Agricultural Production Capacity
Cultivation Areas, Crop Yield, Environment
Cultivation areas are just as limited as is the yield per hectare. For example, replacing 30 million tons of diesel fuel by methyl ester of rapeseed (bio diesel), with a yield of approximately 1,550 l/ha (about 1,350 kg/ha), equals to a required area of more than 20 million hectare of area to be cultivated. With an agricultural area of "only" 17 million ha in Germany, this is basically impossible.
Assumed that only 10% of the agricultural area would be used for bio diesel crops, this could not cover more than 8% of the demand.
This does not even yet consider the environmental impact of cropping, harvesting and production, as the cultivation of productive land is again connected with CO_2 emissions.
In the case of bio ethanol, the situation is similar, despite of the higher yield per hectare, as the so-called fuel equivalent is significantly lower and it must be accounted for an increase of about 40% in fuel consumption.

CONCLUSION

The traffic and transportation sector in Germany needs more than 50 million tons of fuel.
From these more than 50 million tons of fuel, realistically, not more than 5% can be covered by biological products from agricultural production in Germany.
While traffic is responsible for about 20% of CO_2 emissions, fuel production based on agriculture can contribute only to an insignificant extent to their reduction. Such contribution to the CO_2 reduction is very desirable, for reasons of eco-political considerations and decisions. All possible ways to reduce CO_2 emissions must be utilised, in order to reach the goal of falling 20% below the values of CO_2 emissions in the year 1990, which is a value that has been determined by the European Parliament within the frame of the climate package.
Therefore, it is imperative to exploit other sources of energy for traffic and transport. In principle, the only available source is sun energy, which in turn produces electric power and, with that, must and can provide power for vehicles.
A realistic calculation of the investments required for this new area is probably not yet possible. However, irrespective of economic aspects, the reduction of CO_2 emissions is desirable no matter what the case may be.

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STUDY OF HOUSEHOLD ATTITUDE TOWARD RECYCLING OF SOLID WASTES: A CASE STUDY

ABSTRACT:
Solid waste management is a growing problem in Malaysia. For this reason the government of Malaysia through the Ministry of Housing and Local Government (MOHLG) have taken various measures to promote recycling amongst its population. Recently, a nationwide campaign was launched to get the people to recycle their wastes. Recycling centers equipped with separate recycling bins for different recyclables have been set up across the country. In addition, publicity drives using the newsprint, the electronics media on top of the other modes of information dissemination such as seminars, workshops and meetings were held on a continuous basis over the years. However, despite the effort little has been achieved due to the lack of participation from the households. This paper identifies the reasons for the failure of the campaign. Data were gathered using a mail-out questionnaire to 400 randomly chosen households. Quantitative analysis made based on 347 responds received indicated that although all of the respondents had a positive attitude towards recycling only a few did recycle. The poor response is largely due to the lack of facilities provided. Many residents are turned down when they are unable to locate the recycling centers and if they are able to locate one, it seems too troublesome to be needed.

KEYWORDS:
Recycling, Solid Wastes, Household Attitude, Malaysia

INTRODUCTION

The concept of attitude has played a major role in the history of social psychology. It is undeniable that the concept of "attitude" has become something of a factotum for both psychologists and sociologists (Fishbein, 1976). Nowadays, solid waste recycling is a problem of major relevance for all societies. Moreover, finding acceptable strategies to cope with such a problem is becoming a quite hard task, owing to the increasing awareness of environmental issues by population and authorities. However, Malaysia, with a population of over 24 million in 2005 generates 17,000 tons of domestic waste daily (Noor, 2005). At present, the per capita generation of solid waste in Malaysia varies from 0.45 to 1.44kg/day depending on the economic status of an area, the national average being 0.5 – 0.8 kg/person/day but may increase up to 1.7 kg/person/ day in major cities (Agamuthu, 2001). Perak is the second largest state in Peninsular Malaysia. It is bordered on the north by Kedah and Thailand, on the east by Kelantan and Pahang, on the south by Selangor and to the west by the Strait of Malacca. Perak means silver in the Malay language. The name comes most probably from the silvery colour of tin. In the 1890's, Perak, with the richest alluvial deposits of tin in the world was one of the jewels in the crown of the British Empire. However, some say the name comes from the "glimmer of fish in the water" that sparkled like silver. Perak's population is now approximately 2 million. Once Malaysia's most populous state, the decline in the tin mining industry caused an economic slowdown from which it has yet to recover, leading to a massive drain in manpower to higher-growth states such as Penang, Selangor and the Federal Territory of Kuala Lumpur. Modern Perak is divided into 10 administrative divisions, or "Daerah" in Malay.

However, the Executive Council is the highest administrative body in the state. At the local government level, the state has one local authority, namely the Municipal Councils of Ipoh (MCI). The average throw away in Perak is around 0.9 – 1.1 kg of waste/person/day, which is higher than the national average (MOHLG, 2005).

This paper reports on the results of a research study that evaluated attitude of household towards recycling solid wastes. The research aims of shed to light upon the level of environmental awareness of the different household in Perak state at Malaysia concerning recycling of solid wastes and their perception on the success of the recycling campaign. The main objective

of the research was to study the attitude of households, their awareness as well as the problems which was related to failure of the recycling campaigns. The findings of this research study may be used in decision making as a measure of attitude of household and should help households to recognize how important the environmental issues of recycling solid wastes recently.

THE RECYCLING CAMPAIGN

As mentioned earlier, the Ministry of Housing and Local Government, Malaysia launched a nationwide recycling campaign (Kempen Kitar Semula) in 1993. However, the campaign failed due to lack of response and participation from the people. A bigger and more aggressive campaign was initiated in 2000. Sixty-five (65) drop-off or collection centers, located at schools, gas stations, shopping malls and other convenient public places are opened nationwide.

Year round programs aimed at increase awareness and participation of the population were initiated or organized by the Ministry of Housing and Local Government, Non-Governmental Organization's and Consumer groups. These include talks, exhibition and actual recycling activity. (Table 1)

Table 1: Recycling related activities (January -July 2003). Source: Ministry of Housing & Local Government, Malaysia.

	Type of Activity	Occasions
1	Talks/Speech	13
2	Exhibition	26
3	Meetings	27
4	Actual recycling activity	7
	Total	73

Table2: Location of Recycling Collection Centers. Source: Ministry of Housing & Local Government, Malaysia.

	State	Frequency
1	Penang	16
2	Kedah	210
3	Kelantan	0
4	Terengganu	0
5	Perak	180
6	Pahang	138
7	Selangor	177
8	Negeri Sembilan	109
9	Melaka	98
10	Johor	108
11	Sabah	150
12	Sarawak	217
	Total	1403

METHODOLOGY

The study sought to evaluate the attitude of households in Perak, Malaysia on recycling of solid wastes. Specifically it is aimed to discover reasons why the nationwide recycling campaign organized by the Ministry of Housing and Local Government Malaysia failed to attract households to recycle. Four Hundred (400) questionnaires were distributed within the period of three months beginning the 2nd of February 2006 to 27th of March 2006. To ensure good response, the strategy used was to distribute the questionnaire at randomly selected houses on Perak State. Three Hundred and Forty Seven (347) useable questionnaires (87%) were received and analyzed. Although, the number of questionnaires received was small, it is sufficient to give some indication of the overall attitude of the households of Perak on recycling of solid wastes and is adequate to enable the findings to be generalized for the whole population of Perak. The descriptive analysis of the data collected is presented below.

RESULT AND DISCUSSION

Awareness of the recycling activities/campaign

A majority (84.7%) of the respondents claimed that they are aware of the ongoing campaign. Most knew it through ads in the newspaper. TV and Radio ads ranked second followed by newsletter and billboards.

Importance of recycling

Asked on the importance of recycling, all participants (100%) indicated that recycling is important. However, only about 71% (247) of the respondents indicated that they participated in the recycling activity. The main reasons given, ranked in order of importance are:

i) Concern for the environment;
ii) Concern about availability of landfill;
iii) Encouragement from their children/others.

A small number indicated that they recycled for money.

Participation in recycling

Amongst those who did not participate in the recycling activity (29% or 100 respondents), the main reasons given are inconvenience and lack of facilities (62%). It is interesting to note that about 18% of the non-participating respondents indicated that they "don't bother" or find it unimportant (13%). Although the number of respondents within this group is small, particular attention should be taken to 'convert' them. Comparing with a Singapore the research by Foo (1997) was found that only 9% of the respondents practice regular was recycling and another 11% practice recycling 'some of the time', whereas the rest only practice recycling once in a while (64%).

Facilities provided

Respondents were also asked about the facilities provided for recycling. When asked whether they know the location of the nearest collection point for their area, 61.7% indicated they knew the location. However, more than 52% complained that the location could not be easily located. In term of distance, only 33% indicated that it was within 1 kilometer from their house, 16% was within the radius of 2 - 3 kilometer and 44% indicated that it was more than 5 kilometer radius. Undoubtedly, the farther the location of the collection point, the more discouraged will the householders be. Adenso-Díaz (2005) commented that when citizens who are environmentally concerned have bins near to home, they appear to be willing to recycle more fractions than when they have to walk for a longer time to drop off the waste, due to the inconvenience of carrying the large volumes that this

type of waste usually occupies. He concluded that distance and access to the bins is obviously an incentive to recycling. The benefit of facility may bring to local residents can influence attitudes (Lima, 1996). However, citizen's attitudes depend on knowledge about a facility (Rahardyan, 2004). It was observed that, the farther the location of the collection point was the more discouraged were the householders were to recycling.

Types of materials recycled

Amongst those who recycled, the type of materials recycled ranked in term of quantity is newspaper, aluminum cans, plastics, cardboards and glass. In response to the question "How often do you recycle", 46% indicated they sent their recyclables weekly while about 24% indicated they need to recycle more often i.e. twice or three times a week.

Perception on the success of the recycling campaign

The respondents were asked to give their opinion on the on-going recycling campaign hosted by the Ministry of Housing and Local Government. On the question whether the campaign succeed or failed, a huge 90% or (311) indicated that it fails and it can be seen in the Figure (1). Asked for the reasons for the failure, their responses can be divided into the following five broad categories:

i) Little improvement in the surrounding. The surrounding area, public places and rivers are still littered or polluted.

ii) People continue to throw recyclable items such as papers, glass and aluminum cans in ordinary dustbins. Not many took the effort to separate them before throwing.

iii) Not enough facilities provided. Many areas are not provided with the facility for recycling. Many people do not know the location of the nearest collection point. Location of collection points is either not good or too far. Easier to throw the recyclables than to bring it to collection point.

iv) Some people are selfish. They continue to litter and do not bother about the negative effect of their action. Some think of it as a waste of time.

v) Have very little knowledge about what recycling is. Do not realize the importance of recycling. Never heard of the campaign and never participated.

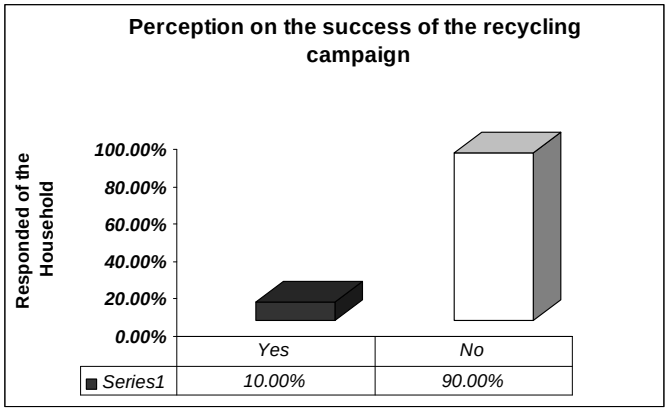

Figure 1: Perception on the success of the recycling campaign

How can it be improved?

The respondents were also asked of their views on how the situation could be improved. The majority of respondents suggested, "more facilities be provided". There should be "local collection centers", which is within easy reach for each community or housing areas. Community or group recycling should be encouraged and more effort is needed to educate the people of the need and importance of recycling. Monetary incentives may also be considered, for example by improving the community facilities in an area as a reward, based on the quantity of recyclables collected. In this regard, it is observed that the high rate of newspaper recycling might be due to the ready market for it. When asked whether they will recycle in the future, if all facilities are provided, all 99% of the respondents said that they would participate and this will be different comparing with the research by Grodzińska-Jurczak (2003) in Jaslo City, Poland when he asked the same questions to the household whereas got 41% of 932 interviewed they would to recycle and the rest refused any participation (22%) or did not respond (37%).

CONCLUSION

Recycling has become a household word in Malaysia, based on the finding of this study; it is evident that the households in both states are of the opinion that recycling is a very important activity. However, result of the study gave a clear indication that the recycling campaign by the Ministry of Housing and Local Government in Malaysia failed.

Even though the households agreed that recycling is important, not many of them did recycle. The quantity of recyclables collected in both states is indeed very small. The main reason, as indicated by the study result, is due to misdirection in the campaign. Although much money was spent on advertisements, there is a clear misinformation. It is observed that advertisement campaigns are focused on informing households to sort their recyclables and place them in separate bins. However, such bins can only be found at designated public places, which are usually at a distant from residential areas. It is therefore not surprising that most of the households find it too troublesome to bring their recyclables to the collection centers. Furthermore, reasons such as "lack of facilities" or "distance of facilities too far from home" are also clear proof that most households are not aware that they can do their bit in recycling by simply putting the recyclables and non recyclables in separate bags and placing them in the ordinary rubbish bins available at home which will then be collected by the council or appointed agents.

Therefore, the location of the recycling station is essential and the public attitudes are knowledge about source separation in general and recycling stations in particular are of interest for the functioning of the whole system (Petersen et. al, 2004).

In the final analysis, it is interesting to note that the actual reason for the failure in terms of recycling, the lack of support and participation of households in Perak on recycling are not due to their negative attitude towards recycling but due to misinformation on the part of the authorities. In order to increase the rate recycling of solid waste and at the same time to reduce the social problem related to solid waste management at the following suggestions were made to the Perak People of Committee as followed:

1. *Improving the publics' general knowledge and awareness concerning these issues is of prime importance to the minimization of waste, in general, and harmful effects of landfills on the environment, in particular.*
2. *Efforts are also needed to involve the public in the policy-formation, development of plans, and implementation of waste management programs and landfill sitting decisions. Public support is essential for the success of such decisions.*

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SLOVAKIA AND THE WIND ENERGY AT PRESENT

ABSTRACT:
The exploitation of wind force has been known for a couple of thousand years and it is being linked to the beginning of the human civilization when man decided to make use of this kind of energy. An effective step in transforming wind energy into electricity is also building wind energy plants/parks where the main concept is to maximize the possibilities of the given location.
The following article is focused on wind energy as one of the mostly used renewable energy sources. The goal of this paper is to familiarize the reader with the current situation of electrify generation using wind energy in the Slovak Republic and it's share on the market. Bringing the basic patterns of usage of this energy and the positive impact on the environment. The contribution shows the current share of wind energy in Slovakia and the subsequent plans and visions of the Slovak Republic as EU Member States, which wants to increase the proportion of use of this energy in the coming years.

KEYWORDS:
wind energy, wind energy plants, renewable energy sources, environment

INTRODUCTION

The energy that we use today in the form of heat, electricity and fuels for motor vehicles, has its origins mostly in fossil fuels (coal, oil, natural gas). These fuels are below the surface, where it originated millions of years after the decomposition of prehistoric plants and animals. Although fossil fuels the action of natural forces (heat and pressure) ever created, its current consumption far outweighs their formation.
The fact that they are not replenished nearly as fast as they are being consumed means that in the near future they run out. For this reason, fossil fuels are considered non-renewable energy sources. The main negative consequences of burning fossil fuels is serious damage to the environment and therefore it is today, when rising demand for electricity we must seek alternative sources of energy. Between a so-called renewable, "green", energy sources we include biomass, geothermal, solar, water and wind energy.

USAGE OF WIND ENERGY

The exploitation of wind force has been known for a couple of thousand years and it is being linked to the beginning of the human civilization when man decided to make use of this kind of energy.
Since wind energy is being counted into unexhaustible renewable energies without direct impact on the environment and represents a clean form of energy with no waste production, no air pollution and no negative effect on the human health, a tremendous development of wind energy plants, which is the fastest growing branch in energy producing, is being observed.

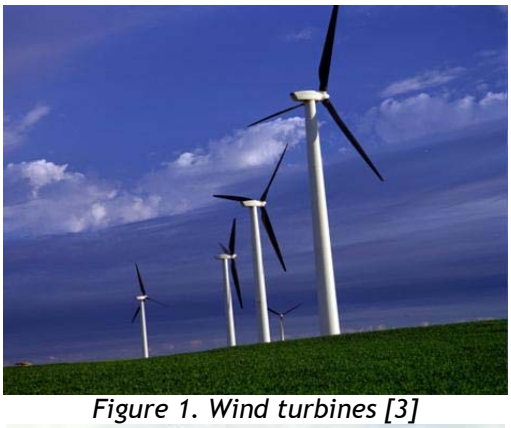

Figure 1. Wind turbines [3]

Figure 2. Wind farm [3]

The currently mostly used forms of wind use are wind energy plants using turbines. They are converting kinetic energy of the air molecules to mechanical work of the turning rotors which, through a geared mechanism, drive electric generators that transform work energy into electricity.
An effective step in transforming wind energy into electricity is also building wind energy plants/parks where the main concept is to maximize the possibilities of the given location. Therefore, several turbines are built in the same location.

EFFECT ON THE ENVIRONMENT

Every form of energy production creates negative effects on the environment, however while using wind energy plants, the negative effects are minimal in comparison with other, traditional electric production. [1]
Replacing the production of electricity from fossil fuels with wind chargers brings positive facts: [2]

1. *Saving the fuel that is not renewable*
2. *Reducing the amount of CO_2 that would be produced while burning this fuel*
3. *Reduction of gas emission (SO_x, NO_x)*
4. *Reduction of dust outlet*
5. *Reduction of liquid and solid waste*
6. *Reduction of the waste heat leaking into the atmosphere or water systems*

CURRENT STATUS OF WIND ENERGY UTILIZATION

Although the wind energy is one of the youngest technologies of energy production and does not have such background as other commercial sources of electricity production, with time its usage as a renewable source of energy grows more and more.
Despite the massive development in Europe in the field of wind energy began in the early 90's, many of those managed to establish world leadership in a relatively short time. Wind energy and its usage reached the highest growth from the entire spectrum of renewable energy sources in the EU (tab. 1). Together with solar energy, it is considered to the "second generation" technologies.

Table 1. The development of renewable energy sources in the EU [3]

Order	Energy	Year			
		1990	2000	2010	2020
1	Solar Energy	0.1	0.2	0.9	3.2
2	Wind Energy	0	0.1	0.4	2
3	Geothermal Energy	0.1	0.3	0.5	0.8
4	Modern Biomass	1.4	2.2	3.5	5.1
5	Small water generators	0.2	0.3	0.4	0.6
	Total	1.8	3.1	5.7	11.7

The reduction of electricity prices is a commonly observed trend in the wind energy field. This is tightly bound to the power increase of the new wind turbines.
As a side effect, the competitiveness of the wind energy with commercial energy production is growing as well. At the same time it gets less dependent on the state grants reflected mainly in the buying prices of the renewable energies. It is to be expected that the prices of electricity will continue to drop, as well as the competitiveness of wind energy with current energy sources will continue to grow. The development of the equipment is also foreseeable.

THE POTENTIAL OF WIND ENERGY UTILIZATION IN SLOVAKIA

Slovakia as an inland country has its potential in utilizing wind energy rather limited as in comparison with the west European countries. It has been estimated to 600GWh/r which, in comparison with other renewable energy sources potential (biomass, water), is very low.
Despite relatively large occurrences of wind during the year, not every region is suitable for electing a wind charger. In our latitude and average altitude of 600m above sea level, the wind speed is averaging to 2-3m/s while the ideal wind speed would be 12m/s. In the mountain terrain that is characteristic for Slovakia, is the wind flow relatively inconsistent. As a result of terrain obstacles the wind intensity and direction is changing and inapt turbulences occur. Therefore multiple year long specific measurements with special analysis needs to take place to estimate the suitability of the locality for wind chargers.
Despite the good wind conditions with speeds over 5,5m/s are certain areas, like the National Parks (High Tatra National Park etc.), excluded from electing wind parks for environmental reasons.

BARRIERS IN THE UTILIZATION OF WIND ENERGY IN SLOVAKIA

Among the barriers that are complicating the utilization of wind energy in Slovakia are being counted:

1. *lack of knowledge of the wind climate (wind intensity and its temporal and geographic variability)*
2. *a strong dependence on wind climate*
3. *lack of knowledge of the effects of a high proportion (approximately over 5%) in electricity production and fluctuations in transmission and distribution system*
4. *negative impact on power system stability*
5. *problems in perception, mainly related to changing visual environment*
6. *restrictions in protected areas*
7. *lack of awareness of health and environmental impacts of operational wind farms*

Another important criterion is the economic return of wind power in the form of electricity generation. The cost of installing 1 kW wind power in Slovakia are from 1500 to 2000 Euros, the price paid for electricity generated from wind power is 94 Eur / MWh. From that follows that the period for the return of total investment is about 17 years.

WIND POWER PLANT IN SLOVAKIA

Even though we are not a country with ideal conditions for the use of wind energy, there are currently 9 wind turbines in operation in Slovakia in three operating wind parks located in (Fig.3).
These power plants annually produce about 6 GWh of electricity (as of 2004). Slovakia uses only about 1% of its full potential The reason is the wide range of economic, legislative and environmental barriers, of which the introduction of fixed prices for electricity generation from renewable sources eliminate at least some. Highly actual issue, which divides the professional community impact assessment, is mainly impact of the construction of wind farms on the environment.

Figure 3. Wind farms in Slovakia [6]

VISION OF SR WIND ENERGY UTILIZATION LISTEN

Slovak Republic as a European Union member country is obliged under their obligations to contribute to increased share of renewable in the total resources, thereby reducing negative environmental impacts, the European Union's heavy dependence on imported fossil fuels and vulnerability to fluctuations in energy prices.
Setting targets for the years 2010 and 2015 gives a real opportunity for Slovakia to increase the current 4% share of renewable in total energy consumption to 12% share in 2020.
Basis for setting a binding target for Slovakia in 2020 will be elaborated in a forthcoming material, energy security strategy of the SR, which is an indication of the outlook to 2030.
According to ZVES (Association of wind energy in Slovakia), Slovakia has the potential to increase the current total installed capacity of 5 MW to approximately 600 MW over the next 5-7 years and the prospect to further enhance the technology up to 1000 MW. This objective can be considered as a realistic and feasible in the horizon of 2020.

CONCLUSION

If we are to get even closer to achieving the objectives of increased use of wind energy as a renewable energy source and thus avoid possible sanctions from the EU, it is essential to use all available and economically and environmentally sound electricity generation from renewable energy sources, which include the use of wind energy.

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DEVELOPMENT OF FORECASTING SYSTEMS

ABSTRACT:
In this paper we demonstrate a detailed overview of the history of forecasting software applications over the past decades, concentrating especially on the interaction between hardware and software. Additionally we present a framework by describing important developments of forecasting techniques in terms of hardware and software environments. We then focus on the application areas of forecasting software modules in business and planning environments which are often partially automated due to the large number of time series involved. Finally we make some suggestions about in which direction forecasting software should be improved.

KEYWORDS:
forecasting software applications, detailed overview

INTRODUCTION - THE HISTORY OF COMPUTER DEVELOPMENT AND FORECASTING METHODS

The history of forecasting and time series methods began in the 17th century when numbers of sunspots and price indices were analyzed by scientists. However, the practical use of statistical techniques has been made possible by the invention of computers in the 1950s.

At the beginning, the use of computers for forecasting was limited by inadequate processor speed, random access memory and disk space. In the 1960s, forecasting was capable to analyze short and isolated series, collected in flat files, and processed by batch runs using Hollerith cards on mainframes. In these days programming was mainly done in Assembler and FORTRAN under a variety of different and largely incompatible operating systems.

The introduction of OS/360 in 1967 as a scalable operating system for IBM mainframes resulted rapid migration between hardware platforms, simplifying the movement of programs. It was developed by IBM (Brooks, 1974) with the intention of creating programs that could be run on IBM computers of different sizes. Prior to the development of OS/360, operating systems were only designed for individual computer architectures. With the arrival of the system, software could finally be moved from one computer to another.

The appearance of UNIX in 1969 resulted in the development of portable software for smaller systems. The introduction of personal computers such as IBM PCs and Apple Macintoshs in the first years of the 1980s allowed the use of computers at everywhere, independent of mainframes.

Many advances in computer science had an influence on forecasting. The continuous increase of processor performance, memory and disk space allowed scientists to deal with larger data sets and more complex algorithms. Later cathode-ray terminals supported the design and use of interactive applications with their character user interfaces (CUI), screen reports, and graphs. This development occurred in the 1970s, when a lot of mainframe management information systems and manufacturing resource-planning systems appeared on the market. The next step to graphical user interfaces (GUI) in the 1980s changed the software environment, as allowed a much larger community to use forecasting software.

Application software also changed in the 1960s, when forecasting methods were individually programmed using either Assembler or FORTRAN. This allowed later the selective use of new techniques such as smoothing or complex techniques such as Box–Jenkins models. Several statistical and econometric software systems were developed in the 1970s. In the meanwhile, material replenishment systems, which focused on inventories and production, were developed independently of the statistical forecasting tools. Later these became the roots of enterprise resource planning (ERP) and management information systems (MIS). This is important because this difference has never been closed entirely. Only in recent years have the data produced by ERP systems been used as input data into forecasting software.

Databases were developed simultaneously. At the beginning, data was collected manually and stored on punched cards, or transferred to text files on disks and tapes. While this remained the primary method of data input into statistical systems for a long years, transaction and planning data were migrated to database management systems (DBMS) quite quickly. The development process started from hierarchical and network databases in the 1970s to relational database systems in the 1980s, enhanced by object-oriented DBMS in the 1990s. The last two resulted in the object-relational database systems used these days. Within business planning, data processing was often replaced by PC-based spreadsheets, which were saves and modified on local PCs. This separation of local planning data and centralized transaction data still can be detected today, often resulting in problems of consistency and concurrency of the database. In a further step, the integration of database systems and transaction systems happened. With the constant increase of available data, databases moved on to data warehouses, offering also a wide range of tools for extraction (on-line analytical processing, OLAP), visualization, and analysis, including predictive data mining techniques.

DEVELOPMENT PERIODS OF FORECASTING SOFTWARE

While computer development was evolutionary, the development of forecasting software can be categorized into periods. These are:

- *Period I.: Mainframe forecasting software*
- *Period II.: PC and workstation forecasting software*
- *Period III.: Process-oriented and highly integrative forecasting software*

Period I.: Mainframe forecasting

Mainframe software, either in batch or timesharing mode, dominated forecasting software in Period I. However, some very popular programs took quite a while to offer even basic forecasting features. For example, SPSS surprisingly had no forecasting functionality until it added the „Trends" module in 1994. On the other hand, SAS/ETS was first released in 1980.

In industry, commercial firms devoted to forecasting for industrial clients did so with mainframe computing capabilities. The main packages offered were DAMSEL, TROLL, AUTOBJ. B34S, and TSP were available not only to industry but also to academicals use.

Prior to this time, microcomputers had been the domain of computer programmers, primarily because of the lack of application software. The first popular spreadsheet package, Visicalc, turned the microcomputer into an effective business application. Lotus 1-2-3, released in 1982, offered the combination of spreadsheet, presentation graphics, and simple database functionality to for the PC. However, there was no forecasting in this field in Period I. There were two main reasons for this. First, the lack of solid compilers. Second, mainframe packages could not be moved directly to the PC, as the PC was still not powerful enough. Only some parts of the mainframe software could be used on a PC version, and even then it should have to be rewritten in BASIC instead of the original FORTRAN.

Period II.a: IBM PC and forecasting packages

By 1985, the successful IBM PC and its clones had been around long enough that forecasting software was available. By 1989, more than one hundred software forecasting packages were available for the PC (Rycroft, 1994).

In this period, universities also began to move away from mainframes, setting up PC laboratories. For industrial companies, the situation was slightly different. Corporate IT departments, in order to controlling the mainframe, had long dictated computer use. Every single department could buy and use a PC, and they didn't need the IT department to approve the purchase or maintain the computer. For such departments, the PC had become effective enough to work in large scale forecasting, for example for production and inventory purposes.

However this decentralization generated new problems. Different organizational units might track the same data but maintain them differently, or use different numbers to represent the same facts. Therefore, the databases would also produce conflicting data and different forecasts too. The PC was at this stage just a batch engine, it was capable of only to produce forecasts for large numbers of items, and then write these forecasts to a file. It was still not good enough to do this work interactively.

The wide spread of standalone PCs produced its own urgent need. These PCs might solve the problems of individual organizational units, but they did nothing to improve the flow of information between these units. The persons making the forecasts for production had no idea how many parts were in inventory. Solving this incompleteness would be up to Enterprise Resource Planning (ERP) systems.

Period II.b: modern PCs and forecasting software

The Intel 486 processor appeared in the market 1989, and the class of forecasting problems for which mainframes were necessary becomes much smaller. The capabilities of forecasting software had reached a stage where even persons with no technical training could benefit from methods that previously had required technical training and support. After this, given just a unvaried time series, a program could determine which method best suited the data (for example exponential smoothing or ARIMA) and then optimize the parameters for the chosen model. The importance of this advance was that people could work out very good forecasts without consulting an expert. However for these forecasts to be good, they also needed reliable data. In this period, each department maintained its own database and each database had to be updated individually, so multiple databases could not be updated from the same source. Consequently, in these databases there were conflicting information and could not serve the entire organization. ERP vendors such as ORACLE, SAP and People- Soft realized the opportunity, connecting the disparate computers

and databases via a client/server architecture. However, it required many years before this task was completed.

Period III.: PC and client/server architectures with forecast software

After ERP systems has been implemented, with all the data flowing back and forth, forecasts were completely missing from them and were often made with Excel 6, if at all (Sanders, Manrodt, 2002). Forecasting methodology has made great developments (Chatfield, 1996), but the pace at which these advances have been included into software were not fast enough. As far as industrial software is concerned, ERP vendors can't produce forecasting software. The solution was the integration of existing forecasting software with the ERP systems.

DEVELOPMENT OF FORECASTING SYSTEM FOR BUSINESS AND OPERATIONAL PLANNERS.

BUSINESS AND OPERATIONAL PLANNING

Business planning repeated on a regular basis, often with the creation of a monthly sales plan. Accordingly, the sales plan is the basis for marketing plans, purchase and production decisions or investment planning. A sales plan differs from an operational plan in that it addresses a higher level of aggregation in terms of both time and product, and is expressed in revenues rather than volume. Business planning forecasts are usually worked out on a monthly, quarterly or annual basis for product groups (instead of products), brands, and different business units such as sales regions. The average forecasting horizon usually ranges from 1 to 5 years.

Production and logistic decisions are supported by an operational plan. The main aspects of these plans come from the company's supply chain:

- *demand plan,*
- *inventory plan,*
- *transport or distribution plan,*
- *replenishment plan,*
- *production plan,*
- *maintenance plan, and*
- *collaborative plans.*

For operational planning, forecasting programs are used to calculate future demand per stock keeping-unit (SKU) on a daily, weekly or monthly basis. For example in energy planning, forecasts are required by the hour and at 15 minute intervals. In general, forecasts at the SKU-level needed for a large number of items, very often in the thousands, and these items are usually grouped into a product hierarchy, by distribution channels and by sales regions. When numerous items must be forecasted on a frequent regular basis, the uses of pre-defined or automatic forecasting techniques are critical. Forecasting systems must not only meet organizational requirements for accuracy but also for processing speed and robustness (Hartványi, Nagy, 2009).

The difference between business planning and operational planning depends on the way a firm organizes its planning processes. Ideally, a forecasting system should integrate both elements into a consistent set of plans. This is not easy for many companies today, where we find separation more often than integration. In operational planning, the forecast time interval is short and often not more than 6 weeks. These forecasts heavily affect decisions on the production levels per line, lot sizes, transportation schedules, and the purchasing of materials for particular time periods. In business planning forecasting the number of time series is usually low, allowing individual inspection and modification by the planner. On the other hand, in operational planning the number of time series is huge, which severely limits the possibility of individual inspection and modification. So, automatic procedures for forecast calculation are necessary.

Additionally, business planners are usually less experienced in forecasting techniques than in the functional areas of the business, such as marketing, finance and accounting. For operational planners it is the same, because they are often engineers or business administrators with a detailed knowledge of the logistical and technical processes, but with limited knowledge with forecasting methodologies.

FORECASTING SYSTEM FOR BUSINESS AND OPERATIONAL PLANNERS

Although forecasting libraries in FORTRAN and Assembler were used from the 1960s, but their use was very limited. Practically this meant that, sales plans were still set up on paper. Very slowly, larger companies began to implement these routines for business planning. However, these routines only provided forecasts, without any integration to other systems. To calculate forecasts, batch runs had to be programmed and intervention in the forecasting process itself (for example alteration of parameters) was not possible. While an analyst concentrating on forecasting a few series has enough time to try out different forecasting models to improve forecast accuracy, the time needed for an operational planner with a much larger number of series was too much. Therefore, they used only basic, standard models within the business forecasting process. As a result, forecasting accuracy was usually poor. It took a long period of time for companies to implement forecasting for business planning and even longer for operational planning.

In simple batch processing systems, the user could not interact with the software as it was described. This deficiency was remedied by the introduction of line oriented terminals, which allowed the software to ask the user for his input during the different processing steps. For example, a seasonal decomposition could be calculated before deciding whether to apply seasonal or no seasonal forecasting models.

With the appearance of character-based user interfaces the user could move the cursor all over the monitor, and enter instructions without following a prescribed sequence. This was the first time the planner could make technique selections by setting all parameters simultaneously on the same screen before starting the forecast calculation.

The first software products that allowed business planners to interact closely with the forecasting process appeared in the 1970's. These offered simple planning methods such as administration of time series, aggregation and disaggregation of series, planning screens, report generators, and functions to modify data and produce simple graphs.

Simultaneous progress was being available in data base programs (for example dBase) and spreadsheet systems. These, along with rapidly increasing hardware capabilities, offered major advances in forecasting software including parameter optimization (optimizing smoothing constants in exponential smoothing), multi-level forecasting for product and geographic hierarchies, data and forecast overrides, and so on.

Graphical elements, interfaces to databases, spreadsheets, external data sources, numerically and statistically robust methods, and simple automatic algorithms for the selection and specification of forecasting models were now common tools of business forecasting software. Not surprisingly, awareness of forecasting program tools grew rapidly, although the majority of companies at the end of the 20th century still used spreadsheets to develop sales plans.

Most recently, with the emergence of computing networks and intranets, participants in the forecasting process who were located at different sites could more readily collaborate with each other, particularly on sales plans. Collaborative forecasting capabilities were implemented into systems such as Demand Solutions, Futurmaster and Futurcast.

The difference between business planning and operational planning was now disappearing. Software's such as Peer Planner and Logol could be used to calculate forecasts at the product level for operational planning, as well as at the product-group level for business planning. The emphasis in such software's was not on the planning process but on the forecasting engine. However, the use of methodologically sophisticated forecasting software's strongly linked to production scheduling, transport planning, inventory and purchasing was unknown in the past. After a long period of time the main obstacles were the missing interfaces between the forecasting and the production planning components.

The first commercial forecasting software's, like IMPACT, were simply operational forecasting and replenishment systems, providing SKU forecasts. However, product-level forecasts were needed to support production scheduling and material replenishment. As a result, simple forecasting models were included in production planning systems, including BAAN, i2, Peoplesoft and SAP/ R3 (Fandel et. al., 1998). In comparison to the business forecasting software's, these operational systems (SAP/R3, mySAP) incorporated only simple methods such as trend curves, elements of exponential smoothing and tracking signals. Standard techniques, such as probability-based prediction intervals and out-of-sample evaluations, were not implemented. This difference was partially closed by the end of the 1990s. SAP for example developed an application called APO, where forecasting methods and sophisticated optimization routines augment the simpler functions included in SAP/R3. Still, sophisticated modeling such as the automatic Box–Jenkins systems as implemented in Autobox and SCA-Expert, as well as rules based forecasting (Collopy, Armstrong, 1993), have not developed into operational planning.

THE FUTURE OF FORECASTING SYSTEMS FOR BUSINESS AND OPERATIONAL PLANNERS

The most business and operational planners focusing on similar data, mainly sales figures. Sales effects at both the product and group levels have common origins, such as seasonality, trading days, and promotions, so it would seem that the same forecasting methods could be applied. On the other hand, there are significant differences. While a business planner focuses on forecasting a small number of aggregated series and makes effort to provide detailed explanations and reporting, operational planners have to keep their attention across a large number of series and frequent forecast rounds. So the operational planner can intend much less time to the specific features of the data and the forecast models, and seeks to automate the forecast process as much as possible.

Future challenge is to integrate the business and operational planning components in one application. First of all DBMS interfaces are required, just as they are made by analysts. However, for rolling planning systems it is not so important to have many interfaces. Instead, a stable, solid and fast interface to the transaction database or online data warehouse needed. Obviously this technique is simplified (and cheaper) if little or no interface programming is required. The reliability and online synchronization of the forecasting database with the actual enterprise database are the most important factors here.

Additionally, in supply chains of consumer products bullwhip effects often occur, which can be described as an increase in variability as fluctuations move up the supply chain. This means that retailers directly detect the customer demand without much variation while inventory and reorder levels fluctuate considerably across their supply chain. An possible method to handling this problem is the introduction of collaborative planning and forecasting replenishment (CPFR) and vendor managed inventory (VMI) applications. Because these forecasting processes involve several organizations of the supply chain, the software must come with a standard interface by which data can be exchanged. Some companies have developed standards regulating the data exchange processes, as well as the data structures and contents. For example, a standard for exchanging information within the German consumer goods industry has been worked out by the Centrale für Coorganisation (CCG, 2002). Standardization of supply chain management

processes is also begun, according to the Supply Chain Council (2004), which developed the „Supply Chain Operations Reference". More and more SCM vendors follow this process architecture, so forecasting system vendors will also have to pay attention to it.

There is a special problem with truncated supply chains which quite common in practice. In the case of a surplus demand, most systems usually do not archive the actual demand but only the actual sales, so that only sales data can be used for forecasting. Consequently all forecasting techniques, with the exception of subjective approaches, generate biased forecasts which lag behind real demand. Another frequent problem which sometimes happens in practice is that sales data are achieved on the day of invoicing which often does not fall on the day of shipment. Shipment being relevant for production and logistics scheduling. Such problems cannot be solved by methodological inventions but only by correct database structures. Nevertheless, application and database vendors should set up solutions to save this information jointly with the time series to be forecasted to allow more detailed analysis and to make the application suitable for future methodological enhancements.

Additionally, when implementing special effects like advertising and calendar events, modeling is still often on a case-specific base requiring user interaction, for example by setting up a distributed lag structure for the advertising effect. With the huge number of time series in planning, some of the techniques indicated above (pre-defined effect profiles and lag specifications) should be run automatically and over hierarchies. Manual modification must be limited to a small number, requiring the use of some kind of effect prorating or automatic modeling.

Error prone procedures can only be used if exceptions will be caught by trap mechanisms. Unfortunately there is still much software that is not able to detect and handle numerical errors (such as overflow and insufficient data) suitably. Furthermore there are still well-known and widely sold software's where the forecasting methodology is limited to a small number of trend curves and exponential smoothing methods.

While many methods usually work satisfactorily for some longer series, especially on a monthly base for short time intervals, the increased application of high frequency data needs the incorporation of causal effects. Unfortunately, current software's do not offer a well established but simple methodology. As a result, most planners are forced to limit their forecasting repertoire to techniques which do not take causal effects into account.

Forecasting systems has been designed as standalone applications focusing on model selection for obtaining accurate forecasts. The forecast software vendors invest little in the processing of the forecasts for important decisions such as those involved in inventory replenishment and production scheduling. Moreover, many of them do not offer interfaces to other information systems.

An important deficiency of planning systems is the lack of attention paid to the theoretical basis of modeling, and therefore to the measurement of uncertainty in the forecasts. Without measures of uncertainty, the forecasts are not directly useable to replenishment and scheduling decisions. If, for example, forecast error distributions were computed and passed on to ERP software, forecast uncertainty could be involved into the computing of lot sizes and replenishment levels and intervals.

It is expected that forecast method selection should not be based simply on forecast error metrics but also on the costs of forecast errors in terms of replenishment decisions (Gardner, 2004). For example, the frequency of out-of-stock occurrences resulting from a certain method should suggest the need to change to a different method, as should excessive inventory costs. The required feedback between the forecast and the decision is not resolved in planning software's. The problem is aggravated by the concentration on point forecasts in optimization routines for production scheduling. Consequently they fail to provide the capabilities of modern forecasting methodologies to measure uncertainty.

In production systems, the number of out-of-stock situations is often tracked by key-performance indicators (KPI). Most KPI-systems do not include reliable indicators of forecast errors, the difference of forecasts from actual demand. While recording signals have been around since the 1960s, these metrics are more often found in planning system than in forecasting system. Sometimes statistical metrics can be found in systems with a primary focus on planning, but the majority of advanced planning systems only give non-statistical alerts. From a business point of view, out-of-stock percentages and excess stock are useful, but these statistics are hardly used for reporting forecast accuracy. For the last static and dynamic forecast simulations are suggested, but their availability in integrated planning and forecasting software's is not common.

CONCLUSIONS

Only a few forecasting systems offer state-of the- art functionality. Too many software's rely on outdated techniques. Examples are non-optimized smoothing parameters, poor initialization in exponential smoothing, erroneous formulas for computing safety stocks, graphs with inefficient time scales, lack of capability for forecast adjustments, aggregation of individual item forecasts and prorating of aggregate forecasts, as well as erroneous prediction intervals. Forecasting vendors need to upgrade to incorporate more recent methods.

Many new techniques in forecasting are not included into forecasting software within a reasonable time. Software vendors usually have to wait to see which new methods stand the test of time, but these methods are tending toward the simpler ones. If a scientist wishes to apply a new method, he must

duplicate the effort of the inventor, as he must rewrite code that already has been written once. This is not the right way for science to progress. By given the choice between programming a difficult method and a simple method, many researchers will choose the simple method, because it is easier. So these are the easily programmable methods that get used in applied journals.

Software vendors concentrate to new techniques face an additional obstacle. They discover that a new technique has become popular in the applied literature, and then try to write their own code for the proposed forecasting model. Often they must make educated guidance about the details of the algorithm that were published in the article. Moreover, testing new techniques is even more difficult than it should be because inventors of the methods were not required to create an archive of the data used. Sometimes it is impossible for the developer to decide that his version of the program gives the same answer as the inventor's published results.

So while hardware processes are much faster, software advances are lagging behind. In order to test a new method, the developers and researchers have to program the code from the start. In the age of the internet, there is no reason not to record the data and the code used as the basis for an article. Imagine how easy it would be for a researcher to compare two or three different techniques if he did not have to program each one from the beginning.

We believe that development in forecasting needs forecasting methodology to be closely linked to the available data and to the environment in which business decisions are made. We would require much closer integration between the information offered by forecasting and the use of this information in optimization and decision-making.

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A MULTI AGENT ROBOTIC SYSTEM FOR SIMULATION AND CONTROL OF A MANUFACTURING PROCESS

ABSTRACT:
In this work the multi-agent technology is exploited in order to develop a Multi-Agent Robotic System with the aim to simulate and control a production chain and lays the bases for the introduction of the agent technology into a manufacturing industrial process.
In particular, a simplified washing-machine production system has been studied and agentified. More in detail, automatic production, negotiation, supplying of pieces and management of the production have been considered.
The overall simplified system has been implemented by means of the JADE (Java Agent Development Environment) platform, compliant with the FIPA (Foundation for Intelligent Physical Agents) specifications, and extensively tested in order to prove the robustness and effectiveness of the approach. The developed simplified system has been conceived in order to be easily expansible, thanks to its modularity and structure, and ready to be upgraded.

KEYWORDS:
manufacturing process, assembly line, Multi-Agents, robots

INTRODUCTION

Reconfigurable and adaptive production systems, which can provide companies with the proper level of agility and effectiveness, are necessary in order to satisfy fast changes of customers' needs and demands.
Markets are highly competitive and push manufacturing systems from a mass production to a mass customization fashion. A reduction of the product life-cycles, short lead times and high utilization of resources without increasing the costs are the main targets to satisfy.
In order to comply with these requests, Just In Time (JIT) techniques that allow to reduce waste of time and resources are adopted. Thus, the market is becoming more and more mutable and changeable and new technologies have to be adopted in order to react and adapt in a fast manner.
Such premises do not allow a centralized production because a high amount of work and a low flexibility of the structure will occur. Hence, production means need to become reconfigurable and founded on autonomous and intelligent modules, which dynamically interact with each other for the achievement of local and global objectives. Production processes have to provide the required level of agility, i.e. the ability to success in a rapidly changing outer environment, and embed adaptivity attributes. Moreover, in a flexible production system the goals are also the time-to-market reduction, the raise of the productivity level and the cost reduction.
Autonomous and intelligent agents - an agent is a system situated in some environment and capable of autonomous action in this environment in order to meet its design objectives [1] -, that model the production by means of a decentralized control unit and are suitable for high uncertainty and error ratios, can be the answer. Indeed, differently from the Computer Integrated Manufacturing, there is no need of a centralized approach and a unique complex process manager; only the communication and negotiation phases between agents for the use and control of machinery, resources and materials are needed.
The main advantages of this technology and approach are:
1. Decentralized and distributed decision (i.e. each agent keeps decisions autonomously).
2. Modular structure (i.e. agents are independent).
Agents can be used and exploited for:
1. Simulation. Agent frameworks are extensively used where the interactions between different entities have to be studied;

2. Management and control. An effective control system has to show flexibility, fault tolerance, reusability and low costs. As underlined in [2], agent technology is suitable for effectively reacting to the production changing and high volumes production.

In the last decade, the scientific community has contributed to the development of techniques and applications of Multi-Agent systems (MAS [1,3]).

A Multi-Agent System (MAS) consists of a group of agents that can potentially interact with each other [3]. By exploiting this feature several advantages such as reliability and robustness, modularity and scalability, decentralization, time-dependency, adaptivity, concurrency, parallelism and dynamism [4,5] can be reached. Bussman in [6] shows how a Multi-Agent system matches the requirements for agile and fast reaction to sudden and unpredictable changes in production demands and is suitable for high volumes production.

In literature, many works that deal with MAS can be found (e.g. [2]; [7]; [8]; [9]; [10]) but agent concepts and techniques are rarely applied and practically adopted in industry. Only few applications and a small part of the available technology has been successfully applied and is currently on the market. How underlined in ([2]; [11]), many works do not specify the working environment or the production plant, focusing only on the definition of a general or theoretical model. Usually, MAS has been applied in order to simulate process flows or decision activities by developing demonstrators, industrial process and chain production simulators, and small system prototypes ([8]; [12]; [13]; [14]; [15]).

At today, industrial companies rarely use Multi-Agents mechatronic systems in production and management. Most of the works are only simulations ([2]; [11]; [16]) while successful working applications is low. Among these, the flexible and distributed MAS control of a ship equipment, the Rockwell Automation, Inc. "MAST" simulation tool for material-handling and the application of MAS for production planning of SkodaAuto cars [11] can be cited.

With the purpose of standardizing agent technologies for the interoperation of heterogeneous software agents, "the Foundation for Intelligent Physical Agents" (FIPA) has become an IEEE Computer Society standards organization and has developed specifications for permitting the creation of a set of shared rules. Thanks to this efforts on standardization, FIPA-OS (FIPA-Open Source), JADE (Java Agent Development Environment) and ZEUS agent platforms compliant to the FIPA rules and directives have been created. The JADE agent platform [17], based on Java, has been chosen in this attempt in order to implement the agents and deploy the multi-agent environment.

In this work, the intelligent agent techniques will be adopted in order to study and develop a distributed framework in order to simulate and control an industrial process like the washing machine chain production.

The target is to model and identify the production chain and to realize a Multi-Agent-Robotic-System (MARS) able to simulate and control a fully autonomous assembly process that works by means of the cooperation of software and robotic agents. Such physical robotic agents move on the environment in order to comply with specific requests as transport and station restocking like in a real factory.

THE STUDY: WASHING-MACHINES CHAIN PRODUCTION

Industrial manufacturing, robotized and autonomous operations and washing-machines chain production are addressed in this work. These fields suit well with the agent technology and theories.

The main target is to develop a MARS (Multi Agent Robotic System) with a high degree of flexibility that can be exploited as the base for a future intelligent and automatic system able to control the full chain production. Such a chain can be viewed, in a simplified scheme, as a collection of working stations.

Each station is in charge to assembly one (or a set of) component and pass the piece at the following station where the next correct component has to be assembled.

Each station is furnished with a small store of components (i.e. local store) that, in order to not stop the production, has to be correctly supplied and refurnished. Thus, each station can be viewed as an agent that is autonomous and reactive. Moreover, autonomous agents or robotic agents can be applied in order to consider and substitute the human work (i.e. a human that drives a forklift truck for supplying an order).

In practice, when the autonomous agent that represents the i-th station realizes that the local store has to be refurnished, searches a free autonomous robotic agent that can supply its request both in terms of material quantity and time. After a negotiation phase and the entrust of the task, the chosen autonomous robotic agent goes to the central store, loads the components and brings them to the calling station. Some agents can be used as traders and facilitators in order to manage the communication or settle the conflicts and some others can record the robot data in order to give information to the stations like a yellow page service.

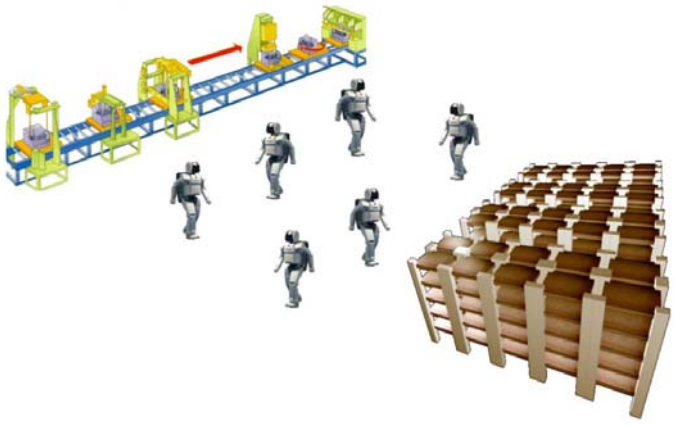


Fig. 1: Sketch of the scenario: assembly line, supply robots and main store

In this attempt, some simplifications have been made but the developed framework is implemented in order to be modular and easily expanded. A sketch of the chosen scenario is shown in Fig. 1.

In this work the simplified supply chain has been modeled by means of four stations, each one in charge of assembly a specific part of the washing-machine:

- *Station 1: motor and belt;*
- *Station 2: drum and washing tank ;*
- *Station 3: two bearings;*
- *Station 4: frame.*

In a simplified view, the production follows the following operations:

- *Station i, if the component is available in the local store, assembles the piece and, if Station i+1 is free, pushes forward the assembly; if Station i does not have the piece to be mounted, searches and calls an autonomous robotic agent in order to be re-furnished. If an autonomous robotic agent is free, it is charged/entrusted to go the the central store, keep the lacking components and refurnish the calling station.*
- *When Station i has sent the current assembly to the station i+1, its internal state is set on "free" and it is able to receive and manage another piece.*

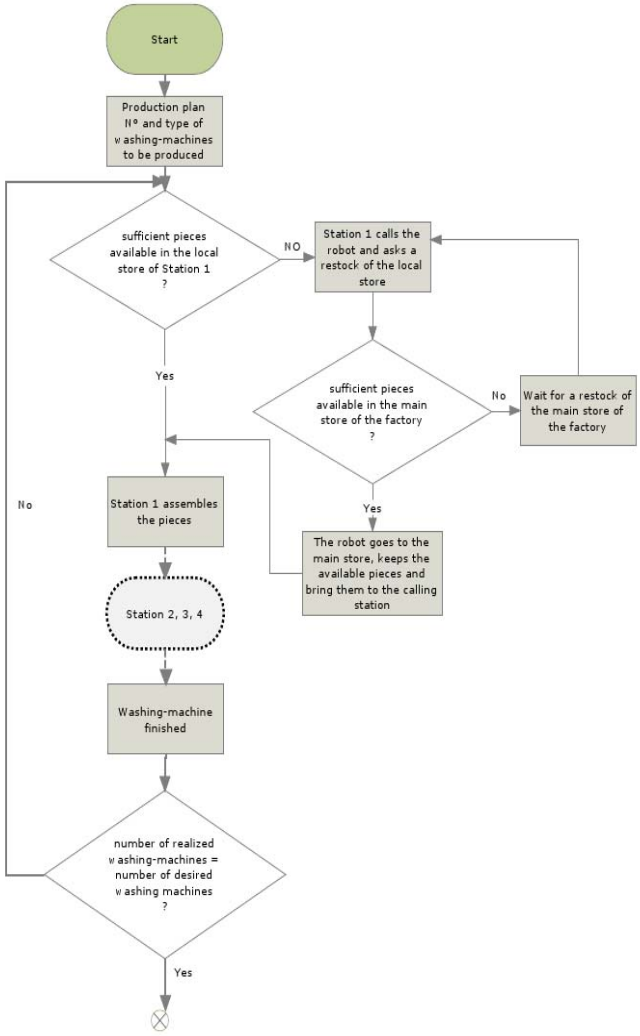


Fig. 2 : Flow-chart of the simplified process

All the works and operations have to be carried out in a parallel and not sequential manner. The flow-chart of the simplified process is presented in Fig. 2.

THE MA(R)S SYSTEM

At least two kinds of agents are necessary: one for the stations, Station Agent, and one for the autonomous robots, Robot Agent.

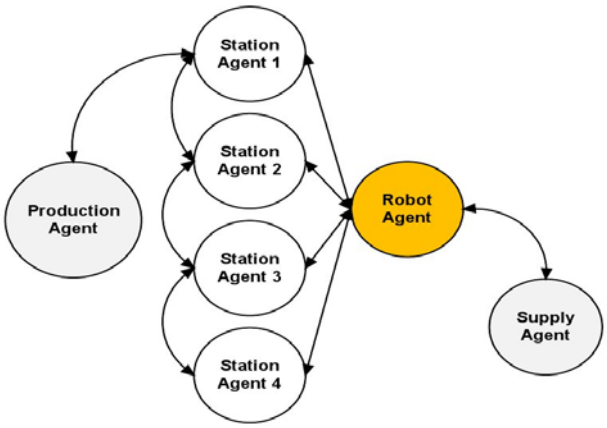


Fig. 3 : Agents of the framework

Moreover, a Production Agent, that is in charge to start and stop the process flow, and a Supply agent, that will manage and supply the main store when the stocks are ending, are necessary. Thus, by considering for sake of simplicity only one autonomous robotic agent, 7 agents are single out: 4 Station Agents, 1 Production Agent, 1 Robot Agent and 1 Supply Agent.

If all works properly, the Production Agent calls Station Agent 1 that, after its assembly task, calls Station Agent 2 and so on. If a component to be mounted is ending, the related station calls the Robot Agent that negotiates the components with the Supply Agent (see Fig. 3).

Production Agent

The Production Agent starts the production and sets the number of washing-machines that has to be produced.

First of all, it continuously searches all the available Station Agents by means of a cyclic behavior.

Inner this behavior, the Station Agent 1, i.e. the one related to the first station, is searched by means of a CALL_FOR_PROPOSAL (CFP)-message inner the StationCommand behavior.

If the Production Agent receives a PROPOSE-message, the Station Agent 1 is ready to work; otherwise, if the replies are only REFUSE-messages, it means that there are no free agents or their name is not Station Agent 1 and the behavior is repeated (general case). Within the REFUSE-MESSAGE the number of completed washing-machines is passed and, in the particular case of a number of completed pieces equal to the desired one, the production is completed.

If a PROPOSE-message is received, the Production Agent sends an ACCEPT_PROPOSAL-message with the current number of lacking washing-machines to the Agent Station that replied with a PROPOSE-message.

Station Agent

Each Station Agent has to know the number of available pieces in its local store, the part to assembly, how many and which Robot Agents and Station Agents are present in the framework and the name of the following station.

Each station has a certain number of available pieces in its local store and of elements that has to assembly (e.g. motor, bearings).

Moreover, each agent has to register itself into the Directory Facilitator (DF) that is a sort of "yellow page", in order to be found.

For this class, six behaviors are implemented:

· ResearchRequest, cyclic.

This behavior waits the CFP-messages from both the Production and the other Station Agents and sends a PROPOSE-message if it is free and is the correct station. Otherwise, a REFUSE-message is sent.

· ArrangeResearch, cyclic

This behavior starts with the ACCEPT_PROPOSAL-message of the Production Agent and sends an INFORM-message to the calling agent.

· ProductionResearchRobotAgent, one-shot.

It is called inner the ArrangeResearch behavior. If the local store is not empty, the correct piece is assembled and the SearchStationAgent behavior is called. If the local store has few pieces or it is empty the ExecutionResearch behavior is called.

· ExecutionResearch, generic.

It asks the lacking components to a suitable Robot Agent.

· SearchStationAgent, oneshot.

It is similar to the cyclic behavior of the Production Agent. It calls the StationbystationCommand generic behavior.

· StationbystationCommand, generic.

Similar to the CommandStation behavior. The next station is searched in order to pass the current washing-machine to be assembled.

If the local store is empty, a REQUEST-message is sent to the Robot Agents. A first research of the available robots is made; after that the lacking piece is requested by means of a CFP-message.

The negotiation is based on the time requested to supply the local store. The request is repeated until when at least one robot replies positively.

Supply Agent

It has two cyclic behaviors:

· SupplyRequest, cyclic.

In this behavior the supply requests from the Robot Agents are evaluated.

In this first version of the framework the main store is considered as ideal and, thus, the reply is always a PROPOSE-message.

· SupplyOrder, cyclic.

With this behavior the supply requests are satisfied and an INFORM-message is sent to the calling Robot Agent when the operation is ended.

Robot Agent

Each Robot Agent is able to supply a certain number of pieces and is registered into the DF in order to make visible its services. Moreover it represents a real autonomous robotic system (e.g. AGV, forklift truck).

The implemented behaviors are:

· RequestOffer, cyclic.

This behavior is used in order to supply the CFP-messages of the Station Agents. If the requested components are available and the robot is able to fulfill the order, it replies with a PROPOSE-message with the estimated time for making the operation. Otherwise a REFUSE-message is sent.

· SupplyOrder, cyclic.

This behavior reacts when the Agent Station accepts the proposal; it makes the restocking and sends an INFORM-message when a successful delivery is done.

· SearchSupplyAgent, one-shot.

It searches a Supply Agent in order to satisfy the order. It calls the SupplyOrder behavior.

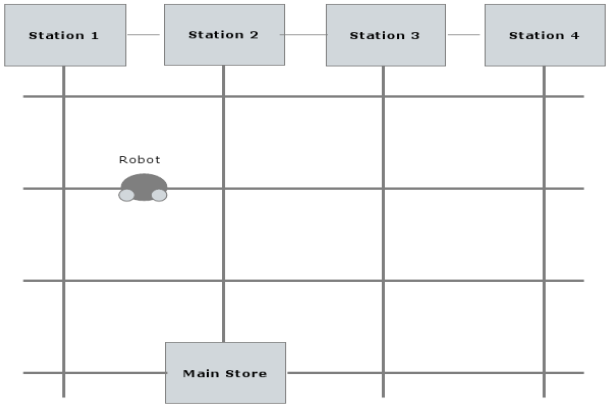
· SupplyOrder, generic.

Similar to StationCommand behavior.

When a Robot Agent accepts a task, its state is set to "occupied" until when the requested components are not delivered.

In order to realize a framework that deals not only with software agents but also with physical agents, real robots have to be integrated into the framework. The software language, the communication channel and the physical sensors and actuators have to be set-up.

(a)



(b)

Fig. 4: the NXT robot (a) and the realized scenario (b)

The hardware chosen in order to create a realistic simplified scenario is the Lego Mindstorms NXT shown in Fig. 4(a) [18].
This robot has been employed on a three wheeled (tricycle) configuration with two motors that control the two tractor wheels (see Fig.4(a)). The robot is equipped with different sensors. In particular, two classes of them have been used. Two light sensors have been installed and located at the robot front in order to follow the chosen road and recognize the crosses. Indeed the travel area has been defined as a grid of roads to be followed. Also, an ultrasonic distance sensor has been included in the robotic system in order to evaluate if there are obstacles in a range between 10 and 15 cm. Java is the programming language that has been used to implement the overall system. In particular, in order to command and control the robot, the ICOMMAND API has been exploited and the leJOS firmware has been employed [18].
As depicted in Fig.4(b), the working stations are at the top while the main store is at the bottom of the plant. When a robot is called and accepts the work, it has to leave from the calling station or from the current position, go the central store and come back to the calling station. For each station a predefined path can be used or a shortest path searching algorithm can be exploited. In order to communicate, send orders and receive information with the real robot, a Bluetooth-connection is established between the Robot Agent and the NXT.
The overall system has been implemented on an Intel Pentium Dual Core T3400 @ 2.16 Ghz, RAM 4 GB PC hardware and extensively tested in order to fix bugs or unwanted behaviors. Different production orders have been sent to the Production Agent in order to simulate a realistic production.

CONCLUSIONS

In this work a Multi-Agent Robotic System has been studied, defined and realized in order to lay the bases for the optimization and management of an industrial process by means of the theories based on the autonomous agents.
As a scenario, a washing-machine assembly line has been evaluated. Human operators that work in order to restock the local stores of each working station have been considered as autonomous (robotic) agents.
Each working station has been modeled as an agent, and a simplified agentification of the process has been made. The overall framework and agents have been realized by means of the JADE platform that follows the FIPA standards and a NXT robot has been integrated into the system in order to simulate in a realistic manner the motion of a robotic agent and the communication process into the real-environment.
Future work will cover the extension of the framework in order to consider the main store management and the integration of different robotic systems with high navigation, motion and handling capabilities.

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WAYS AND METHODS TO REDUCE NOISE AT WORKPLACES

ABSTRACT:
This post is dedicated to acoustic waves, which is part of the physical fields that surround the man, acting on the body, affecting his health, behavior, activity, efficiency and wellbeing. Frequency distribution of sound waves, infrasound and ultrasound affecting human biosphere. However, if the rate exceeded the intensity of the initiative, becoming the acoustic load producing a stress event with the following characteristics of nonspecific adaptive responses with normal speech.

KEYWORDS:
Working environment, noise, noise pressure level

INTRODUCTION

In terms of interactions between man and environment is characterized by physical factors, several common characteristics: increasing energy consumption (thermal, electromagnetic, acoustic); the man can act as a "field" (acoustic, electromagnetic); in some cases they cannot perceive the senses.
The severity of these factors stems from the fact that usually affects large population groups, and since their effects on health are not visible immediately, the public underestimates their importance. [1]
Physical working environment factors are ionizing radiation, ultraviolet radiation, visible light, infrared radiation, lasers and electric, magnetic and electromagnetic fields. Other physical factors are noise, vibration, and shock and heat-humidity microclimate. [2]

NOISE AS PHYSICAL FACTOR OF WORKING ENVIRONMENT

The main source of noise in the workplace are machinery and technological equipment, some of the activities carried out using hand tools and material handling, for example. When using pneumatic tools, noise occurs mostly in the range from 100 to 110 dB, the power tool is 90 to 100 dB, in forging about 130 dB. High noise levels can be observed even in woodworking machines, it's more than 90 dB. [4] A very important and frequent source of excessive noise is powered hand tools. There is serious risk of noise and operating machinery in metallurgy and heavy machinery where sources of noise are both great machines, but also technological processes. In such operations noise often exceeds 100 dB. [5]
As a result of adverse exposure to noise at work on health, many employees become manifest hearing loss. In the last decades of the 20th century the number of newly reported occupational diseases diagnosed with "Noise-induced hearing impairment" repeatedly exceeded 200 cases per year. The principal enforcement of new legislative measures to protect employees from noise for this number decreased significantly in the 47 cases a year. Noise at work determining the noisiest source. In measuring and assessing noise in the workplace is a distinction:

- *Noise in the workplace, i.e. in the area where the workers during the work resides*
- *Noise in the area of work, i.e. in the area where the workers during the work moves*
- *Noise levels for the individual who expresses an individual's noise exposure during work time. [4]*

In assessing the noise in the working environment of man is paramount to determine what sort of traffic goes, what types of machinery and equipment are at work used, as addressed issues of noise, in which technical condition are used machinery and equipment and the like. Measurement and objectivity to determine what the noise exposure a person is working in the service exposed. [5] The work environment is a way of measuring the noise determines the inspection of workplaces. Measurement of jobs is mainly carried out when employees are staying longer in jobs and the nature and noise are different for different jobs. If employees at work often change jobs and noise at different locations do not differ too, measured the noise in the workspace. Measurement of individual noise load is performed if the workers at work places and frequently changing noise levels at individual sites vary greatly. If the worker persists in the workplace throughout the work shift, characterized by data noise in the workplace also virtually noise load of the

individual. The measured value of noise at work then, depending on the method of measurement gives the noise burden on staff or noise at work then, depending on the method of measurement gives the noise burden on staff or noise in the workplace.
Way to evaluate noise and maximum values defining the parameters for the noise in the workplace down the provisions on health protection against noise respectively. Technical standards specifically for the current audible sound, infrasound, ultrasound, high frequency sound and low-frequency sound. [4]

EFFECTS OF EXCESSIVE NOISE ON THE HUMAN BODY AND DISEASES

Noise can be adapted to subjective, but objectively his action on the human body cannot be avoided. Noise is mainly the effect of harassing, harmful and disruptive activities and welfare of man. These effects of noise depend on several acoustic and human factors, which are listed in Table 1. [3]

Table 1. Health and comfort interactive factors of human [3]

Acoustic factors
▪ type of noise and distance from source ▪ intensity, respectively. sound pressure level, ▪ the amount of frequency emitted noise ▪ tonal spectrum of sound components, ▪ frequency spectrum ▪ interval operation and conduct of exposure ▪ interruption frequency noise levels and the difference between the noise source and background noise ▪ vividness and distinctiveness noise and its unexpectedness.
Non acoustic factors
▪ gender, age and health, ▪ subjective relationship to the noise source, ▪ time perception of noise operators (day, night, seasons) and the immediate disposition of man, ▪ need noise associated with human activities, ▪ social status, ▪ Experience with noise from the past ▪ economic dependence on the noise source, ▪ relaxation and sleep.

The crucial characteristics of noise in terms of its influence on human organism are intensity, frequency and time course. Sounds above 2000 Hz with a narrow frequency range are effective, short and irregular sounds that cause fright response and disruptive. Effects depend on the noise parameters in addition to a large extent on the individual susceptibility of humans, age, lifestyle, legacy disease, current health status, but also with regard to the sound and its source. [2]
The effect of noise level below which there is damage normal healthy ear of habitual noise exposure is known as the criterion of risk of hearing damage. It should be noted that hearing damage is cumulative result of sound level and time of exposure and any criterion must take into account the sound level and time of exposure. [3]
Health effects of noise: Noise is not active only on human hearing, but also affects the function of various organs. One-off short-term effect of over-intensity sound can cause acoustic trauma, which has been considered as an occupational accident. Long-term intense noise causes temporary threshold shift and later at noise levels higher than 85 dB, there is the constant increase and the onset of hearing loss professional.
Occupational exposure: Acute acoustic trauma resulting from rare may occur after heavy sound impulses such as. Shot blast.
The clinical picture of disease: acoustic trauma is manifested resound feelings, pressure and pain in the ear and ear subjective tinnitus. Symptoms may take several minutes to days and then the condition usually normalizes. Tinnitus (ringing in the ears) may be permanent. Hearing loss from noise there is repeated exposure to excessive noise on the auditory analyzer. It is a symmetrical two-sided type of cochlear sensory disorder.
Diagnosis of the disease: Diagnosis of occupational hearing loss from noise is based on:

- *work anamnesis and establish long-term exposure to excessive noise*
- *typical clinical picture of disease, confirmed by repeated otorhinolaryngological and repeated audiometric testing. In complicated cases, using the method of objective audiometry.*

Table 2. Hearing loss calculation in per cent by Fowler [6]

Hearing loss	Hearing loss in per cent [Hz]			
dB	500	1000	2000	4000
10	0.2	0.3	0.4	0.1
15	0.5	0.9	1.3	0.3
20	1.1	2.1	2.9	0.9
25	1.8	3.6	4.9	1.7
30	2.6	5.4	7.2	2.7
35	3.7	7.7	9.8	3.8
40	4.9	10.2	12.9	5
45	6.3	13	17.3	6.4
50	7.9	15.7	22.4	8
55	9.6	19	25.7	9.7
60	11.3	21.5	28	11.2
65	12.8	23.5	30.2	12.5
70	13.8	25.5	32.2	13.5
75	14.6	27.2	34	14.2
80	14.8	28.8	35.8	14.6
85	14.9	29.8	37.5	14.8
90	15	29.9	39.2	14.9
95	15	30	40	15

Rate and Importance of damage is rated from liminal tonal audiogram would Upshot of percentage deficit by Fowler. This calculation performed with, that first must calculate hearing loss in% for each ear separately, this is performed, that is recorded each hearing loss on audiogram in dB for tones of 500, 1000, 2000 and 4000 Hz frequencies will assign matching percent of hearing loss from Table 2.Total of those four values gives percentage loss for right and left ear. Total hearing loss in% is Calculated, that a hearing loss less damage ear Expressed in% is added ¼ of difference between both ears. [6]
In total hearing loss in 20% of the affected disorder generally unaware of the loss of up to 40% can be offset by increased attention and to higher losses in the communication difficulties.

Initially only understand speech in difficult acoustic conditions, and then do not understand even in normal communicative situations and a quiet room. Specifically, communication difficulties associated with frequency and disability cannot be unreservedly committed to the disability rate in% according to Fowler. [6]

LIMIT AND ACTION VALUES OF NOISE EXPOSURE

On the major workplace part of production and introduction sector employee can be exposed by different work and working environment factor. I tis very important, that employee health would be protected before negative work and working environment effects, and eventually that bad affects were adjusted, or their rubbish was reduced for the lowest possible rate.

At present according to Parliament European and council directive no. 2003/10/EC are establishing concepts to our legislation:

- *limit value exposure $L_{AEX,8h,L}$ = 87 dB (or L_{CPk} = 140 dB at individual impulses),*
- *high action value of exposure $L_{AEX,8h,a}$ = 85 dB (or L_{CPk} = 137 dB at individual impulses),*
- *lower action value of exposure $L_{AEX,8h,a}$ = 80 dB (or L_{CPk} = 135 dB at individual impulses).*

Action value of exposure is noise value in the work environment, where at going beyond that has to be done precaution for noise decrease.

Limit value exposure is noise value, which at employee can not be exceeded for any conditions, even with earmuffs applications. [7]

OBJECTIFICATION METHODS

In measuring and assessing noise in the workplace will use 3 types of limit values and biological, emissions and air pollution.

Biological evaluation of noise and its harmful effects is performed when the noise exposure of workers can not accurately assess the physical measurements, when the hearing impairment and other factors involved and there is no known relationship between exposure, the incidence and size of workers' hearing from noise damage. The basis of the audiometric examination of the exposed workers in a quiet audiometric chamber, which measures the increase of hearing loss across the group for one year.

Noise emission values of equipment characterized in terms of their ability to radiate acoustic energy. Using these figures, it can calculate the distribution of noise levels in a certain area, thus the ability to characterize the source of a sound the space. This property is expressed in sound power level. Noise emission values are fundamental and technical characteristics of machines used to assess the quality of machines in terms of noise and efficiency of technical measures taken to reduce their noise.

Imitated noise values are used for ranking noise on workplaces in terms of potential effects on human organism. The basis of the measurement noise nuisance, i.e. the noise in places of residence of workers. We distinguish between direct measurement of noise load, measurement noise in the workplace and measurement noise in the workspace.

Noise on working place is measured when, during the shift workers are mostly working on one place and outside of this place do not enter into area with Massively A higher noise level than on permanent working place.

Measurement noise in the work area is carried out when in a noisy area moves more people, space is filled with a greater number of noise sources of the same type and level of noise in the workspace does not change significantly. Workers are mostly working part time staying in this area and outside it are not exposed to greater noise. Integral part of measuring and assessing noise in the workplace survey is the type of activity and duration of exposure. Evaluation of noise in the workplace is against the measured values of noise, the type of work and duration of exposure to the permissible limits in the legislation. [2]

PREVENTIVE MEASURES AGAINST NOISE

Measures used to prevent or reduce the noise in the work environment can be divided into several groups:

- *technical steps to eliminate potential sources of noise in the manufacture of machinery and technological equipment, selection of equipment with lower noise, acoustic coatings, noise-absorbent wall materials, preventing transmission of the building structure, isolation of man from the noise source (noise cab), acoustic wall tiles,*
- *technological measures: low-noise technology, covers material transport routes,*
- *organizational measures: reducing the number of exposed workers, reducing exposure (e.g. emergency breaks, which they must spend in the so-called. Quiet noisy areas outside the workplace), relief workers, integrating noisy operations to less busy changes, determination of hazardous work, preventive medical examinations,*
- *personal Protection: failing to implement such measures, or they reached the noise below 85 dB: earplugs, earmuffs, the noise over 95 db: helmets restrict the bone conduction of sound, and used in noise above 100 dB. [2]*

EXAMPLE NOISE REDUCTION BY OPTIMIZATION OF TECHNOLOGICAL ELEMENTS OF MECHANICAL SYSTEM

It should be noted that the real structure contains many discontinuities, which can be considered as a kind of insulator, in which the change of intensity of vibro-acoustic waves, respectively power flux and thus reducing the information content signal. Examination of the vibration transmissibility of the structure, such as detecting the transfer function from point B to point C (Figure 1) does not lead to information that would adequately identify the transmission path. When using traditional construction materials, if not in the way of discontinuity, the attenuation per unit length is negligible. It is therefore important to examine the transmission through the discontinuity. [3]

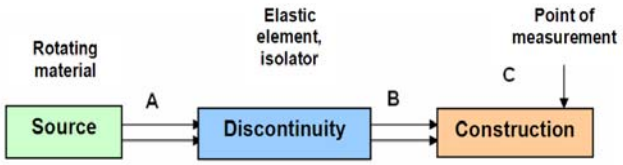

Figure 1 Power flow of mechanical vibration signal [3]

One example of how to reduce vibration in our mechanical system studied is the change of stiffness of elastic pneumatic clutch and changing the pressure in the compression chamber. For measuring and evaluating the effectiveness of coupling, we used acoustic camera that can record the sound pressure levels throughout the measured frequency spectrum. An example of such mechanical system is shown in Figure 2.

Figure 2 Mechanical system

Measurements were carried out in various modes of speed of mechanical systems and various pressures in pneumatic clutch. Also measurements were made when the system elastic clutch was not located; it means that the shafts were combined fast. From the measured data we have in frequency spectrum indicated a frequency of 570 Hz, which is most pronounced in the system. Figure 3.

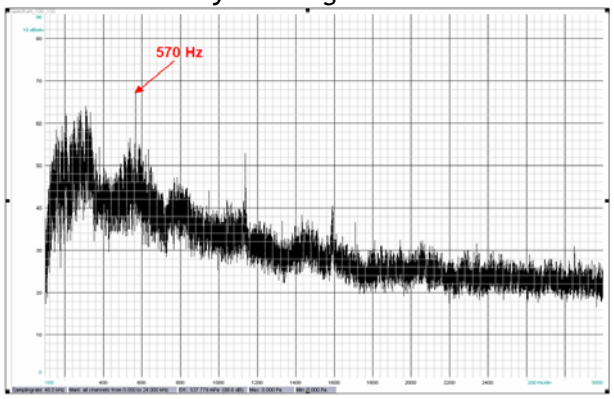

Figure 3 Selection of the frequency in spectrum

Evaluation of measurement is presented in the following chart, which is dependent noise pressure level of frequency 570 Hz at mode 450 rpm and different pressure changes in the elastic clutch. Figure 4. With regulation and tuning of rotating mechanical system components the whole mechanism decreasing noise level also occurred following decreasing of sound pressure level in work environment.

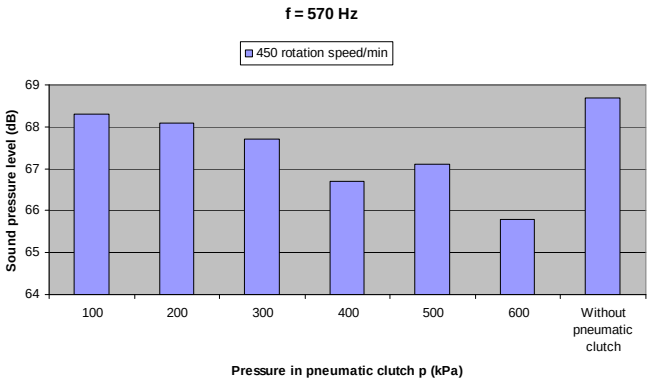

Figure 4 Result measurement and analysis

CONCLUSION

This article provides basic terminology, determinants and physical properties of acoustic wave propagation environment. Discusses the effects of sound waves to a man and an example of noise reduction by optimizing technological elements of the mechanical system.

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INVENTORY LEVEL REDUCTION BY INSERTING UNPACKING STATIONS IN PRODUCTION SUPPLY PROCESS

ABSTRACT:
This paper deals with questions of production supply of assembly plants. It is a general aim to resolve the trade-off between production supply service level and engrossed component stock level in production. On the one hand by pumping components to production in larger portions supply processes become simpler and quicker. On the other hand large portions cause high level of component stock. By inserting unpacking stations between warehouse and production lines, optimal system can be achieved. With the help of computer simulation software a model a single-stage kanban controlled production supply system was modeled where production lines receive components directly from warehouse. After that we simulated the effects of establishing unpacking stations that distribute components for production lines and determined the inventory level reduction.

KEYWORDS:
Production, inventory level, unpacking station, simulation

INTRODUCTION

New trends of manufacturing systems concentrating fully on perfect customer fulfillment (e.g.: MCM - Mass Customized Production) emerged in the previous decades. Manufacturers are facing with the problem that mass production should be run according to diverse claims. Because of diversity large lots are split into smaller ones which results in set up time increase; which of course results in decrease of production capacity and increase of costs. In order to find optimal solution of these kinds of trade-offs several methods, philosophies exist. In this paper we deal with a narrow problem which is a decrease factor of production costs that affect the mentioned trade-off at kanban system supplied manufacturers. The size of packaging units delivered from warehouse to production firmly influences inventory level and cost. In order to minimize this inventory level by unpacking packaging units into smaller ones may be one possibility. During our research we used logistic simulation software to validate the assumptions.

REVIEW OF KANBAN PRODUCTION SUPPLY SYSTEMS

Kanban originates from the Japan word "card". Several researches were made in this topic Junior and Filho gives a broad overview of kanban features [9].
In production systems cards, empty boxes or digital signals indicates the consumption of production processes. Kanbans usually contain part number, lot number, part description, location, destination, quantity, lot quantity, and other additional information.
Reaching a pre-defined inventory level - e. g.: certain number of empty boxes accumulates at an inventory buffer - starts the supply process; inventories are filled with kanban quantity. By kanban philosophy WIP (work in process) level can be decreased drastically since only the used up quantity is ordered from warehouse or partner. However packaging unit quantity, size and material handling circumstances - e.g.: lead time - often strongly determine kanban batch size and affect WIP level. Also safety factor is built in the system; these are the causes why zero inventory level can not be achieved in manufacturing practice. The schematic figure of kanban material flow is illustrated on Fig. 1.

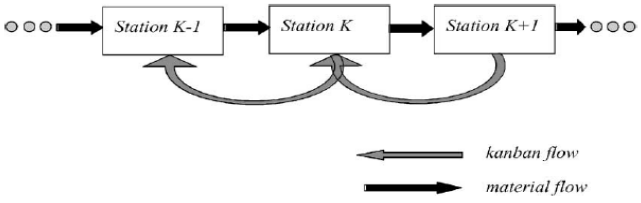

Fig. 1. Mechanism of the material and message flow in a Pull-type manufacturing system [3]

Just in time (JIT) manufacturing systems produce according to production schedule, which is generated by ERP (enterprise resource planning) systems based on

customer orders. Purchase orders and incoming deliveries fit to production schedule; the right product is delivered/produced at the right time. According to Chan the most appropriate tool for supporting JIT manufacturing is kanban [3].
Sharma and Agrawal established a simulation model in order to aid control policy selection; their simulation result showed that in case of manufacturing systems the most preferred control policy is kanban [15]. Simulation is widely used to investigate features of manufacturing systems or whole supply chains applying kanban control policy - e.g.: [5],[6],[10],[13],[21]. Also applications of mathematical models confirm advantages of kanban [20]. The kanban size has a prior importance on determining in-process inventory level. The number of kanbans can be calculated with Toyota's formula [3], [4], [8] in Eq. 1.

$$n = \frac{d_a \cdot (t_w + t_{pc}) \cdot s}{k} \qquad (1)$$

where d_a means the average consumption of the particle during given period, t_w means the waste and waiting times, t_{pc} means the processing time, s is a safety factor, k is the quantity of kanban packaging unit, kanban box or container.
The demand of a production line is a stochastic value, methods to calculate variability of production lines exist [7]. Also optimal planning methods support demand estimation [14],[11].
An approach for determining the optimal location of inventory control points in serial production systems with pull control has been presented by Askin and Krishnan [2].
The trade-offs between optimal base stock levels, numbers of kanbans, and planned supply lead times are demonstrated by Liberopoulos and Koukoumialos [10]. When designing single-stage kanban system the main parameters are the workstation production capacity and processing rate, utilization factor of the system, number of servers in the system, and the ordering rate of raw material [1]. However kanban systems are getting more and more complicated Sarker and Balan indicate that the issues of raw material orders, WIP inventory and finished goods setups (batch sizing) have to be considered together rather than separately in order to minimize the total cost of the inventory system [13].
In adaptive kanban systems the number of kanbans changes according to the consumption and inventory level [17], [19]. The design of adaptive systems is supported by mathematical models (Genetic algorithm, Simulated annealing-based heuristics) [16], [17].

BUILDING SIMULATION MODEL

During our research we have collected production data from electronic assembly company that used single stage kanban system. In this case operations on products are taken by only one single work center; material movement between work centers is not present.
In our research the current kanban system is compared with a modified system:
I. The current is a simple single-stage shop-floor kanban system in which raw materials are delivered from warehouse to work centers in the package provided by vendor. This means fix, non-optimal kanban number and quantities.
II. In the other version unpacking station is applied. We assume that by applying unpacking station inventory level would decrease smaller buffers at work centers and in warehouse is needed.
At many cases it is not recommended to unpack packaging units without proper identification process, because it would damage product traceability. This is problem is especially present at participants of automotive, industry, machinery, food industry, etc. If the connection between new package and the parent package is registered traceability is feasible.
We examined 5 raw materials used at 3 work stations. This survey is an initiative investigation to a broad company research; in the future this simulation model will be expanded to most problematic material. There is a company directive regarding raw material inventories namely the inventory located at shop-floor should not exceed inventory level enough for half an hour production. Of course if packaging unit quantity exceeds this half an hour inventory level, it can not be achieved. Considering this the installation of unpacking stations is not a possibility but compulsory.

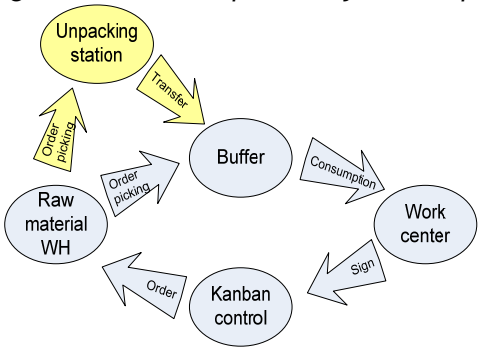

Fig. 1. Simple scheme of manufacturing system

Fig.1. shows the schematic model of current manufacturing system and manufacturing system installed with unpacking station. At each work center maximum 2 packaging units can be present, one with whole quantity and one in process. At the point when the whole packaging unit is opened a new kanban is forwarded to the warehouse, the order is picked and delivered to the work center.
Basic input data of the model are the followings:
N_{RM}: quantity of raw centers
Q_{PU}: Packaging unit material per finished good, retrieved form BOM list
T_{CWC}: Cycle times of work quantities
T_{CP}: Cycle time of picking process
The numeric data used for simulation are demonstrated in table 1. The size of packaging units are determined by the vendors, the company has some influence on it during the product and packaging design phase. The packaging unit quantity is usually size dependent. For example Part_05 is a larger box

that is why the packaging unit quantity is only 10. Naturally in case of smaller kanban quantities more picking cycles should be made and higher kanban number should be determined and also unpacking would not have significance in the simulation. Based on simulation results the kanban number of Part_05 at Work center 01 is 3 so the maximum number of packaging units can be 12 (11 whole and 1 in use).

Table. 1. Input parameters of simulation

Work center	Part_01	Part_02	Part_03	Part_04	Part_05	Throughput of production line (pcs/min)	Cycle time (sec/pcs)
Work center 01	0	0	0	4	2	2	33
Work center 02	5	0	2	12	0	1	74
Work center 03	0	1	6	0	1	2	55
Quantity of packaging unit (pcs)	300	25	1 000	300	10		

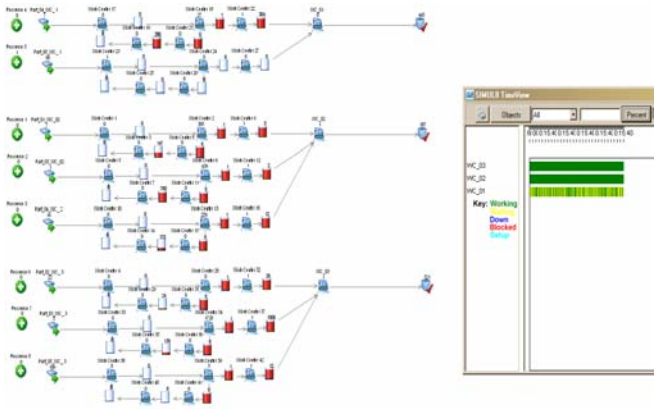

Fig. 2. Graphics of simulation model

The picking process lasts at about 300 sec with normal distribution, the material handling between buffer and production process is negligible, it is contained in the processing cycle time of the production line. The operators have some extra time to unload buffers without setting back production.

The simulation was made by Simul8 software, the graphics of the model is represented on Fig. 2. In the first part of the simulation the material flow of units separately in reality picking cart is used, this negligence is not significant considering inventory relations.

SIMULATION RESULTS

A. Current single-stage kanban manufacturing supply control

After running model described in previously the inventory quantities engaged at work centers was collected (Table II.), which values were compared to results of improved system.

It is a common problem at kanban systems that kanban orders are put on when packaging unit consumption starts, since the inventory in one single packaging unit may cover several day long production (e.g.: tiny screws, microchip, micro compounds for SMT - Surface Mount Technology or other typical fields.

Table 2. Results of simulation of current system

	WC_01	WC_02	WC_03	Total
Part_01		449		449
Part_02			39	39
Part_03		1553	1513	3066
Part_04	425	456		881
Part_05	54		17	71

B. Two-stage kanban manufacturing supply control with unpacking station

The material flow between the raw material warehouse is interrupted with unpacking. However unpacking is not worth in all cases of packaging units. Table III. indicates that in cases of Part_02, Part_04 and Part_05 packaging unit is smaller than consumption during 30 minutes, which is the company directive, so unpacking has no advantage.

In case of Part_01 the suggested modified packaging quantity is 150 (enough for 37 minutes), it is recommended to use rounded quantities when unpacking is made by operators and not by machine.

Table 3. Raw material consumption during 30 minutes

	Part_01	Part_02	Part_03	Part_04	Part_05
WC_01	0	0	0	220	110
WC_02	121	0	48	291	0
WC_03	0	56	338	0	56
Consumption in 30 min	121	56	386	510	166
Packaging unit quantity	300	25	1000	300	10
Number of kanbans	1	3	1	2	17

Table 4. Results of simulation of modified system

	WC_01	WC_02	WC_03	Buffer	Total
Part_01		229		183	412
Part_02			39		39
Part_03		731	753	823	2307
Part_04	425	456			881
Part_05	54		17		71

The situation is a bit complicated in case of Part_03. The packaging unit quantity is 1000 pieces; the total consumption during 30 minutes is 386. The problem is that the consumption difference between Work center 02 and Work center 03 is significant. In practice it is often too complicated to distinguish packaging quantities according to destination. Sometimes even adding information to each raw material is a very hard task. We took the simpler case when a common quantity is defined for both work places; 400 pieces. Although the inventory level will cover 44 minutes at Work center 03 and 310 minutes at Work center 02 least developed informatics system is capable handling this version.

By installing unpacking stations the shop-floor inventory of raw materials involved in unpacking decreased significantly. In case of Part_01 the decrease was 8,2% at Part_03 the decrease was 24,8%.

Considering kanban quantities the inventory of unpack station buffer is relatively low. (Part_01: 183, Part_03: 823). The unpacking station coherences were demonstrated in this paper through a simple example, in practice much more production lines and raw materials are usually included. It can be assumed that the average inventory in the unpack station buffer would increase in a low rate as more work centers are included.

CONCLUSION

During the research single-stage kanban system was investigated at a electronic assembly-type manufacturing system. Two versions were examined: one without another with unpacking station. We assumed that the inventory level can be decrease

radically in case of the second version; the aim was to determine the extent of this decrease.

After installing unpacking station the work centers stopped ordering separately from raw material warehouse, they ordered from unpacking station. Previously for example in case of Part_03 in the moment of delivering new packaging unit to work stations 4 packaging units were reserved in production.

As the result of this the main buffer of unpacked materials evolved at the unpacking station, the kanban quantities between the work centers and the unpacking station decreased. Smaller kanban quantities resulted smaller in-process inventory level, significant cost savings can be achieved by unpacking stations. The advantages come out especially at relatively large packaging unit quantities and high value products. The rate of cost saving can reach 25-30 % of the engaged inventory.

However we have to mention that unpacking may have disadvantages; it may damage or weaken traceability features. The other additional drawback is the extra information handling constraint and extra material handling processes may occur.

Further researches focus on the material flow intensity in case of different type of supply control policies. By installing unpacking stations the material movement tasks also change this way the utilization of resources modifies. Unpacking is an extra handling process, the deliveries from unpacking station to production lines should be solved a different way. It is not that obvious which version is the more cost-, and time effective, if unpacking stations cause a growth in material handling intensity than we are facing a new trade-off – for which simulation is an effective tool to investigate.

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THE CENTRAL AND THE LOCAL SYSTEMS OF RURAL DEVELOPMENT IN THE REGION MANAGEMENT

ABSTRACT:
The sustainability is strongly connected to the conception of Food Sovereignty, which became an everyday issue again in the last years among the people dealing with agriculture. Considering the philosophy of the movement, the farmers have a right to produce local food, and the consumers have a right to decide by whom and how produced provisions intend to buy. In our research we examined the attitude of the consumers toward the natural foodstuff. The tools of the marketing have a role in the positioning of these products.
Regional marketing is a new concept, which is not widely known in Hungary, there are only very few and limited experiences with it. It is a total of all the activities and at the same time a way of thinking, the aim of which is to take a product to the customers very efficiently.
In the South Great Plain Region several top-quality products are made and these products are Hungarian specialties. In this immense competition an image formed about a country, a part of a country or about a region has a considerable influence on the decision of customers - both on the national and international market.

KEYWORDS:
region marketing, rural development

INTRODUCTION

Regional marketing is a new concept, which is not widely known in Hungary, there are only very few and limited experiences with it. It is a total of all the activities and at the same time a way of thinking, the aim of which is to take a product to the customers very efficiently (Berács, 2006). The task of regional marketing is to explore the competitive assets and attractions of a region, to help the realization of the plans in order to support achieving the goals of economic and community life. In the South Great Plain Region several top-quality products are made and these products are Hungarian specialties (Piskóti, 2006). In this immense competition an image formed about a country, a part of a country or about a region has a considerable influence on the decision of customers - both on the national and international market.

MATERIAL AND METHODS

Region marketing is barely known in Hungary and we have only limited experience in connection with its Hungarian applications. Region marketing is by all means part of marketing. It is a mixture of such activities which purpose is to effectively channel products to the customers.

It must be considered, that there is a strong competition in satisfying consumer demand. Main goal of region marketing is to help discovering the competitiveness and charm of the region in order to reach multilateral development-, economic- and life-conduct objectives. Being a member of the European Union, it is vital for Hungary that its food industry could reserve its traditional role. Numerous high-quality, special products are produced in the South Great Plain Region. Farming experience - gained throughout centuries - resulted in special, unique products representing national values
Europeanisation is about opening up political, economic, geographic and social space. This is being carried out through the reduction of a wide range of traditional protection mechanisms of these spaces. The process serves the interests of the economic centre, the market, international capital and multinational companies. Nationally or regionally specific rules and regulations currently represent obstacles for the free movement of people, goods and capital (Camagni, 1995). Business needs to have access to local and regional economies. To achieve this, generally accepted regulations and policies, to ensure the necessary conditions (stability, proper relations, common technical standards, etc.), are needed.

The European Union, the political centre of Europe, can be seen as a central organisation, which can design, negotiate and enforce these conditions. The continuously growing common regulations on markets, trade, safety, environment and different aspects of production, aim to provide for the access required by the economic centre (Picchi, 1994).

RESULTS AND DISCUSSION

REGION MARKETING IN THE REGION OF DÉL-ALFÖLD OF HUNGARY

The contradiction of the present time is the "global-local paradox". While global competition is intensifying, more and more companies have been concentrating in one region, where the local environment provides appropriate conditions for production. The reason of that is that among the advantages of the association, the advantages coming from a local environment secure increasing revenue levels.

In the Region of Dél-Alföld, the image was created in a way that it reflects the characteristics of the countryside, the atmosphere of the land, values of local people and history and traditions of the region. The region possesses a number of good quality agricultural products that have great prospects for the future. The positive image of the regions enhances the identity of local communities that assist them in finding their interest locally.

The figure 1 shows the aspects of situation survey basing marketing strategy.

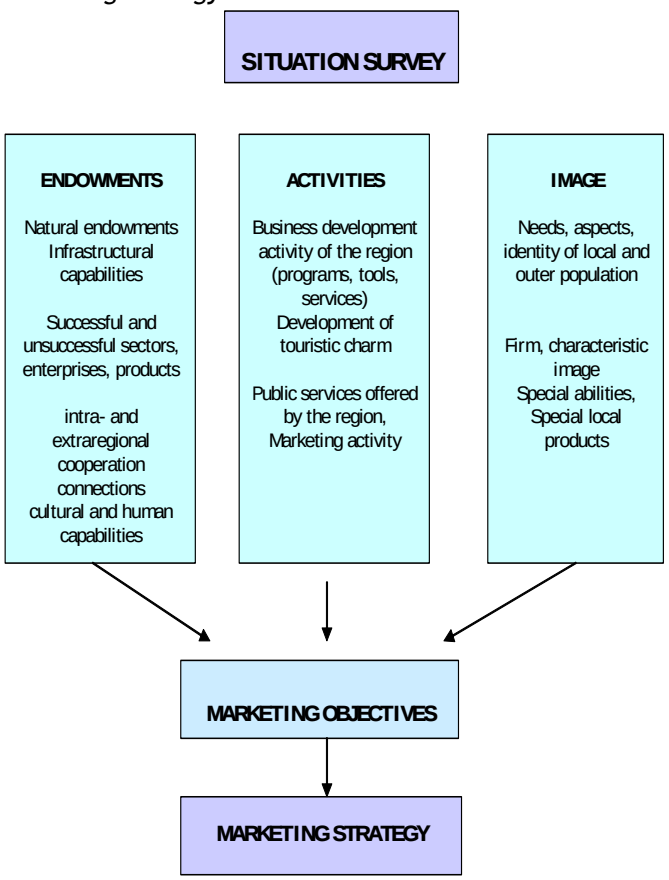

Figure 1. The aspects of situation survey basing marketing strategy

THE CENTRAL AND THE LOCAL SYSTEM OF RURAL DEVELOPMENT

One type could be called the central administrative system of rural development, based on fundamentally top-down interventions of the political centre (Gusztáv, 2005). It comprises such elements as: European and domestic policies; centrally redistributed resources; institutional networks; skills, technical and procedural knowledge of various level bureaucrats; strategic development plans. It has a formalised and institutionalised character. It is based on written rules, established procedures and controlled by bureaucratic institutions. It uses external resources for intervention, usually works with a very narrow flow of information, with high transaction costs and aims at quantifiable results. At the same time it can have a large scope and embrace higher level or long term strategic objectives, which are above short term economic rationality (Amin et al., 1994). The other type could be called the local heuristic system of rural development, based on essentially endogenous, bottom-up processes (Ray, 2001). It comprises such elements as: local economic, political and social actors; local development plans; social networks and kinship relations; local authorities, innovative individuals, development associations and partnerships as well as the development skills and experiences of these local actors (Gusztáv, 2005). Although it builds upon local resources, rural values and synergistic effects of multiple activities, it often needs external finance and encouragement: financial resources, technical assistance, mediation, expert knowledge, etc. (Terluin, 2003).

SWOT ANALYSIS OF THE REGION

Strengths of the region:

- *Role of agriculture is dominant in the Region, the food industry is competitive even by international comparison;*
- *Number of sunshine hours is very high and the average yearly temperature is also amongst the highest in Hungary;*
- *Number of tertiary educational-, research- and cultural centers is outstanding in national comparison.*
- *Many famous firms with high level of professional culture and brands connected to them works in the Region.*
- *There are a number of unique, excellent quality traditional products, which are unambiguously characteristic to the region.*

Weaknesses:

- *The GDP per capita has remained unchangedly below the national average in the past years;*
- *Quality and quantity of transportation infrastructure is insufficient;*
- *Proportion of foreign capital is lower than the national average;*
- *Many small regions of the Region belong to the group of small regions currently being in critical position.*

Threats:

- *Regional effects of the EU's Agricultural Policy;*
- *Appropriate environmental protection agreements and cooperations wouldn't be signed with the neighbouring countries;*
- *Sharpening competition between the domestic region and the regions of neighbouring countries.*

Possibilities:

- *Growth of the role of euroregional organizations;*
- *Affirmation of the South-Western European gate role with the reconciliation of the Balkanic situation;*
- *Change in consumer preferences;*
- *Positive international image of certain kinds of foods;*
- *Demand for unique, special provincial products.*

CONCLUSION

Material and immaterial products which are manufactured in, and are representative exclusively to the Region should be supported practically in regional cooperation. Beside measurable economic profits the following advantages can be achieved:

- *conservation of traditions and cultural heritage, strengthening the idea of belonging to the same community among the people living in the region;*
- *forming the peculiar image in the competition among the regions and in the accelerating globalization processes of our days.*

It can be expected only as a result of a long-term, coordinated marketing strategy that the image of South Great Plain Region becomes widely known and attractive. One precondition of this is that the Region should successfully represent the selected image and to develop a positive affection for its special local products. This affection could be formed inside the region by positive local-patriotism, while outside the region with the sympathetic and valuable features.

This is important because the South Great Plain Region has its competitors by now - certain domestic and neighbouring country regions. In the future, the enhancement and specialization of the competition between regions could be expected. The South Great Plain Region only has its chance to effectively join the domestic and international competition if conscious preparations and image-forming takes place.

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NON-INVASIVE MONITORING OF CALM TRAFFIC

ABSTRACT:
This paper deals with the use of video detection to identify the occupancy of a parking place from image information. The video detection comes in handy for cases of large and indented car parks. Suitably mounted camera can cover large area and software can locate from its images occupied places. The whole video detection system interprets the situation at car park and information about free parking places could be displayed on navigation panels guiding the drivers to the nearest free places. An added value for the management is the real-time video overview about the situation.

KEYWORDS:
car park occupancy, car park management, video detection, object tracking, calm traffic

INTRODUCTION

Today, the frequently discussed problem is how to detect the occupancy of parking places at institutions, park-and-ride areas, shopping centres etc. If there is a way of reliable detection of occupancy of parking place, it could be used for many commercial and security applications as well. Targeting this domain, there was realised a project "Non-invasive monitoring of calm traffic". It solves the problem of recognition of occupancy of parking places at the University of Žilina by using the video detection.

ESTIMATION OF CAR PARK OCCUPANCY RATE

Every kind of car park has its own limited capacity of parking places given by areal possibilities. Already all accessing roads can be considered as a part of the car park system. Depending on many factors, the information about occupied parking places can differ from the real situation. This could lead to misinformation of drivers searching for a parking place. So an early and advisable consideration that the car park is full can prevent the ineffective navigation. The estimation of the maximum rate of occupancy to declare the car park as full depends on type, complexity, area and many other criteria. Generally there are hints helping to estimate the moment to declare the car park as full:

- *To gain information about vehicles routing from/to car park*
- *To use zone detection and zone navigation in cases of complex car parks*
- *To use time zones during the day with different upper limits to declare the car park as full*
- *To leave a gap to take into accounts some critical situations (fire, police, ambulance, guests, etc.)*
- *To take into account the capacity and characteristics of car park*

METHODS FOR OBJECT DETECTION AND TRACING

The content of every image (regardless if standalone or in a video sequence) can be divided into several levels of abstraction hierarchy [4]. The first one consists of pixels, elementary parts of every digital image, containing information about brightness or colours. The next level is aimed at features as edges, corners, curves, areas, etc. The upper level of abstraction combines and interprets this information as objects and their attributes. The top level uses concepts of processing and analyzing of images similar to human perception. These methods couple individual objects and define relations between them. The process of detection of an object in video sequence includes the step of catching its occurrence and locating it as accurate as possible in individual frames for further processing. The principle of tracking the object is generally based on processing the detected changes of its location, size, and shape in consecutive frames. Basic methods used to detect objects:

- *Detection of objects based on their features*
- *Detection based on shape*
- *Detection based on colour information*
- *Detection based on pattern matching*
- *Motion detection*

CAMERA POSITION

The position of a camera is important to effectively use its images. Therefore this fact has to be taken into account for every car park individually when using a video detection system. There are generally following two rules:

- *place the camera to cover most parking places*
- *place the camera to minimize overlapping of objects (e.g. van vs. sport car)*

In our case there were two possible views:

1. *To shoot our experimental car park lengthwise, where all parking places were covered. But the problem was the height the camera to be placed (see Figure 1b). The farthermost objects were overlapped. It is important to keep the ratio between the height h and length d as great as possible to reach higher point of view (Figure 1a)*
2. *To shoot the experimental car park broad wise, where the ratio was more suitable. Though the angle of view of the camera in this position was limited (Figure 2 - not all parking places were covered) it was sufficient to verify our algorithm to detect the occupancy of a parking place.*

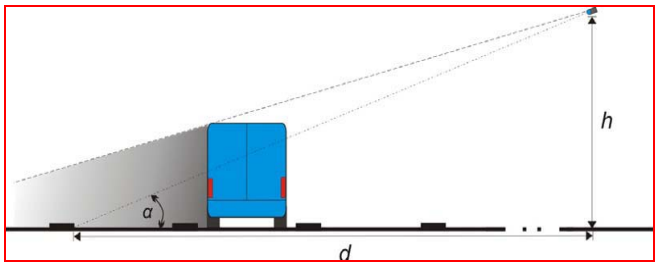

Figure 1. a) Overlapping the parking place by a vehicle, b) general view

STRUCTURE AND DESCRIPTION OF THE PROGRAMM

The program implements methods of detection of object based on its motion and colour information. It was written in the C++ language using the "OpenCV" - a library for computer vision. The source code was written according to the specification given in [1]. The structure of the application is explained in following text.

Definition of Region of interest - ROI

There are defined three ROI for each parking place. Two of them are used to gain relevant data (Figure 2: blue, the narrower ROI1, the wider ROI2).

The ROI3 is used to visually inform about the occupancy of a parking place (Figure 2: green=free, red=occupied). For every ROI are defined four basic pixel values of its position in the frame: top, left, width and height.

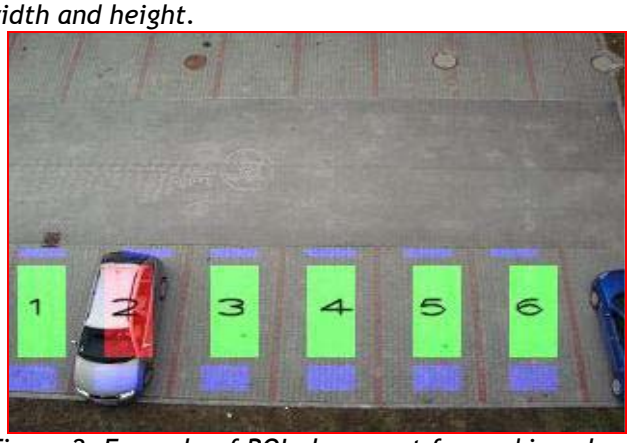

Figure 2. Example of ROI placement for parking places

Detection of moving object

For the proper run of the application it is important to accurately designate the moving objects and to interpret their impact on the parking place. Therefore the following schema illustrates the most important part of the application (Figure 3).

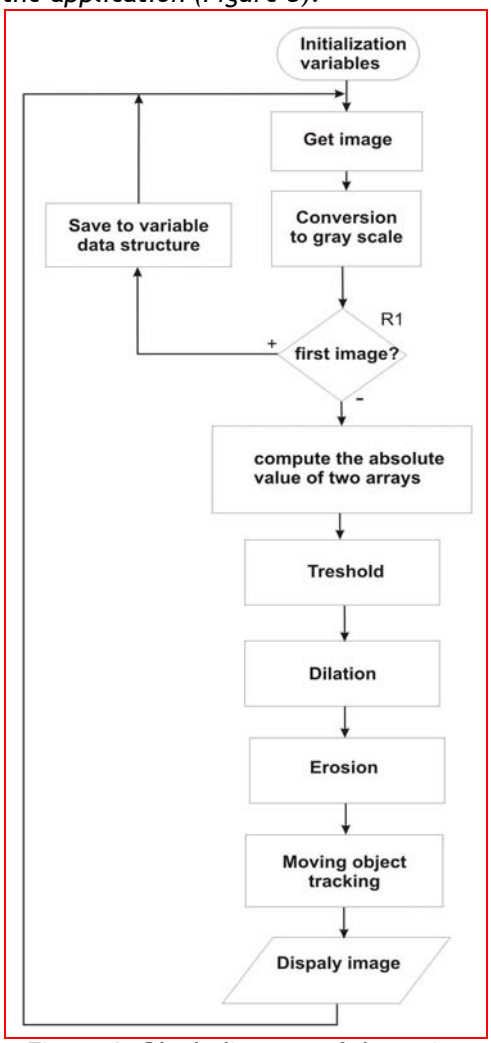

Figure 3. Block diagram of detection of a moving object

Block of initialization of variables
Definition and initialization of variables used during the application run for storing data
Block of getting image
The reading of image data into variables. There are three alternatives of getting the image data:

- *Reading the video from connected camera (integrated webcam, camera connected through supported interfaces)*
- *Reading the video directly from a local storage in AVI format*
- *Reading the image directly from a local storage as a simple file*

Block of conversion
Because of further processing, here takes the conversion from colour to greyscale place
Block R1
Because there is nothing before to compare with the first image, the application stores it in a variable to compare it with the next one.
Block of computation of changes
Computation of data changes takes place. Figure 4 shows us an example of detected changes in two consecutive frames.

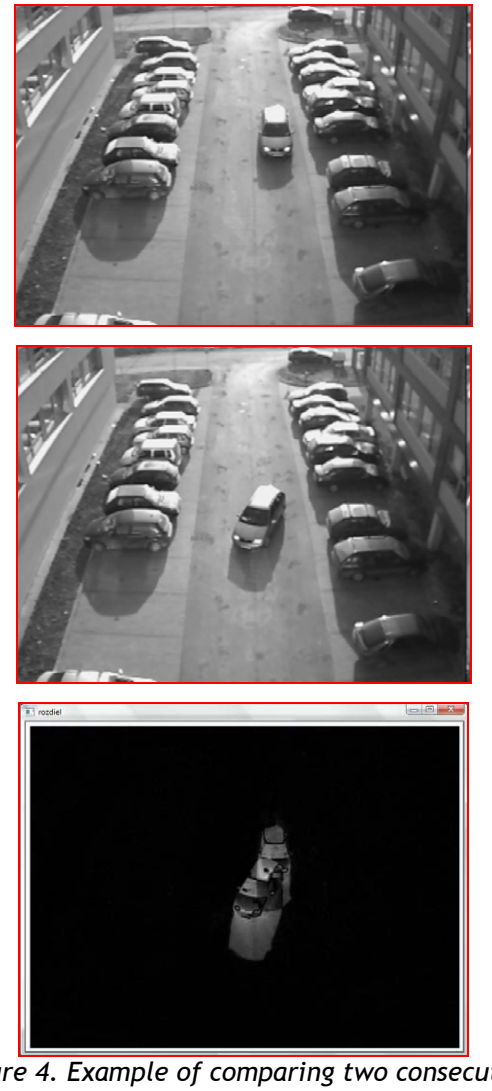

Figure 4. Example of comparing two consecutive frames in time of 0,5s

Threshold block
The value of change for each pixel varies in range from 0 to 255. Processing such data structure would be complicated. Therefore a transformation to binary values is needed. It is important to set properly the threshold value [2]. The following example shows the presence of a shadow as an unwanted element when setting the threshold too low. The threshold value has to remove the artefacts and to preserve the best compactness of pixels of the moving object. The threshold value was estimated experimentally (Figure 5).

Figure 5. Example of using the threshold (values: left 35, right 80)

Blocks of dilatation and erosion
Even after an ideal threshold, the information about changed pixels will be insufficient to locate the moving object as a whole. To overcome this, several morphological transformations are used [3], [5]. The goal can be reached by their appropriate combination and properly set structural elements. All pixels of a moving object will be then compact. The modified binary image matches the moving object. In this state, there is no problem to find the object (Figure 6).
Block of moving object detection
Using mentioned modifications we can locate moving objects by finding their borders after the erosion step. The application gains data about the binary object and stores them. Based on the saved data as well, we can detect and display the moving object in actual frame to demonstrate this way the process we described.
The visual location of an object is done by a function drawing a rectangle around it (Figure 7). There are some limitations on accuracy according to the speed limits and refresh rate.

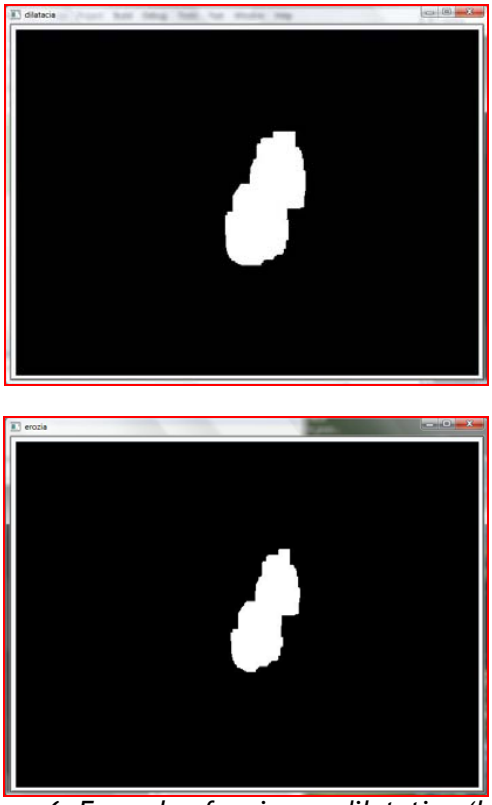

Figure 6. Example of an image dilatation (left) followed by erosion (right)

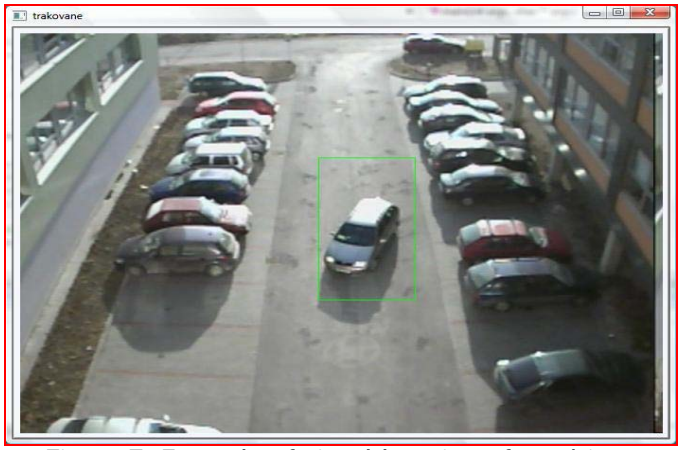

Figure 7. Example of visual location of an object

Evaluation of parking place occupancy

If required data for evaluation of occupancy are available (detected motion of an object in ROI1 and colour information from ROI2), the application is driven by the algorithm of evaluating changes of parking place occupancy (Figure 8.).

CONCLUSION

There was proposed an algorithm for evaluation of parking place occupancy by joining two methods of object detection. The algorithm is resistant to influence of weather conditions and walking pedestrians on car park. It is based on attributes of objects (speed and size of vehicles) that need to be detected. The functionality of the application was proved at the car park of university (Figure 9, 10). The proper evaluation of parking place occupancy was only influenced by vehicles moving too fast.

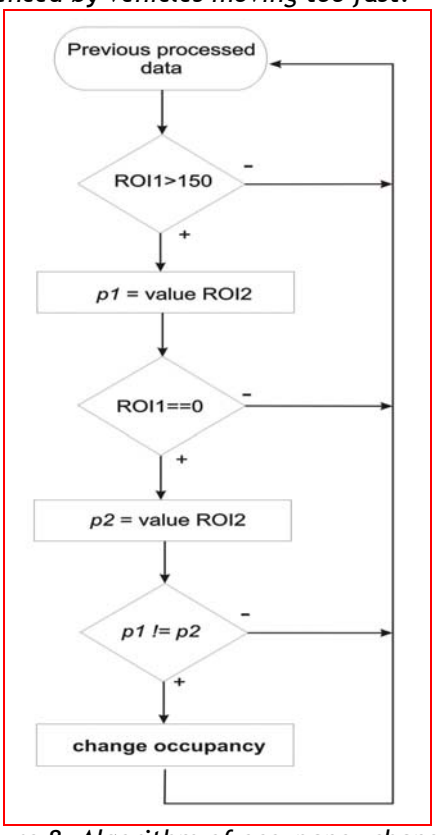

Figure 8. Algorithm of occupancy changes

Figure 9. Filling of parking places

Figure 10. Freeing of parking places

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USE OF E-LEARNING AND VIRTUAL LABORATORY TO AUTOMATION TEACHING

ABSTRACT:
In this paper is described the main ideas of national project "KEGA 3/7131/09 - Laboratory of production system program control". This project is focused to build of virtual laboratory and supplemental e-learning documents for several studying subject at our institute. This virtual laboratory serve for teaching automatic control principles and programming in flexible production via various control modes often used in the technical practice. In this laboratory there are applied real elements of control systems. By means of these laboratory students as future graduates of technical university can acquire and improve occupational competences demanded by actual labor market.

KEYWORDS:
virtual laboratory, e-learning, production system, automation

INTRODUCTION

Within the grant project KEGA being solved in the Institute of Production Systems and Applied Mechanics, STU Bratislava, in years 2009-2011, we endeavor to acquire and improve abilities and skills which employers expect graduates of technical universities to have in present circumstances.
Intent of this project is to create a laboratory for program control of production systems by pneumatics and a suitable teaching system supporting key and occupational competencies, abilities and skills of technical university students which at the same time would reveal strong point's and weak spots of their preparation for practice. In this paper we wish to present targets of this grant mission and its expected merit.
To achieve project goals it is necessary to revise curriculum and to use such teaching forms and methods that enable to exceed the scope of cognitive knowledge of scientific disciplines and professions that means to develop key competencies of students. These gain extraordinary significance not only for the personal development but also in term of lifelong education and employability of technical university graduates.
The present time brings along the need of superior education providing for:

- *Ability to make decisions,*
- *Solve problems,*
- *Work with information,*
- *Ability to learn - lifelong education,*
- *Computer literacy,*
- *Communicative skills even in foreign languages,*
- *Self-activity and self-responsibility*

Rapid changes put higher and higher demands on people nowadays. Obtained professional knowledge is out of date after a shorter and shorter time. Professional knowledge includes areas of „general basic knowledge and knowledge specific for particular major".
This one is usually obtained cognitively and stored in the left brain hemisphere. However, in the area of electronics and technology, changes will be more frequent.
Key competencies should help us deal with professional knowledge with aim to solve the problems. Competencies with focus on one particular situation are quickly out of date or totally useless.
„Key competencies have longer lifetime than professional qualification. That's why these are the basis for the next learning".
Key competencies can be understood as a complex of universal abilities exceeding the boundaries of specific professional knowledge and abilities. They express abilities of people to behave adequately to a specific situation.
Working in virtual laboratory will develop and strengthen computer literacy, so important on the present and even more important in future as we presume and last but not least will absolutely support acquisition of other key and occupational competencies of our university graduates.

Graduates will acquire the needed skills, experience and knowledge of production system controlling design methodology. They can simulate functions of designed devices. For simulation specialized software will be installed on our intranet. By this software we can supervise every part of the designed control system. This control system includes only real industrial parts (PLC, stepper driver, servo driver, sensors, etc.).
By object-lessons and connection with practice we want to increase value of our graduates at the labour market.

PROJECT TARGET AND IMPLEMENTATION

The Project target includes building of virtual laboratory for program control systems. That laboratory is instrumental to teaching architecture principles of pneumatic and electro-pneumatic and program control systems and to verification of these systems´ functions by simulations.
Students gain experience of working with real industrial parts and the learning process is more effective. The goal is to make the pedagogical process more attractive for students in several studying subjects e.g.:

- *Automation and mechanization,*
- *Theory of automates,*
- *Production systems,*
- *Production systems operation,*
- *Production and manipulation devices programming,*

Students learning in this planned laboratory will acquire necessary skills and will acquaint themselves with generation methodology of several systems (pneumatic, electro-pneumatic, and electric ones) what will markedly increase their value at the labour market. The Fig. 1 presents the mentioned virtual laboratory.

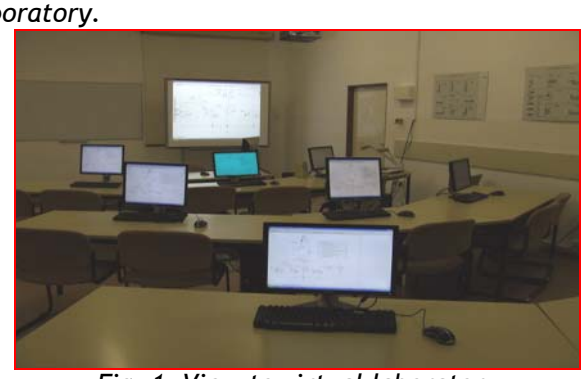

Fig. 1: View to virtual laboratory

Creation of virtual pneumatic or electro-pneumatic program control systems requires both individual work and decision making and cooperation including discussion on simulation of the proposed control circuit (Fig. 2).
By this laboratory students will obtain an opportunity to prepare assignments and projects of various subjects applying pneumatic and electro-pneumatic control systems and get ready for the real problem solving in practice. Thereby they also get a practice so important for employers. It widely develops and strengthens their technical occupational competencies and also their key competencies.

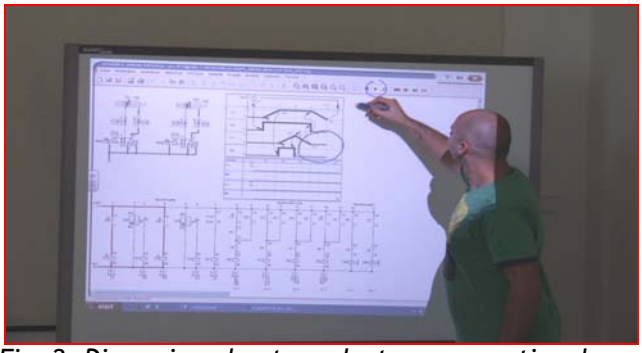

Fig. 2: Discussion about an electro-pneumatic scheme

Within the project there will be developed study e-learning materials (manuals, methods, examples,...) and made available on Internet which will enable effective working in the laboratory and serve as a basis for further development of knowledge and skills of our students.

E-LEARNING

Traditional learning design is indicative of the learning field's reluctance to change. In spite of advances in neuroscience, collaborative technology, and globalized business climate, learning is still largely based on design theories created during the early 1900's to 1960's. The environment in which we are immersed has changed. Media and technology has changed. The social environment has been altered. The world has become networked and connected. In this environment of colossal change, the design methodologies used to foster learning remain strangely outdated - created for a time and need which no longer exist. Learning Development Cycle (LDC) is a learning design model to bridge the gap between design approaches and knowledge needs of academic and corporate learners.
Much of LDC is rooted in more traditional design structures. We are currently still in the beginning stages of societal and technological alterations. The model is intended to simply open doors to new design approaches, while maintaining aspects from previous models that still serve learners. More developed (connectivist-centric models) will be required as we move forward. LDC is a transitory design approach, bridging traditional design and beginning to embrace internet-era design.
Different types of learning exist. Learning happens in a variety of ways - from courses, conversations, life experiences, personal thought, or working on a project. Each different type of learning requires a different design process (as the object of the design differs depending on learning type). LDC presents four broad learning categories: transmission, acquisition, emergence, and accretion. These categories will be discussed in greater detail in this paper.
Learning today has moved beyond courses (courses serve a static knowledge field). As a result, course-based ID is not as useful for designing alternative modes of learning. The more rapidly knowledge and information climates change, the greater the need for responsive dynamic models.
E-Learning - phenomena of education of the 21st century. It is astounding by its extensiveness, attracts

by huge amounts of technical resources, and affects nearly all areas of human gnosis. The reason is time and change velocity in daily life of all of us. One option is to apply electronic education - e-Learning in our lifelong education. Education is one of the most important life priorities for us but also for the modern society.

Electronic learning or e-learning (sometimes written as elearning) has various definitions. E-learning is facilitated and supported via information and communications technology (ICT).

The American Society for Training and Development (ASTD) defines e-learning as a broad set of applications and processes which include web-based learning, computer-based learning, virtual classrooms, and digital. Much of this is delivered via the Internet, intranets, audio- and videotape, satellite broadcast, interactive TV, and CD-ROM. The definition of e-learning varies depending on the organization and how it is used but basically it is involves electronic means of communication, education, and training.

Many terms have been used to define e-learning in the past. For example web-based training, computer-based training or web-based learning, and online learning are a few synonymous terms that have over the last few years been labelled as e-learning. Each of this implies a "just-in-time" instructional and learning approach.

Regardless of the definition you chose to use, designers, developers, and implementers make or break the instructional courses and tools. E-learning is simply a medium for delivering learning and like any other medium, it has its advantages and disadvantages. E-learning covers a wide array of activities from supported learning, to blended or hybrid learning (the combination of traditional and e-learning practices), to learning that occurs 100% online. Sound e-learning is founded on instructional design principles, pedagogical elements that take into account learning theories. Given its nature, online distance education is well matched with e-learning and flexible learning but is also used for in-class teaching and blended learning.

E-LEARNING IN VIRTUAL LABORATORY

If we look at e-learning as at efficient utilization of information technologies in educational process then it actually means new opportunities that can be used in education.

E-learning is a solution designed for education, however education conceived in full context. It is not limited to education of students only but is in a broad sense a method of information sharing and passing within lifelong education that is a necessity especially for technicians.

In contrast to classical information systems dealing especially with information sharing and a possibility to find information necessary in proper time; e-learning lays a big stress on method of representation. Nowadays it is not enough only to acquire correct information in due time but it also is necessary to understand it fully and see it in context. And just e-learning supports these abilities.

E-education as a progressive teaching form opens many new opportunities. This form can be used in all formal education grades and also in lifelong education

E-Learning effectively measures every course by means of testing objects and control systems. It enables to set up desired goals without prejudice (e.g. student must answer correctly to test questions verifying his/her actual knowledge of studied subject after taking in the course). E-Learning gives immediately available information on individual students, how many points they achieved, how much time they spent in individual course parts, how they answered questions. Equally simply E-Learning evaluates statistically fruitfulness of individual courses and thereby identifies courses to be revised. Likewise E-Learning brings new forms of communication and cooperation among students and between students and lectors which would be inconceivable without using information technologies.

E-Learning turns teaching into an addressed, individual, interactive and interesting process integrated with daily life of students.

E-learning means a process which describes and solves creation, distribution, managing and feedback realization of the pedagogical process by computers and network. These applications contain simulations, multimedia, combinations of text and graphics, audio, video and electronically testing of students. Every student can choose individual form of study that is suitable for him. E-learning is a high quality extension of existing possibilities of study.

The virtual laboratory applies a combination of classical way of teaching and e-Learning courses.

E-Learning turns teaching into an addressed, individual, interactive and interesting process integrated with daily life of students.

For working in the virtual laboratory of pneumatics and electro-pneumatics we use software environment FluidSIM that is one of many software enabling to set up various pneumatic and electro-pneumatic control circuits as well as to verify their function by simulation of these control circuits. Fig. 3

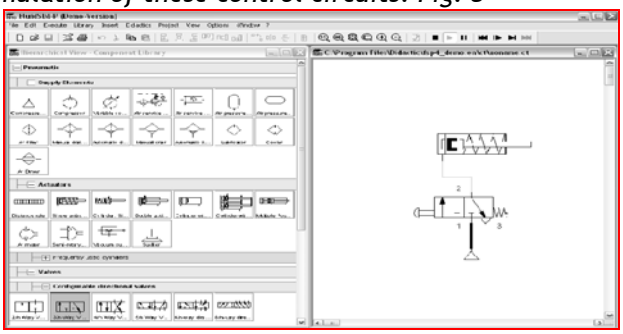

Fig. 3: FluidSIM workbench

Software FluidSIM was compiled by the company FESTO and serves the purpose of control simulation of pneumatic and electro-pneumatic circuits.

Step by step students learn creation principle of pneumatic and electro-pneumatic control circuits by means of e-Learning materials and with participation

of a lector. On the basis of e-Learning courses they pass step by step through creation principles of control circuits at first, thereafter through verification by simulation of control circuit function. Control circuit diagram can be seen in Fig. 4.

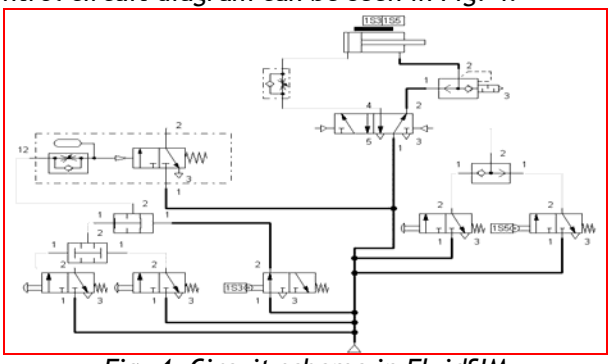

Fig. 4: Circuit scheme in FluidSIM

Work of students in the virtual laboratory is a part of e-Learning courses where they can create their own pneumatic and electro-pneumatic control circuits for control of specific equipment and thereafter verify its reliable function via simulation.

CONCLUSIONS

We have "learning centers" and "training departments" - treating learning as if it were a compartment or corporate activity in which we sometimes engage, rather than a constant, ongoing process - a thread through the fabric of daily activities. Learning is a thread that runs through all of life. We do not belong only in corporate training rooms. The act of learning is ongoing and constant.

An organization's ability to adapt is important to ongoing survival (even innovation, if you will). But the adaptation must be of a particular type. It must be progressive, ongoing, punctuated with periodic bursts (the transformation), but many about a progressive, but not overly reactionary trends to what is going on in the larger learning landscape. Few organizations will be positioned to adopt wholesales the ideas I've presented. To do so would damage many elements of the system continuing to work well. But to survive, all organizations need to embrace experimentation - an ongoing "blood in the corporate veins" type of experimentation. Policy-induced change can be effective, but most often, if we follow the lessons of evolving organisms, developing corporate competence progressively is the best approach for long-term sustained change.

The needs of continual learning, often tightly linked to work, required a new approach and model. LDC has been designed to create an alternative, less-linear view of learning. Learning is the intent of any development activity - communities, courses, networks, or ecology. Selecting the most appropriate design approach will assure greater a more positive and valuable experience for the learner.

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International Conference "MANAGEMENT OF TECHNOLOGY - STEP TO SUSTAINABLE PRODUCTION" (MOTSP 2011),

8-10 June 2011, Bol, Island Brac, CROATIA

INVITATION

INTERNATIONAL CONFERENCE "MANAGEMENT OF TECHNOLOGY - STEP TO SUSTAINABLE PRODUCTION" (MOTSP 2011), will take place from 8-10 June 2011, Bol, Island Brac as a joint project organized by the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, Faculty of Graphical Arts, Croatia, Faculty of Management, University of Primorska, Koper and University of Maribor, Faculty of Mechanical Engineering, Slovenia.

The main objective of this International Conference (MOTSP 2011) is to gather international experts from academic entities, research laboratories and industries related to the field of Management of Technology and Sustainable Production. The Conference will also provide a platform for sharing knowledge, ideas and results between science and industry. The management of technology, the stimulation of innovation and invention and the transfer of technology are considered important challenges of the developed countries and countries in transition.

MAIN TOPICS

- MANAGEMENT OF TECHNOLOGY
- PRODUCTION, OPERATION MANAGEMENT
- STRATEGIC, ENGINEERING MANAGEMENT,
- INDUSTRIAL ENGINEERING
  - OPERATIONAL RESEARCH
  - LOGISTICS
  - PRODUCTION ECONOMICS
  - DECISION AND RISK ANALYSIS
  - MANUFACTURING COSTS
  - SUPPLY CHAIN MANAGEMENT, TOTAL QUALITY MANAGEMENT
  - FORECASTING, TECHNOLOGY FORESIGHT
  - BUSINESS INTELLIGENCE
  - MAINTENANCE, ETC
- RAPID PROTOTYPING AND MANUFACTURING
- COMPUTER INTEGRATED MANUFACTURING CAD, CAM, CAPP, CAQ,.
- ARTIFICIAL INTELLIGENCE
- TOTAL COST ASSESSMENT
- SUSTAINABLE PRODUCTION
  - PRODUCT LIFECYCLE MANAGEMENT (PLM)
  - GREEN PRODUCTION (BAT)
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  - LCM (LIFE CYCLE MANAGEMENT) & DECISION SUPPORTS
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Deadline for abstract submission: January 31st, 2011
Submission of paper titles and abstracts (up to 100 words) using abstract submission form at motsp2011.info
Notification of acceptance of abstracts: February 10th, 2011
Final submission of full papers: March 15th, 2011
Notification of the acceptance of full papers: April 15th, 2011.

Presentation

Presentations should take 15 minutes. The authors will have the possibility of using computers for the presentations (Power Point).All the accepted papers will be published in the Conference Proceedings to be distributed during the Conference. According to the Scientific Committee recommendations, the authors of the selected papers will be invited to extend their papers for publication in the following journals (some of them are included in databases CC, SCI, SCI - Expanded):

- Strojarstvo, Journal for Theory and Application in Mechanical Engineering (Current Contens)
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4TH INTERNATIONAL CONFERENCE FOR ENTREPRENEURSHIP, INNOVATION AND REGIONAL DEVELOPMENT
From Entrepreneurial Learning to Innovation and Regional Development
5 – 7 May 2011
Ohrid, MACEDONIA

OBJECTIVE OF THE CONFERENCE

The objective of the conference is to gather together decision makers (government, ministries and state agencies), innovation experts (universities, research and development centers, technology transfer centers, start-up centers) and practitioners (SMEs, business incubators and business support organizations) to generate discussion and exchange on the potential of entrepreneurship promotion and innovation to national and regional competitiveness.

ORGANIZER & PATRONS

- *National Centre for Innovation and Entrepreneurial Learning - www.ncdiel.mk*
- *European Academy of Sciences and Arts - www.euro-acad.eu*
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The International Conference for Entrepreneurship, Innovation and Regional Development (ICEIRD) Consortium was formally established in 2008. It is a multi - disciplinary and cross-sectoral network crossing several streams of theory and practice, namely entrepreneurship, innovation, regional economic development and information systems. The ICEIRD Consortium was set-up with members from institutions jointly researching and collaborating in strategising/organising the annual ICEIRD conference and managing joint projects focused on the theory, policy and practice of entrepreneurship and innovation in particular as it pertains to information technologies.

One of the higher concern features of the so-called European Innovation Paradox is the divide between academic research and policy-making, between thinkers and doers. The ICEIRD can become an authoritative reference in bridging this gap by developing analysis in the field of innovation and regional policy, based on high-level academic research, but without neglecting the lessons learnt by policy makers and professionals in the field. Thus establishing experiential feedback learning loops and cross fertilization among two communities which have lived too far away from each other for far too long, and in the European Union in particular.

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- *Corporate entrepreneurship / intrapreneurship*
- *Entrepreneurial Finance and Venture Capital*
- *Entrepreneurial Process: From Creation to Growth*
- *Entrepreneurial university and the role of universities*
- *International Entrepreneurship*
- *Linking Intellectual Capital, Strategy and Entrepreneurship*
- *Models of Entrepreneurial learning at all levels of education*
- *Technological entrepreneurship, social entrepreneurship, green entrepreneurship*
- *Young and Female entrepreneurship*
- *Global Entrepreneurship Monitor (GEM) related experiences*

Innovation: as the driver of national, regional and global economy

- *Develop the enabling environment for innovative entrepreneurship*
- *National and regional policies on entrepreneurship and innovation*
- *Green Innovation*
- *Human Resource Practices for promoting innovation for SMEs*
- *Innovation training & education*
- *Innovative processes and models (SCM, ERP, BPR, e-business models, …)*
- *Intellectual Property Management in Higher Education and Research Institutions*
- *Intellectual property rights*
- *International cooperation and national innovation policies to face global challenges*
- *Methods and tools for innovation*
- *Open innovation strategies and models from universities and research centers*
- *The conditions for developing sustainable systems of innovation*
- *European Innovation Scoreboard (EIS) related experiences*

Regional development: and the possibilities and barriers for closer cooperation between South East European economies, EU and beyond

- *Cross-border cooperation – best practices towards regional development*
- *Entrepreneurship and Regional Open Innovation Systems*
- *ICT and Regional competitiveness*
- *Intelligent regions*
- *Networks and clusters of innovation*
- *Regional competitiveness and development*
- *Support infrastructure for entrepreneurial ventures and business incubation*
- *Territorial cooperation as a driver of regional growth*
- *The benefit of knowledge zones, business start-up centers and incubators in the region*

DEADLINES & SUBMISSION INFORMATIONS

Submission of papers: 20 February 2011
Submission of camera ready full papers: 20 March 2011
Early registration: Before 20 March 2011
Registration: After 20 March 2011
Conference dates: 5-7 May 2011

CORESPONDENCE ADDRESS

NATIONAL CENTRE FOR DEVELOPMENT OF INNOVATION AND ENTREPRENEURIAL LEARNING, FACULTY OF MECHANICAL ENGINEERING
Karpos II bb., POBox 464, 1000 Skopje, MACEDONIA
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www.ncdiel.mk, www.iceird.org

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
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8th INTERNATIONAL CONGRESS "MACHINES, TECHNOLOGIES, MATERIALS"

Topic: „Innovative Solutions for Product and Process Development"

18 – 21.09.2011

Varna, BULGARIA

ORGANIZERS & CO-ORGANIZERS

- SCIENTIFIC-TECHNICAL UNION OF MECHANICAL ENGINEERING BULGARIA
- FEDERATION OF THE SCIENTIFIC-TECHNICAL UNIONS IN BULGARIA
- TECHNICAL UNIVERSITY – SOFIA
- TECHNICAL UNIVERSITY - VARNA
- RUSE UNIVERSITY „ANGEL KANCHEV"
- TECHNICAL UNIVERSITY - GABROVO
- TODOR KABLESHKOV UNIVERSITY OF TRANSPORT, BULGARIA
- ASSOCIATION OF POLISH MECHANICAL ENGINEERS AND TECHNICIANS – POLAND

with the support of:

1. *NATIONAL SCIENTIFIC -TECHNICAL SOCIETIES:*

- SOCIETY OF FOUNDRY
- METAL SCIENCE AND HEAT TREATMENT SOCIETY
- AUTOMATION OF DISCRETE PRODUCTION SOCIETY
- BULGARIAN SOCIETY OF NON-DESTRUCTIVE TESTING
- GEAR TRANSMISSIONS AND DRIVING SOCIETY
- PLASTIC DEFORMATION SOCIETY
- PLASTICS IN MECHANICAL ENGINEERING SOCIETY
- SOCIETY OF POWDER METALLURGY AND COMPOSITE MATERIALS
- MANAGEMENT AND ENGINEERING SOCIETY
- ERGONOMICS AND INDUSTRIAL DESIGN

2. BULGARIAN WELDING SOCIETY
3. BULGARIAN SOCIETY OF ROBOTICS AND MECHATRONICS
4. BULGARIAN SOCIETY OF TRIBOLOGY

INVITATION

The Eight International Congress "MACHINES, TECHNOLOGIES, MATERIALS '11 - INNOVATIONS FOR THE INDUSTRY" will be carried out on 18th – 21st September, 2011 in the resort "St. St. Konstantin and Elena", region Varna, as a comprehensive scientific-technical manifestation, which includes three main topics and five special congress sub-sections: GEAR TRANSMISSIONS, ERGONOMIC AND ENGINEERING DESIGN, BULTRIB, INDUSTRIAL INFORMATIC, NANOMATERIALS

We invite scientists and researchers to present to their colleagues and to the industry representatives the results of their researches and to publish them in the web-based International scientific-technical journal "MACHINES, TECHNOLOGIES, MATERIALS", which is issued in print and on CD.

We invite the companies to take part with their presentations in the congress meetings and with advertisement in the congress materials to present their machines, equipment, technologies, materials and services, which are currently on the market.

We hope that in this way the Congress will become a bigger innovation mediator between scientific research and industry and we offer you to take advantage of this opportunity.

The pre-congress program for the weekend before the opening of MTM'11 will give you the possibility to rest, to have fun and to learn about landmarks, cultural and historical sightseeing on the north coast of the Black Sea.

MAIN TOPICS

MACHINES:

KINDS: *Treatment Machines; Machining Machines, Processing Machines, Connecting Machines, Casting Machines, Packaging Machines, Driving Machines, Transporting Machines, Manipulation Machines, Automation Machines,Measurement and Testing Machines.*

TOOLS AND MEASUREMENT DEVICES STORAGE. TRAINING.

ACTIVITIES: *Designing and Construction. Rapid Prototyping. Manufacturing. Research and Testing. Repair, Operation and Maintenance. Recycling and Utilization. Life Cycle Engineering. Re-Engineering. Training.*

Special Sub-Congress Sections:

1. GEAR TRANSMISSIONS 2011

2. ERGONOMIC AND ENGINEERING DESIGN 2011

TECHNOLOGIES:

COLD AND HOT SHAPEFORMING: Metal Casting, Plastic Deformation, Welding, Soldering and Adhesive Bonding, Machining. SURFACE TECHNOLOGIES. SURFACE TREATMENT. SURFACE MACHINING. CHANGING OF PROPERTIES. TESTING, MEASUREMENT AND CONTROL. AUTOMATION. INFORMATION TECHNOLOGIES. LOGISTIC. LOAD TRATEMENT. MANAGEMENT ENGINEERING. INDUSTRIAL DESIGN. ENERGY SAVING AND ENVIRONMENT FRIENDLY TECHNOLOGIES. TRAINING

Special Sub-Congress Sections:

1. BULTRIB 2011

2. INDUSTRIAL INFORMATIC 2011

MATERIALS:

KINDS: Metal Materials, Non-Metal Materials, Tool Materials, Structural Materials, Accessory Material.

MATERIALS SCIENCE. TRAINING

Special Sub-Congress Section: NANOMATERIALS 2011

IMPORTANT TERMS

Sending the abstract of the paper and Author's Response Form "A" or online registration should be sent: ***28.02.2011***

Confirmation of the paper receiving: ***31.03.2011***

The full text of the papers, payments and Participation Form "B" or online registration should be sent: ***30.04.2011***

Announcement of the plenary and sectional session's program on our web page: www.mech-ing.com/mtm: ***31.07.2011***

The Organizing Committee will receive posters up to: ***01.09.2011***

Receiving of the application for transfer and Pre Congress Program: ***01.09.2011***

Registration of the participants: ***19.09.2011***

Opening of the congress: ***20.09.2011***

REGISTRATION

Online registration *and the whole information about Honorary Committee, International Program Committee, National Organizing Committee, instructions for making papers and posters, fees, payments, visas and transfers on:* ***http://www.mech-ing.com/mtm/index.html***

For participants in the Congress and accompanying persons for the weekend before the opening of ***MTM'11*** *will give you the possibility to rest, to have fun and to learn about landmarks, cultural and historical sightseeing on the north coast of the Black Sea. You can find more information about the Pre-Congress Program here:* ***Pre-CP1, Pre-CP2, Pre-CP3***

PUBLICATION

- *Detached issue of the web based International Scientific-Technical Journal* ***"MACHINES, TECHNOLOGIES, MATERIALS"*** *(ISSN 1313-0226).*
- *In* ***CD****, containing all papers.*

CORRESPONDENCE ADDRESS

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tel./fax (+359 2) 986 22 40, tel. (+359 2) 987 72 90
nts-bg@mech-ing.com , www.mech-ing.com/mtm

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RIM 2011

8TH INTERNATIONAL SCIENTIFIC CONFERENCE ON PRODUCTION ENGINEERING
DEVELOPMENT AND MODERNIZATION OF PRODUCTION
September 26th – 30th
Praha, CZECH REPUBLIC

ORGANIZERS

FACULTY OF TECHNICAL ENGINEERING FROM BIHAC, and
SOCIETY FOR ROBOTIC OF BOSNIA AND HERZEGOVINA

ORGANIZING BOARD

D.Sc. ISAK KARABEGOVIĆ, PRESIDENT
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D.Sc. DARKO UJEVIĆ

THEMATICALLY AREAS

A. RESEARCH AND DEVELOPMENT OF MECHANICAL ENGINEERING PRODUCTION SYSTEMS AND TECHNOLOGIES

MACHINING, NONCONVENTIONAL MACHINING, TOOLS, RAPID PROTOTYPING, MANUFACTURING PROCESSES, WELDING PROCESSES, PLASTIC FORMING PROCESSES, MATERIALS, CAP TECHNOLOGIES, CIM, ENGINEERING OF POLYMERS, POWDER METALLURGY, MEASURING, THIN & THICK COATINGS, SURFACE ENGINEERING, MOLDING PROCESSES, CAM TECHNOLOGIES

B. RESEARCH AND DEVELOPMENT OF WOOD - INDUSTRY PROCESSING

WOOD PRODUCTS, WOODWORKING, WOOD INDUSTRY, PROCESSES, FURNITURE AND FURNITURE COMPONENTS, MANUFACTURING, WOOD MATERIALS, ENGINEERED WOOD, VENEERS, LUMBER

C. TECHNOLOGIES AND TECHNIQUES IN ELECTRICAL ENGINEERING AND ELECTRONICS

MODERN DEVELOPMENTS, TOOLS, POWER, CONTROL, MICROELECTRONICS, TELECOMUNICATIONS, COMPUTERS, ELECTRICAL ENGINEERING, POWER SYSTEMS, ENERGETICS, HARDWARE AND SOFTWARE, SIGNAL PROCESSING, NETWORKING, NEURAL NETWORK, ARTIFICIAL INTELLIGENCE

D. ENGINEERING IN CONSTRUCTION INDUSTRY AND INDUSTRY OF CONSTRUCTION MATERIALS

BUILDING CONSTRUCTION, MATERIALS, MACHINES, INDUSTRIAL CONSTRUCTION, HEAVY AND CIVIL CONSTRUCTION, CONSTRUCTION PROCESSES, EXPERTISES, PROCUREMENTS, DESIGN AND BUILD, ENVIRONMENTAL ENGINEERING, MUNICIPAL ENGINEERING

E. MODERN TECHNIQUES AND TECHNOLOGIES IN TEXTILE AND GARMENT INDUSTRY

ADVANCEMENT IN GARMENT MANUFACTURING, DEVELOPMENT IN TEXTILE MACHINERY, FIBRE PHYSICS AND TEXTILE MECHANICS, NANOTEXTILES, TEXTILE DESIGN AND FASHION, MODELLING AND SIMULATION, MANUFACTURING, MATERIALS

F. HIGH TECHNOLOGIES OF WIDE APPLICABILITY

INDUSTRIAL ROBOTS, MICROROBOTICS, PROGRAMMING, SIMULATION, VIRTUAL MANUFACTURING, AUTOMATION, AEROSPACE TECHNOLOGIES, NANOTECHNOLOGY, NUCLEAR PHYSICS

G. MANAGEMENT, ENTREPRENEURSHIP, ECONOMIC DEVELOPMENT.

KNOWLEDGE MANAGEMENT, PROJECT MANAGEMENT, PRODUCTION MANAGEMENT SYSTEMS

H. QUALITY MANAGEMENT, MANAGEMENT OF HUMAN AND NATURE RESOURCES, VIABLE DEVELOPMENT

QUALITY MANAGEMENT, TQM, MAINTENANCE, QUALITY IMPROVEMENT, QUALITY STANDARDS, QUALITY TERMS

IMPORTANT TERMS

- *Submission of partipacion .....February 1th 2011.*
- *Submission of abstracts and full papers .....May 1th 2011.*
- *Registration fee payment.....June 1th 2011.*
- *Final Programme .....September 1th 2011.*
- *RIM 2011 .....September 26th - 30th 2011.*

CORRESPONDENCE ADDRESS

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The 7th International Scientific Conference
RESEARCH AND DEVELOPMENT OF MECHANICAL ELEMENTS AND SYSTEMS
IRMES 2011
April 27th - 28th, 2011
Zlatibor, REPUBLIC OF SERBIA

CONFERENCE PURPOSE

New technologies, globalization and individualization of customer demands, as well as high quality of modern products, are forcing industrial enterprises to improve their processes of product development. This implies the support of enterprise processes throughout the product lifecycle, from the product idea through product development, manufacturing, improvement and quality assurance to maintenance during operation. Processes of product development are more than just usual engineering. A product portfolio must be analyzed and product concept must be examined from the aspect of its realization. This requires linking internal domain with external teams. New products must be introduced to market with high quality and low development costs.

The prerequisite for development of high quality products and high productivity manufacturing is to master the knowledge, which is a result of research in science and technology.

Satisfaction and success of a development engineer is reflected primarily in discovering and designing new construction solutions, despite numerous constraints and problems, and in experiencing the seamless operation and high market penetration of the products being developed.

The aim of the Conference is:

- *to gather experts and researchers in the field of scientific research and industrial product development;*
- *to present new design solutions related to energy efficiency, application of available resources, product price reduction,*
- *to exchange knowledge and experience, through presentations of research results and expert information, with the aim of stimulating industrial activities in the region.*

CONFERENCE PRESIDENT

Prof. Dr.-Ing. Vojislav Miltenović, Full professor, Department for mechanical constructions, development and engineering, Mechanical Engineering Faculty, University of Niš, Serbia

SCIENTIFIC BOARD

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ORGANIZATIONAL BOARD

TOPICS

1. *DEVELOPMENT OF MECHANICAL SYSTEMS AND COMPONENTS*
2. *INDUSTRIAL AND ECO-DESIGN*
3. *CAD AND EXPERT SYSTEMS*
4. *MODELING AND SIMULATION*
5. *MECHANICAL LOADS AND STRESS CONDITIONS*
6. *SAFETY, QUALITY AND RELIABILITY*
7. *MODERN MATERIALS, THERMAL TREATMENT, COATINGS AND FRACTURE*
8. *TRIBOLOGY*
9. *NOISE AND VIBRATIONS IN MECHANICAL SYSTEMS*
10. *TESTING OF MECHANICAL SYSTEMS*
11. *MONITORING AND MAINTENANCE OF MECHANICAL SYSTEMS*
12. *TRANSMISSION OF POWER AND MOTION (GEARS, SHAFTS, BEARINGS, COUPLINGS, ...)*
13. *MECHANICAL JOINTS (BOLTED, SLOTTED, HINGES, WELDED, PRESS FIT, ...)*
14. *MECHANICAL ELEMENTS FOR FLUIDS (VESSELS, PIPE CLOSURES, PISTON PAIRS, ...)*
15. *EDUCATION OF DEVELOPMENT ENGINEERS*

IMPORTANT TERMS

Submission of abstracts: 31.12.2010
Notification of acceptance: 15.01.2011
Submission of full text paper: 15.03.2011
The conference languages are English and German. Translation will not be available.

CORRESPONDENCE ADDRESS

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11th INTERNATIONAL MULTIDISCIPLINARY SCIENTIFIC GEO - CONFERENCE & EXPO SGEM 2011

MODERN MANAGEMENT OF MINE PRODUCING, GEOLOGY AND ENVIRONMENTAL PROTECTION

19.06.2011 - 25.06.2011

Congress Centre "Flamingo Grand", Albena Resort, BULGARIA

ORGANIZERS & CO-ORGANIZERS

under the auspices of MINISTRY OF ENVIRONMENT AND WATER
BULGARIAN ACADEMY OF SCIENCES
ACADEMY OF SCIENCES OF THE CZECH REPUBLIC
LATVIAN ACADEMY OF SCIENCES
POLISH ACADEMY OF SCIENCES
RUSSIAN ACADEMY OF SCIENCES
SERBIAN ACADEMY OF SCIENCES AND ARTS
SLOVAK ACADEMY OF SCIENCES
NATIONAL ACADEMY OF SCIENCES OF UKRAINE
ACADEMY OF SCIENCES OF IR IRAN
&
BULGARIAN INDUSTRIAL ASSOCIATION

CO-ORGANIZERS

BEYKENT UNIVERSITY, TURKEY
FACULTY OF MINING AND GEOLOGY, SERBIA
ILLINOIS STATE GEOLOGICAL SURVEY DIVISION, GEOLOGIC MAPPING AND HYDROGEOLOGY CENTER, USA
ISTANBUL KULTUR UNIVERSITY, TURKEY
ISTANBUL UNIVERSITY, TURKEY
G. TSULUKIDZE MINING INSTITUTE, GEORGIA
NATIONAL TECHNICAL UNIVERSITY OF ATHENS, GREECE
NETHERLANDS INSTITUTE OF ECOLOGY, CENTRE FOR TERRESTRIAL ECOLOGY, NETHERLANDS
OKAN UNIVERSITY, TURKEY
SELCUK UNIVERSITY, TURKEY
SOUTH-WEST UNIVERSITY "NEOFIT RILSKI", BULGARIA
UNIVERSITY "PROF. DR. ASEN ZLATAROV"- BURGAS, BULGARIA
UNIVERSITY OF ARCHITECTURE, CIVIL ENGINEERING AND GEODESY, FACULTY OF GEODESY, BULGARIA
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN, INSTITUTE OF NATURAL RESOURCE SUSTAINABILITY, USA
UNIVERSITY OF CHEMICAL TECHNOLOGY AND METALLURGY, BULGARIA

AIM & SCOPE

International Multidisciplinary Scientific GeoConference & EXPO – SGEM strengthened its position as one of the largest and successful geoscientific forums in Europe, with popularity exceeding the boundaries of the European Union. This exceptional success was achieved due to the efforts of all SGEM participants from 2001 to this day. They all created the best Scientific Conference in the European Union - SGEM by their scientific contribution, hearty selflessness and distinguished participation during the years.

We look forward to receiving your paper and hearing you presentation at the up-comming SGEM 2011 conference. Become a SGEM Lecturer, a Delegate or an Exhibitor!

We combine all geosciences connected to the ecological equilibrium of our Planet. Uniting our efforts and we established the largest International Multidisciplinary Scientific GeoConference & EXPO.

WE ARE ALL UNITED BY ONLY ONE CAUSE: The cause of a better, cleaner and more beautiful place, where our children will grow up. A place known as the Planet Earth.

The SGEM GeoConference focuses on the latest findings and technologies in surveying geology and mining, ecology, and management, in order to contribute to the sustainable use of natural resources. In this regards all theoretical, methodological and conceptual reports presenting contemporary geoscience development and problems solving ideas are expecting with a great interest. Special attention will be given to reports, proposing science based ideas for decision-making and adaptation to the new reality of global changes. All accepted papers will be published in a conference proceedings (ISBN-13: 978-954-91818-14) indexed by ISI Web of Knowledge, Web of Science.

SCIENTIFIC & REVIEW COMMITTEE

TOPICS

1. SECTION „GEOLOGY"
2. SECTION „HYDROGEOLOGY, ENGINEERING GEOLOGY AND GEOTECHNICS"
3. SECTION „EXPLORATION AND MINING"
4. SECTION „MINERAL PROCESSING"
5. SECTION „OIL AND GAS EXPLORATION"
6. SECTION „APPLIED AND ENVIRONMENTAL GEOPHYSICS"
7. SECTION „GEODESY AND MINE SURVEYING"
8. SECTION „PHOTOGRAMMETRY AND REMOTE SENSING"
9. SECTION „CARTOGRAPHY AND GIS"
10. SECTION „INFORMATICS"
11. SECTION „GEOINFORMATICS"
12. SECTION „MICRO AND NANO TECHNOLOGIES"
13. SECTION „HYDROLOGY AND WATER RESOURCES"
14. SECTION „MARINE AND OCEAN ECOSYSTEMS"
15. SECTION „FOREST ECOSYSTEMS"
16. SECTION „SOILS"
17. SECTION „AIR POLLUTION AND CLIMATE CHANGE"
18. SECTION „RENEWABLE ENERGY SOURCES AND CLEAN TECHNOLOGIES"
19. SECTION „NUCLEAR TECHNOLOGIES"
20. SECTION „ECOLOGY AND ENVIRONMENTAL PROTECTION"
21. SECTION „RECYCLING"
22. SECTION „ENVIRONMENTAL ECONOMICS"
23. SECTION „EDUCATION AND ACCREDITATION"
24. SECTION „ENVIRONMENTAL LEGISLATION, MULTILATERAL RELATIONS AND FUNDING OPPORTUNITIES"

IMPORTANT TERMS

Abstract Submission: 10 March 2011
Full paper Submission: 1 May 2011
Poster Submission: 20 May 2011
Registration and payment for participants WITH papers: 10 May 2011
LATE Registration and payment for participants WITH papers /you should pay registration fee +10% in addition, if NOT your paper/s will be excluded from the proceedings and the programme: 11 - 20 May 2011
Registration and payment for DELEGATES & other participants: 30 May 2011
LATE Registration and payment for DELEGATES & other participants /after that date you should pay registration fee +10% in addition: after 30 May 2011

CORRESPONDENCE ADDRESS

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URL: www.sgem.org

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XXV. microCAD INTERNATIONAL SCIENTIFIC CONFERENCE

31 March – 1 April 2011
Miskolc, HUNGARY

CONFERENCE PURPOSE

The primary aim of the conference is to give an opportunity to the Hungarian and foreign experts, researchers and PhD students to present their latest results in the accredited scientific fields of the University of Miskolc, as well as to meet, establish and cultivate personal and professional relations.

ORGANISED BY

UNIVERSITY OF MISKOLC, HUNGARY

TOPICS/SECTIONS

The conference will start with the plenary session at 10.00 a.m. on 31 March 2011, and will continue its work in the following sections:

Sections	Code
ENVIRONMENTAL AND ENERGY MANAGEMENT	A
EARTH SCIENCE AND ENGINEERING	B
METAL EXTRACTION, PROCESSING AND ENERGY UTILIZATION	C
FLUID AND HEAT ENGINEERING	D
APPLIED MECHANICS	E
MATHEMATICS AND COMPUTER SCIENCE	F
PHYSICS AND PHYSICS EDUCATION	G
AUTOMATION AND TELECOMMUNICATION	H
ELECTRICAL ENGINEERING	I
MACHINE AND CONSTRUCTION DESIGN	J
MATERIAL SCIENCE. MATERIAL PROCESSING TECHNOLOGIES	K
PRODUCTION ENGINEERING AND MANUFACTURING SYSTEMS	L
APPLIED INFORMATION ENGINEERING	M
MATERIAL FLOW SYSTEMS. LOGISTICAL INFORMATION TECHNOLOGY	N
LEGAL SCIENCE	O
ECONOMIC CHALLENGES IN THE 21ST CENTURY	P
HUMANITIES AND SOCIAL SCIENCES	Q
MEDICAL AND HEALTH SCIENCE	R

ANNOUNCEMENTS

With regard to the 25th jubilee anniversary, papers submitted to the conference will be reviewed and assessed. You are kindly requested to strictly keep to the application deadline.
Papers of the conference will be published in section proceedings. The format of the ready-for-print paper, as an example, can be downloaded from the website of the conference. The maximum length of the ready-for-print paper is 6 (A4) pages. One copy of the ready-for-print paper of the presentation shall be posted in printed form and shall also be sent electronically by uploading it at www.tuko.hu/microcad_upload.php in PDF format exclusively. No other formats are possible.
Papers can only be accepted for oral presentation. One participant can present maximum two papers.
Duration of presentations: max. 20 minutes (only oral presentations are accepted)

OFFICIAL LANGUAGE OF THE CONFERENCE

English and Hungarian (in case the presentation is given in Hungarian, digital projection in English is required)

ACCOMMODATION

Accommodation will be available in hotels of different categories in Miskolc-Tapolca (2,5 km far from Miskolc). More information will be available in the Confirmation Letter.

IMPORTANT TERMS

¨ Registration on-line, sending ready-for-print typescripts of papers:	05 January 2011
¨ Participants shall be informed about the acceptance of papers by:	02 February 2011
¨ Transferring the registration fee:	25 February 2011
¨ Programme booklet is available at the INTERNET:	05 March 2011
¨ The registration desk of the conference will be open on:	30-31 March – 1April 2011

CORRESPONDENCE ADDRESS

If you wish to present your results at the conference, please register on-line and send your presentation to the microCAD Organisational Committee to the following address:
University of Miskolc
Department of Researches Management and International Relations
H-3515 Miskolc Egyetemváros
e-mail: rekveres@uni-miskolc.hu

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European Society for Engineering Education
Europäische Gesellschaft für Ingenieur-Ausbildung
Société Européenne pour la Formation des Ingénieurs

INTERNATIONAL SYMPOSIUM ON DESIGN OF ENGINEERING CURRICULA: INNOVATION AND QUALITY

31st March - 2nd April 2011
Miskolc, HUNGARY

SCOPE AND FORMAT

Higher Education in Europe should face several challenges since the Bologna Declaration was signed in 1999. In response to the new situation, most of the Curricula have undergone substantial changes and new Degrees have appeared all over Europe. On the other hand, those changes have promoted a deeper interest on methodology, and particularly on learning oriented education and innovation.
Accreditation and quality assurance can hinder innovation both in contents and methods of curricula if they are not properly dealt. However, innovation is a must for achieving the best in engineering education programmes. This Symposium aims to analyze the balance between the introduction of innovative changes and the maintenance of high quality standards, as well as the discussion of good practice examples on this matter. The Symposium is mainly a discussion oriented meeting addressed to all those interested in actively participating in innovation processes in Engineering Education: administrators, students and teachers. There will be a limited number of invited introductory lectures in the plenary sessions, and additional discussion on papers dealing with the topics listed below. Experienced discussion leaders will structure with that material discussions in small groups. Official language will be English.

ORGANISED BY

UNIVERSITY OF MISKOLC
in collaboration with
SEFI Curriculum Development Working Group

MAIN TOPICS

The main topics to be discussed are:

- ACTIVE LEARNING. PROBLEMS AND PROJECT BASED LEARNING.
- EFFICIENCY OF E-LEARNING AND BLENDED EDUCATION IN EE.
- ASSESSMENT OF STUDENTS INVOLVED IN ACTIVE LEARNING ENVIRONMENTS.
- SCIENCE AND TECHNOLOGY INTEGRATION IN ENGINEERING CURRICULUM.
- ACCREDITATION AND QUALITY ASSURANCE IN CURRICULUM DESIGN.
- INNOVATION AND GOOD PRACTICE.
- IMPACT OF WORLD CRISIS ON ENGINEERING CURRICULA

PROGRAM COMMITTEE

- URBANO DOMÍNGUEZ GARRIDO (CHAIR), UNIVERSIDAD DE VALLADOLID.
- GABRIELLA BOGNÁR VADÁSZ, VICE DEAN, UNIVERSITY OF MISKOLC
- LÁSZLÓ SZENTIRMAI, UNIVERSITY OF MISKOLC
- ANGELA SZ. VÁRADI, SEFI AC MEMBER, UNIVERSITY OF MISKOLC
- ERIK DE GRAAFF, TECHNICAL UNIVERSITY OF DELFT, THE NETHERLANDS, AND UNIVERSITY OF AALBORG, DENMARK.
- JESÚS ARMENGOL CEBRIÁN, UNIVERSIDAD POLITÉCNICA DE CATALUÑA

INTERNATIONAL COMMITTEE

- GYULA PATKÓ (CHAIR), RECTOR, UNIVERSITY OF MISKOLC
- MIHÁLY DOBRÓKA, VICE RECTOR, FOR INTERNATIONAL CO-OPERATION AND SCIENTIFIC RESEARCH, UNIVERSITY OF MISKOLC
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CALL FOR CONTRIBUTIONS

The Organisers invite academics and stake holders involved in curriculum development of engineering education to contribute to the Symposium with a paper or a poster in the following topics:

- ACTIVE LEARNING. PROBLEMS AND PROJECT BASED LEARNING.
- EFFICIENCY OF E-LEARNING AND BLENDED EDUCATION IN EE.
- ASSESSMENT OF STUDENTS INVOLVED IN ACTIVE LEARNING ENVIRONMENTS.
- SCIENCE AND TECHNOLOGY INTEGRATION IN ENGINEERING CURRICULUM.
- ACCREDITATION AND QUALITY ASSURANCE IN CURRICULUM DESIGN.
- INNOVATION AND GOOD PRACTICE.
- IMPACT OF WORLD CRISIS ON ENGINEERING CURRICULA.

Prospective authors are invited to submit by e- mail their abstracts in English only in one A4-size page. Once the abstracts have been accepted by the Programme Committee, full papers either in English or in Spanish should be prepared following the instructions provided below, to be published in the Proceedings of the Symposium. For presenting posters or paper at least one of the authors should be registered and paid. Abstracts and full paper should be sent to sefi-cdwg@uni-miskolc.hu

IMPORTANT TERMS

Submission of abstracts and recommendations for workshops: 5 January 2011
Notification of accepted papers, posters and workshops: 31 January 2011
Submission of full papers: 10 March 2011

CONFERENCE LANGUAGE

The language of the Conference is mainly English, at some IGIP sessions German and/or English where simultaneous translation will be provided. All abstracts must be submitted in English even if the full paper were worked out in German.

CORRESPONDENCE ADDRESS

:
University of Miskolc
Department of Researches Management and International Relations
H-3515 Miskolc Egyetemváros

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
Tome IV (Year 2011). ISSN 2067-3809

INTERNATIONAL CONFERENCE ON COMMUNICATIONS, COMPUTING AND CONTROL APPLICATIONS IEEE-2011

March 3-5, 2011, Hammamet, TUNISIA

SPONSORED BY:

IEEE CONTROL SYSTEMS SOCIETY (CSS)
IEEE COMPUTER SOCIETY (CS)-TUNISIA CHAPTER
IEEE COMPUTATIONAL INTELLIGENCE SOCIETY (CIS)-TUNISIA CHAPTER
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RESEARCH GROUP ON INTELLIGENT MACHINES, TUNISIA
RU. SOIE, TUNISIA

OVERVIEW

The 2011 International Conference on Communications, Computing and Control Applications (CCCA'11) will be held March 3-5, 2011 at Hammamet, Tunisia.
CCCA'11 will take place in Hammamet (Tunisia), a beautiful city of jasmine, orange trees, and bougainvilleas. Hammamet is also known for its fine sand beaches and its hydrotherapy centres.
CCCA'11 is intended to serve as a major international forum for the exchange of ideas. It is intended to provide a platform for effective interaction between pioneers and researchers in the relevant area to share their innovative and creative views and to present their original contributions. Its purpose is to be a forum for technical exchange amongst scientists having interests in Communications/Information Technology, Computer Science and Control.
The goal of this scientific conference is to propose both theoretical as well as / or methodological papers, but to present practical cases where they are efficiently used.
The technical program will include plenary lectures, regular technical sessions, and special sessions covering the three major tracks. A copy will be provided to attendees on CD-ROM. Please note that at least one full paying author of each accepted paper must register for the Symposium before the indicated deadline.

CALL FOR PAPERS

CCCA'11 is intended to serve as a major international forum for the exchange of ideas. It is intended to provide a platform for effective interaction between pioneers and researchers in the relevant area to share their innovative and creative views and to present their original contributions. Its purpose is to be a forum for technical exchange amongst scientists having interests in Communications/Information Technology, Computer Science and Control. The goal of this scientific conference is to propose both theoretical as well as / or methodological papers, but to present practical cases where they are efficiently used.

IMPORTANT TERMS

Deadline for submission of camera-ready paper: JANUARY 14, 2011
Deadline for author registration: JANUARY 14, 2011

MAIN TOPICS

Topics of interest include, but are not limited to, the following:
CONTROL
ADAPTIVE CONTROL, AUTOMATED GUIDED VEHICLES, BOND GRAPH METHODOLOGY, CONTROL APPLICATIONS, CONTROL EDUCATION, COOPERATIVE CONTROL SYSTEMS, DECISION THEORY, DIGITAL CONTROL, DISCRETE EVENT SYSTEMS, EMBEDDED SYSTEMS, ESTIMATION AND IDENTIFICATION, FACTORY MODELING AND AUTOMATION, FAULT DETECTION, FLEXIBLE MANUFACTURING SYSTEMS, FUZZY SYSTEMS, INTEGRATED MANUFACTURING, INTELLIGENT AND AI BASED CONTROL, INTERFACES AND HUMAN COMPUTER INTERACTION, LEARNING SYSTEMS, LINEAR SYSTEMS, MAN-MACHINE INTERACTIONS,

Manufacturing Systems, Micro and Nano Systems, Modeling of Complex Systems, Monitoring and Supervision, Motion Control, Multi-agent systems, Neural Network, Nonlinear Systems and Control, Optimal Control, Optimization, Petri-Nets and Applications, Process Automation, Process Control & Instrumentation, Real-time Systems, Robotics, Robust and Control, Sensor networks and networked control, Sensor/data fusion, Smart Structures, Stochastic systems, …

Communications/Information technology

Ad Hoc, Sensor and Mesh Networking, Coding theory and practice, Communication Theory, Communications Quality of Service, Reliability, and Performance Modelling, Communications Receivers, Communications Software, Services, and Multimedia Applications, Compression, Computer and Communications Network Security, Cryptography and data security, Data Mining, Detection and estimation, Digital Communications, DSP For Communications, e-Learning, e-Commerce and e-Health, Image Processing, Information theory and statistics, Information theory in networks, Information practice, Mobile and Wireless Communications, Multi-terminal information theory, Networks and QOS, Next Generation Networks, Protocols, and Services, OFDM and CDMA, Optical Networks and Systems, Pattern recognition and learning, Quantum information, Sequences and complexity, Shannon theory, Signal Processing, Source coding, Space-Time Coding, Video and Multimedia Signal Processing, Wireless Networking, …

Computer Science

Algorithmic, Artificial Intelligence, Bioinformatics, Computational Statistics, Computer Science, Database, Financial Engineering, Game and Entertainment Technologies, Hardware Systems, Imaging Engineering, Information Retrieval, Internet Computing, Networking, Security and Cryptology, Software Engineering, Theoretical Computer Science …

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Paper Submission

All papers must be written in English and should describe original work. The length of the paper is limited to a maximum of 6 pages (in the standard IEEE conference double column format), including figures, tables and references.

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7th RESEARCH / EXPERT CONFERENCE WITH INTERNATIONAL PARTICIPATION QUALITY 2011

01-04 June 2011
Neum, BOSNIA AND HERZEGOVINA

ORGANIZED BY:

- UNIVERSITY OF ZENICA (Bosnia and Herzegovina)
  www.unze.ba
  FACULTY OF MECHANICAL ENGINEERING
  www.mf.unze.ba
- UNIVERSITY ERLANGEN NUREMBERG (Germany)
  www.uni-erlangen.org
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  www.qfm.uni-erlangen.de
- QUALITY ASSOCIATION of BOSNIA and HERZEGOVINA
  www.aqbih.ba

CONFERENCE TOPICS

The Research/Expert Conference will be performed as follows: plenary session (Key papers concerned, global topics), symposium (papers according to the conference topics) and workshops, when needed. We would like to inform all the potential authors to prepare papers in the following topics:

1. QUALITY IN BUSSINES
   - Quality management (Concept, Principles, Tools and Philosophies);
   - System and Process Performance Measurements;
   - Metrology;
   - Quality of product and process;
   - Quality in maintenance;
   - Supply chain management;
   - Environment protection quality;
   - Quality Engineering;
   - Quality Economics;
   - Risk Control;
2. QUALITY IN EDUCATION
   - Pedagogical standards and norms;
   - Methods and procedures of students knowledge accompany and control;
   - Methods and procedures of educational staff quality control;
   - Occupational institutions self evaluation;
   - Bologne process and quality;
   - IWA2;
   - Education programs and institutions accreditation and certification;
   - Law regulation in educational field;
3. QUALITY IN PUBLIC SECTOR
   - Quality in public institutions;
   - Quality in health institutions;
   - Quality in community enterprises;
   - Quality in Agriculture;
   - Quality in Food Processing Industry;
   - Aspect of Quality in Process Accesion BiH in EU
4. STANDARDS REGULATION IN QUALITY
   - International standards ISO 9000 - Quality Management System;
   - International standards ISO 14000 - Environmental Management System;
   - International standards ISO 18000 - Occupational Health and Safety Zone;
   - HACCP,
   - ISO 16949,
   - ISO 22000-Food safety management system,

- *ISO 27000-Information security management standards,*
- *SA 8000-Social Accountability,*
- *Status and trends in development standards;*
- *Quality information systems;*
- *Quality awards;*
- *Standardization;*
- *State quality programs;*
- *TQM models and their evaluation*

IMPORTANT TERMS

Submission of abstracts: January 31st 2011
Notification of acceptance of the abstracts and instructions for preparing the papers: February 15th 2011
Submission of the full paper: April 15th 2011
Registration fee payment: May 10th 2011
Final programme: May 15th 2011
Quality 2011: June 1st to 4th 2011

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http://quality.unze.ba/

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IX^th International Conference
PREPARATION OF CERAMIC MATERIALS
June 14 - 16^th, 2011
Herlany, SLOVAKIA

ORGANIZED BY:

TECHNICAL UNIVERSITY IN KOŠICE, FACULTY OF METALLURGY, DEPARTMENT OF CERAMICS
in cooperation with
INSTITUTE OF GEOTECHNIC OF SLOVAK ACADEMY OF SCIENCES, KOŠICE
and
SLOVAK METALLURGICAL SOCIETY
SLOVAK SILICATE SOCIETY
SLOVAK GLASS SOCIETY

INVITATION

*You are invited to **Herľany-Spa** near **Košice** city (**Eastern Slovakia**) in **June 14 - 16, 2011** on **IX^TH International Conference** called **Preparation of Ceramic Materials**. Presentation of activities from various fields of ceramics, glass science and technology. Establishment of new and extension of the already established cooperation between foreign and Slovak companies and universities.*

CONFERENCE TOPICS

:: Refractories and Fireproof Ceramics
:: Construction and Building Ceramics
:: Fine and Advanced Ceramics
:: Surface Treatments of Ceramics
:: Glass and Glassceramic materials

SCOPES OF THE CONFERENCE

:: Contribution deals with production, properties and use of these materials on the subjects will be welcome.
:: Presentation of activities from various fields of ceramics, glass science and technology.
:: Establishment of new and extension of the already established cooperation between foreign and Slovak companions and universities.

ORGANIZING COMMITTEE

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:: A.Prof. RNDr. J. BRIANČIN, CSc., GTI SAV, Košice
:: A.Prof. Ing. B. PLEŠINGEROVÁ, CSc., TU, FM, DC, Košice
:: A.Prof. Ing. J. TRPČEVSKÁ, PhD., TU, FM. DNMFaWT, Košice
:: A.Prof. Ing. P. VADÁSZ, CSc., TU, FM, DC, Košice
:: A.Prof. Ing. G.SUČIK, PhD., TU, FM DC, Košice
:: Dr. Ing. D. ROHANOVÁ, ICT – FCT – Prague
:: A.Prof. Dr. D. HRŠAK, FM, U Zagreb, Sisak
:: Dr. Ing. D. ROHANOVÁ, ICHT – FCHT – Prague, Czech Republic

PAPERS OF LECTURES AND POSTERS

Title of your contributions you write in registration form and send by mail Beatrice.Plesingerova@tuke.sk till February 14, 2011 Contributions will be published in the book of proceedings (ISBN).
Conference Contributions will include invited lectures (30 min.) and contributed papers (15 min.) Poster Section includes competitive works of young scientists and students that will be evaluated with commission of "Poster section of young scientists and students". Dimension of poster table will be 100×100 cm.

LANGUAGE

:: Slovak, Czech and English

INSTRUCTION FOR AUTHORS

:: The text of lecture paper: English, German or Slovak/Czech language, max. 6 pages manuscript including figures and tables, Arial font size 12pt, line spacing 1.5.
:: The text of poster abstract: English language, max. 2 pages abstract, Arial font size 12pt, line spacing 1.5.
:: Papers and abstracts of posters please, submit till 30th of April 2011. The manuscripts are accepted exclusively in an electronic form in text editor – MS WORD.

LOCATION OF THE CONFERENCE

The conference will be held in the spa-building in Herľany. The Herľany spa is located about 30 km east from Košice (Slovakia). The unique cold water geyser is situated in the centre of the spa.

ADDITIONAL INFORMATIONS

*Conference details you can find on **www.tuke.sk/seminar_PKM** in **March 14, 2011**.*
The Registration Fee does not include accommodation. The accommodation and meals will pay by cash at the conference registration.

PRELIMINARY PROGRAM

June 14, 2011

10:00-14:00	*Registration and information*
14:00-18:00	*Opening, scientific program - lectures*
18:00-19:00	*Time for posters preparation*
20:00	*Welcome reception*

June 15, 2011

8:00-10:00	*Registration, scientific program - lectures*
10:00-12:00	*Scientific program - poster section - invitation*
14:00-18:00	*Scientific program - lectures*
18:00-19:00	*Exhibition - Posters*
19:00-20:00	*Meeting of the Slovak Silicate Society*
20:00	*Camp-fire party*

June 16, 2011

8:00-11:00	*Scientific program - lectures*
11:00	*Closure of the conference*

CORRESPONDENCE

TECHNICAL UNIVERSITY OF KOSICE,
Faculty of Metallurgy,
Department of Ceramics,
A.Prof.Ing.B. Plešingerová, CSc.,
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042 00 KOŠICE,
Slovak Republic

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INTERNATIONAL CONFERENCE ON INNOVATIVE TECHNOLOGIES IN-TECH 2011

01- 03 September 2011
Bratislava, SLOVAKIA

WELCOME TO WEBSITE OF IN-TECH 2011

Conference runs from 01.09.2011 to 03.09.2011 in BRATISLAVA, the capital of SLOVAKIA. As the capital of Austria, Vienna is only 80 km from Bratislava, the special trip on 04.09.2011 to Vienna, Austria will be organized.

Authors are invited to submit their abstracts (half page in A4 format) in Microsoft Word or Adobe PDF format via e-mail: info@in-tech.info.

Last International Conference on Innovative Technologies IN-TECH 2010 was organized In Prague (Czech Republic) by the World Association for Innovative Technologies - WAIT and the Center for Surface Treatment Prague. The conference was held in the famous Prague Hotel Pyramid, which is located near the Prague Technical University. IN-TECH 2010 conference was attended about 300 participants from 40 countries.

SPECIAL EXCURSION

The special excursion 04.09.2011 to Vienna, Austria will be organized.

SCOPES OF THE CONFERENCE

- MECHANICAL ENGINEERING
- ELECTRONICS ENGINEERING
- MEDICAL INNOVATIVE TECHNOLOGIES
- BIOTECHNOLOGY AND BIOENGINEERING
- AGRICULTURE INNOVATIVE TECHNOLOGIES
- AEROSPACE AND AERONAUTICAL ENGINEERING
- MATERIAL SCIENCES
- COMPUTER SCIENCE
- INDUSTRIAL ENGINEERING
- MANUFACTURING ENGINEERING
- PRODUCTION ENGINEERING
- ENGINEERING DESIGN
- OPTIMAL SHAPE DESIGN
- NANO SCIENCE
- INTELLIGENT MANUFACTURING SYSTEMS
- MECHATRONICS/ROBOTICS
- MODELING AND SIMULATION
- AI, GENETIC ALGORITHM, NEURAL NETWORKS
- MEASUREMENT AND INSPECTION
- METALLURGY
- AUTOMOTIVE INDUSTRY
- VIRTUAL ENGINEERING
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- RENEWABLE AND NON CONVENTIONAL ENERGY SOURCES, ENERGY SYSTEMS
- PRODUCTION MANAGEMENT
- QUALITY MANAGEMENT
- MAINTENANCE, LOGISTICS

IMPORTANT DATES

Paper/Poster abstract: before March 10. 2011
Acceptance notification: before April 10. 2011
Final Paper/Poster: before June 10. 2011
Registration fee: before July 10. 2011

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ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
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9th IEEE INTERNATIONAL SYMPOSIUM ON INTELLIGENT SYSTEMS AND INFORMATICS SISY 2011

September 8-10, 2011
Subotica, SERBIA

ORGANIZED BY:

ÓBUDA UNIVERSITY, BUDAPEST, HUNGARY
SUBOTICA TECH, SERBIA
UNIVERSITY OF NOVI SAD, SERBIA

INVITATION

Authors are welcome to submit original and unpublished paper and attend the 9th IEEE International Symposium on Intelligent Systems and Informatics (SISY 2011) to be held on September 8-10, 2011 in Subotica, Serbia.
SISY 2011 Call for Papers can be downloaded as a pdf file.
Papers are going to be included into IEEE Xplore database after the symposium.
IEEE reserves the right to exclude a paper from distribution after the conference (e.g., removal from IEEE Xplore), if the paper is not presented at the conference.

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SECRETARY GENERAL
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AUTHORS' SCHEDULE

Full paper submission: July 1, 2011
Notification: August 1, 2011
Final paper submission: August 15, 2011

OFFICIAL LANGUAGE

The official language of the Symposium is English. All the camera-ready manuscripts should be submitted in English, and presentations should be made in English.

PAPER PRESENTATION

All paper must be presented either in oral session or in poster session. If a paper, included into the proceedings, fails to be presented any way at the conference, all authors of the paper will be bar out from paper submission to conferences of the organizers in the future.

Oral Presentation

Presentations can be made by using OHP or data projector. All authors are kindly asked to take their presentation on CD or USB drive. To present the paper it is not allowed to use own computer. Conference room is supplied with OHP and data projector with PC.

Poster Presentation

If you choose to present your paper in a poster session, not in an oral session, please prepare the presentation into 9 A4 sheets or 1 large (70x100 cm) sheet, bring it with you to the conference and post it to the chart. Poster presentation does not mean just to print out your final paper, but it should be edited to make it scenic.

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ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
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15th IEEE INTERNATIONAL CONFERENCE ON INTELLIGENT ENGINEERING SYSTEMS 2011
INES 2011
June 23-25, 2011
Poprad, SLOVAKIA

SPONSORED BY:

- IEEE Computational Intelligence Chapter, Hungary
- IEEE Joint Chapter of IES and RAS, Hungary
- IEEE SMC Chapter, Hungary
- IEEE Industrial Electronics Society
- Óbuda University, Budapest, Hungary
- Technical University of Košice, Slovakia
- John von Neumann Computer Society, Hungary
- Hungarian Fuzzy Association

INVITATION

Authors are welcome to submit original and unpublished papers and attend the 15th IEEE International Conference on Intelligent Engineering Systems 2011 (INES 2011) to be held on June 23-25, 2011 in Poprad, High Tatras, Slovakia.

TOPICS

TOPICS include but not limited to:

Artificial Intelligence in Engineering: Reasoning, Learning, Decision Making, Knowledge Based Systems, Expert Systems
CAD/CAM/CAE Systems: Product Modeling, Shape Modeling, Manufacturing Process Planning
Communications Software and Systems in Engineering: Design Methodologies and Tools, Object-oriented, UML, Software Engineering
Computational Intelligence in Engineering: Machine Learning, Genetic Algorithms, Neural Nets, Fuzzy Systems, Fuzzy and Neuro-fuzzy Control
Intelligent Manufacturing Systems: Production Planning and Scheduling, Rapid Prototyping, Flexible Manufacturing Systems, Collaborative Engineering, Concurrent Engineering
Intelligent Mechatronics and Robotics Systems: Control, Perception and Recognition, Sensing and Sensor Data Fusion, Intelligent Sensors, Intelligent Motion Control, Service Robots
Intelligent Signal Processing
Intelligent Transportation Systems: Navigation Systems, On-board Systems, Real-time Traffic Control
Man-Machine Systems: Human Computer Interaction, Multimedia Communications, Advanced Computer Graphics, Virtual Reality
Ontologies and Semantic Engineering: Ontology, Thesaurus, Disambiguation, Semantic Inference, Natural Language Interaction
Systems Engineering: Systems Analysis, Systems Methodology, Self-Organizing Systems, Systems Integration, Large Scale Systems, Systems Simulation, Diagnosis and Performance Monitoring

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AUTHORS' SCHEDULE

Full paper submission: April 15, 2011
Notification: May 12, 2011
Final paper submission: May 26, 2011

GENERAL INFORMATION

Date and Place
INES 2011 will take place on June 23-25, 2011, in AquaCity, Poprad, the High Tatras, Slovakia.
Official Language
The official language of the conference is English. All presentations, including discussions and submissions, must be made in the official language. No translation will be provided.
Proceedings
Each accepted paper reaching us in time will be published in CD proceedings, and it will be distributed at the registration desk.
Presentation
Presentations can be made by using OHP or data projector. All authors are kindly asked to take their presentation on CD or USB. To present the paper it is not allowed to use own computer. All conference rooms are supplied with OHP and data projector with PC.
INES 2011 Paper Submission
The official language of the symposium is English. Authors should submit IEEE standard double-column paper with the maximum pages of 6. Authors are kindly asked to submit their paper through electronic paper submission system. Papers sent by email are not acceptable.

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ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
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3rd IEEE INTERNATIONAL SYMPOSIUM ON LOGISTICS AND INDUSTRIAL INFORMATICS LINDI 2011
August 25-27, 2011
Budapest, HUNGARY

ORGANIZED BY:
Óbuda University, Budapest, Hungary

INVITATION
Authors are welcome to submit original and unpublished papers and attend the 3rd IEEE International Symposium on Logistics and Industrial Informatics (LINDI 2011) to be held on August 25-27, 2011 in Budapest, Hungary.

TOPICS
TOPICS include but not limited to:
- INDUSTRIAL CONTROL AND MANAGEMENT SYSTEMS
- INTELLIGENT MANUFACTURING SYSTEMS
- CAD/CAM/CAE SYSTEMS
- DISTRIBUTED AND NETWORK-BASED CONTROL
- EMBEDDED SYSTEMS
- FAULT-TOLERANT SYSTEMS
- NETWORK MANAGEMENT AND DIAGNOSTICS
- TRANSPORT AND LOGISTICS SYSTEMS
- COMMUNICATION PLATFORMS AND APPLICATIONS
- ENTERPRISE MANAGEMENT SYSTEMS
- INTELLIGENT INFORMATION SYSTEMS
- PROCESS AND WORKFLOW MANAGEMENT SYSTEMS

GENERAL INFORMATION
Date and Place
The symposium will take place on August 25-27, 2011, in Budapest, Hungary.
Official Language
The official language of the Symposium is English. All the camera-ready manuscripts should be submitted in English, and presentations should be made in English. No translation is provided.
Presentation
All paper must be presented either in oral session or in poster session. If a paper, included into the proceedings, fails to be presented any way at the conference, all authors of the paper will be bar out from paper submission to conferences of the organizers in the future.
Oral Presentation
Presentations can be made by using OHP or data projector. All authors are kindly asked to take their presentation on CD or USB drive. To present the paper it is not allowed to use own computer. Conference room is supplied with OHP and data projector with PC.
Poster Presentation
If you choose to present your paper in a poster session, not in an oral session, please prepare the presentation into 9 A4 sheets or 1 large (70x100 cm) sheet, bring it with you to the conference and post it to the chart. Poster presentation does not mean just to print out your final paper, but it should be edited to make it scenic.
Paper Submission
The official language of the symposium is English. Authors should submit IEEE standard double-column paper with the maximum pages of 6. Authors are kindly asked to submit their paper through electronic paper submission system. Papers sent by email are not acceptable.

ORGANIZING COMMITTEE

AUTHORS' SCHEDULE

Full paper submission: May 27, 2011
Notification: July 1, 2011
Final paper submission: July 29, 2011

CORRESPONDENCE

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ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
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12th IEEE INTERNATIONAL SYMPOSIUM ON COMPUTATIONAL INTELLIGENCE AND INFORMATICS CINTI 2011

November 21-22, 2011 Budapest, HUNGARY

ORGANIZED BY:

Óbuda University, Budapest, Hungary
Hungarian Fuzzy Association
IEEE Hungary Chapter of Computational Intelligence Society
IEEE Hungary Chapter of SMC Society
IEEE Hungary Joint Chapter of Industrial Electronics and Robotics and Automation Societies
John von Neumann Computer Society, Hungary

INVITATION

Authors are welcome to submit original and unpublished papers and attend the 12th IEEE International Symposium on Computational Intelligence and Informatics to be held on November 21-22, 2011 in Budapest, Hungary.

OBJECTIVES

The Symposium is organized with the focus of bringing together scientists from any country working on computational intelligence and its applications with the aims at providing an opportunity for sharing and discussing the recent research developments in this field. The idea is to have a small number of lecturers and participants in a relaxed and informal atmosphere.

GENERAL INFORMATION

Official Language

The official language of the Symposium is English. All the camera-ready manuscripts should be submitted in English.

Registration

Only one paper can be included into the proceedings by paying one registration fee. For including any paper into the proceedings, it is necessary for at least one co-author to be registered and the registration fee has to be paid in advance until October 28.

All paper must be presented either in oral session or in poster session. If a paper, included into the proceedings, fails to be presented any way at the conference, all authors of the paper will be bar out from paper submission to conferences of the organizers in the future.

Paper Submission

Authors are asked to submit electronically a full paper until September 30, 2011 through electronic paper submission system.

The official language of the symposium is English.

Authors should submit IEEE standard double-column paper with the maximum pages of 6.

Authors are kindly asked to submit their paper through electronic paper submission system. Papers sent by email are not acceptable.

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AUTHORS' SCHEDULE

Full paper submission: **September 30, 2011**
Notification: **October 10, 2011**
Final manuscript submission: **October 28, 2011**
All accepted papers which meet IEEE requirements are going to be included into IEEE Xplore database after the symposium. IEEE reserved the right to exclude a paper from distribution after the conference (e.g., removal from IEEE Xplore), if the paper is not presented at the conference.

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BRAMAT 2011

7th INTERNATIONAL CONFERENCE ON MATERIALS SCIENCE & ENGINEERING

BRAMAT 2011

24 – 26 FEBRUARY 2011, Brasov, ROMANIA

ORGANIZED BY:

FACULTY OF MATERIALS SCIENCE AND ENGINEERING from TRANSILVANIA UNIVERSITY OF BRASOV
and
ROMANIAN TECHNICAL SCIENCES ACADEMY

INVITATION

The International Conference on Materials Science and Engineering, BRAMAT 2011, will be held in Brasov, Romania during 24-26 February 2011.
Considering that technological progress is possible only when starting with new/innovative concepts on materials for advanced applications, the conference aims to foster collaboration among the academic, research and industry partners for stimulating future developments based on inter- and trans-disciplinary cooperation.
The event will host well known invited speakers and is opened to thematic workshops.
We invite you to join us in this conference and contribute to the common quest for sustainability in the technological development.

TOPICS

SECTION 1: TECHNOLOGIES AND EQUIPMENTS FOR MATERIALS' PROCESSING
SECTION 2: MATERIALS SCIENCE
SECTION 3: HEAT TREATMENTS AND SURFACE ENGINEERING
SECTION 4: ADVANCED WELDING ECO-TECHNOLOGIES
SECTION 5: SAFETY, MODELING AND SIMULATION IN MATERIALS ENGINEERING

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AUTHORS' SCHEDULE

January, 10, 2011 – Full paper submission
February, 15, 2011 – Conference final program

PROCEEDINGS

The abstracts will be published in the CD Abstracts Proceedings. All papers will be reviewed by the Scientific Advisory Committee of the Conference and by members of the Editorial Board of each Journal.
According to the option of the first author, the accepted papers for publications will be published in special issues of the following journals:
Journal of Optoelectronics and Advanced Materials (ISI),
Metalurgia (BDI),
Metalurgia International (ISI),
Heat Treatment & Surface Engineering (BDI),
Recent (BDI),
Bulletin of the Transilvania University of Brasov (BDI).
The papers will be published in these journals provided acceptance by the journal review committee.
The official conference language is English.

CORRESPONDENCE

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ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
Tome IV (Year 2011). ISSN 2067-3809

4th INTERNATIONAL CONFERENCE ON ADVANCED MATERIALS AND STRUCTURES AMS '11
27 - 28 October 2011
Timişoara, ROMANIA

ORGANIZED BY:

POLITEHNICA University of Timisoara
with the support of
POLITEHNICA Foundation

IMPORTANT INFORMATION ABOUT THE CONFERENCE

Proceedings of AMS'11 will be published as separate edition in "Solid State Phenomena"
Volume containing the peer-reviewed papers will be available in full text through www.scientific.net platform, which is one of the leading site and largest online databases in Materials Science
"Solid State Phenomena" is indexed by Elsevier SCOPUS, ISI (ISTP, CPCI, Web of Science), Ei Compendex (CPX), Cambridge Scientific Abstracts (CSA), Chemical Abstracts (CA), Institution of Electrical Engineers (IEE), Google Scholar, etc.

TOPICS

Topics of the 4th International Conference on ADVANCED MATERIALS AND STRUCTURES (AMS'11):

- *ADVANCED MATERIALS: BIOMATERIALS, COMPOSITES, CELLULAR MATERIALS, SUPPER-ALLOYS, AMORPHOUS, NANO-STRUCTURED MATERIALS, ETC.*
- *MODERN FABRICATION AND RECYCLING TECHNOLOGIES*
- *COMPUTATIONAL TECHNIQUES FOR ADVANCED AND ENGINEERING MATERIALS*

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Secretary of AMS'11:
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Prof. Teodor Heput, Dean of Engineering Faculty of Hunedoara
Prof. Liviu Marșavina, Head of Chair for Materials Strenght
Lecturer Cosmin Codrean, Chair of Materials Science and Welding
Assist. Prof. Cosmin Lovovei, Chair of Materials Science and Welding

IMPORTANT DEADLINES OF THE AMS'11 INTERNATIONAL CONFERENCE

- *Deadline for abstracts (200 words): April 1st, 2011*
- *Deadline for paper submission: July 1st, 2011*
- *Conference dates: 27-28 October, 2011*

CORRESPONDENCE

Advanced Materials and Structures - AMS'11
Mircea Nicoară - secretary of AMS'11
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ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
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6th IEEE INTERNATIONAL SYMPOSIUM ON APPLIED COMPUTATIONAL INTELLIGENCE AND INFORMATICS SACI 2011

May 19-21, 2011 Timisoara, ROMANIA

ORGANIZED BY:

ÓBUDA UNIVERSITY, BUDAPEST, HUNGARY
and
"POLITEHNICA" UNIVERSITY OF TIMISOARA, ROMANIA
FACULTY OF AUTOMATION AND COMPUTERS, TIMISOARA, ROMANIA

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IEEE Chapter of Computational Intelligence Society, Hungary
IEEE Chapter of SMC, Hungary
IEEE Joint Chapter of IES and RAS, Hungary
Hungarian Fuzzy Association
IEEE Romania Section
ASTR - Academy of Technical Sciences, Romania
Hungarian Academy of Engineering

WELCOME TO SACI 2011

Authors are welcome to submit original and unpublished papers and attend the 6th IEEE INTERNATIONAL SYMPOSIUM ON APPLIED COMPUTATIONAL INTELLIGENCE AND INFORMATICS (SACI 2011) to be held on May 19-21, 2011 in Timisora, Romania.

TOPICS include but not limited to:

COMPUTATIONAL INTELLIGENCE
INTELLIGENT MECHATRONICS
SYSTEMS ENGINEERING
ARTIFICIAL INTELLIGENCE
INTELLIGENT MANUFACTURING SYSTEMS
INTELLIGENT CONTROL
GENETIC, NEURAL AND FUZZY ALGORITHMS
EXPERT SYSTEMS
ADVANCED INFORMATICS APPLICATIONS
INFORMATION TECHNOLOGY IN BIOMEDICINE

AUTHORS' SCHEDULE

Deadline of full paper submission: March 3, 2011
Deadline of notification: April 1, 2011
Deadline of final paper submission: April 21, 2011

SUBMISSION OF PAPERS & AUTHORS' GUIDE

Authors are asked to submit electronically a full paper until March 3, 2011 through electronic paper submission system.
The official language of the symposium is English.
Authors should submit IEEE standard double-column paper with the maximum pages of 6. Authors are kindly asked to submit their paper through electronic paper submission system. Papers sent by email are not acceptable.

GENERAL INFORMATION

Date and Place
The conference will take place on May 19-21, 2011, in Timisoara, Romania.
Official Language
The official language of the conference is English. All the camera-ready manuscripts should be submitted in English, and presentations should be made in English.

Paper Presentation

All paper must be presented either in oral session or in poster session. If a paper, included into the proceedings, fails to be presented any way at the conference, all authors of the paper will be bar out from paper submission to conferences of the organizers in the future.

Oral Presentation

Presentations can be made by using OHP or data projector. All authors are kindly asked to take their presentation on CD or USB drive. To present the paper it is not allowed to use own computer. Conference room is supplied with OHP and data projector with PC.

Poster Presentation

If you choose to present your paper in a poster session, not in an oral session, please prepare the presentation into 9 A4 sheets or 1 large (70x100 cm) sheet, bring it with you to the conference and post it to the chart. Poster presentation does not mean just to print out your final paper, but it should be edited to make it scenic.

COMMITTEES

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ENGINEERING CONFERENCES WORLDWIDE
Upcoming events in Engineering and related fields

January 2011

13 International Conference on Sunrise Technologies (i-COST) Dhule India
13 Military Construction Contracting Safety Regulations – OSHA & the EM385-1-1, what you don't know could cost you your contract! - OSHA Webinar Palo alto California
13 Introduction to Letters of Credit - Trade And Logistic Webinar By ComplianceOnline Palo alto California
13 5th Annual Underground Transmission Conference Las Vegas NV
14 The Auditee Bill of Rights - Quality Management Webinar By ComplianceOnline Palo alto California
14 International Conference on Advanced Science, Engineering and Information Technology (ICASEIT) 2011 Kuala Lumpur Malaysia
14 2011 International Conference on Information and Industrial Electronics(ICIIE 2011) Chengdu China
The conference proceeding of ICIIE 2011 will be published by IEEE Press, which will be included in the IEEE Xplore, and indexed by INSPEC, EiCompendex and other indexing services.
21 2011 3rd IEEE International Conference on Computer and Automation (ICCAE 2011) Chongqing China
ICCAE 2011 will be published in the conference proceeding, and will be included in the IEEEXplore, and indexed by INSPEC, ThomsonISI Proceeding (ISTP), Ei Compendex.
21 2011 International Conference on Security Science and Technology(ICSST 2011) Chongqing China
The ICSST 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex, ISI Proceeding and other indexing services.
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 2011 IEEE 3rd International Conference on Computer and Automation Engineering(ICCAE 2011) Chongqing China
The ICCAE 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and be indexed by Ei Compendex and Thomason ISI Proceeding.
21 2011 International Conference on Security Science and Technology(ICSST 2011) Chongqing China
The ICSST 2011 proceedings will be published byIEEE and All the papers will be archived in the IEEE Xplore and indexed by Ei Compendex and ISI.
21 2011 International Conference on Advanced Material Research (ICAMR 2011) Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 ICSE11 - International Conference on Science and Engineering Rohtak India
The scope of the Conference includes all the areas of Engineering Sciences. It encourages a broad spectrum of contribution in the engineering sciences. Articles of interdisciplinary nature are particularly welcome.
22 International Conference on Uncertainty Management: in Green-field projects BHUBANESWAR India
26 2011 International Conference on System Modeling and Optimization(ICSMO 2011) Guiyang China
The ICSMO 2011 proceedings will be published by IEEE and All the papers will be archived in the IEEE Xplore and indexed by Ei Compendex.
26 2011 International Conference on Information and Computer Networks(ICICN 2011) Guiyang China
The ICICN 2011 proceedings will be published by IEEE and All the papers will be archived in the IEEE Xplore and indexed by Ei Compendex.
28 2011 Faculty Student Multidiscipline Global Conference Pretoria South Africa

February 2011

01 IMEF 2011 Prague Czech Republic
01 Bioplastics -Reshaping and Industry Las Vegas NV
01 Energy Security and Sustainability - Global Challenges College Station Texas
02 Acoustics & Noise Control Asia Hong Kong Hong Kong
02 SIX INTERNATIONAL CONFERENCE ON DEVELOPMENT STUDIES Benue State University, Markudi Nigeria
07 ISRANALYTICA 2011 Tel Aviv Israel
11 Innovative Developments in Next Decades - Challanges, Issues & Solutions Jodhpur India
12 International Conference on Communication, Computing & Security (ICCCS2011)[ACM Proceedings ISBN:978-1-4503-0464-1][Submission Deadline Extended 7Nov] Rourkela India
14 2nd FLAC/DEM Symposium Melbourne Australia

14 The 31st IASTED International Conference on Modelling, Identification and Control - MIC 2011 Innsbruck Austria
16 The Eighth IASTED International Conference on Biomedical Engineering Innsbruck Austria
18 APCCSD Auckland New Zealand
19 2011 International Conference on Technological Advancements in Civil Engineering 2nd round call for paper Hyderabad India
19 2011 IEEE International Conference on Prudent Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEE Xplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Technological Advancements in Civil Engineering (ICTACE 2011) Hyderabad India
The ICTACE 2011 proceeding will be published by IEEE Press, which will be included in the IEEEXplore, and indexed by INSPEC, Ei Compendex, ISI Proceeding and other indexing services.
19 The 2011 International Conference on Digital Convergence (ICDC 2011) Hyderabad India
All papers for the conference will be published in the proceeding of the ICDC 2011 conference and will be included in the IEEE Xplore, and indexed by the Ei Compendex and Thomson ISI (ISTP).
19 2011 International Conference on Product Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Technological Advancements in Civil Engineering(ICTACE 2011) Hyderabad India
The conference proceedings will be published by IEEE Press, which will be included in the IEEEXplore, and indexed by INSPEC, Ei Compendex, ISI Proceeding and other indexing services.
22 1st World Congress & Exhibition Infrastructure Asset Management Kuala Lumpur Malaysia
22 Airfield Engineering and Asset Maintenance 2011 Singapore Singapore
23 ASPEN 2011: The First International Workshop on Advances in IT-Service Process Engineering (along with ICDS 2011 / Digital World 2011) Gosier Guadeloupe
25 National Conference On Emerging Trends in Engineering & Technology Kozhikode India
25 2011 Faculty Student Multidiscipline Global Conference Churchill Australia
25 India Emerging: Opportunity and Challenges Greater Noida India
25 National Conference on Information, Communication and Intelligent Systems 2011 (NCICIS2011) Cochin India
25 National Conference on Advanced Mathematics & its Applications Bathinda India
26 2011 2nd International Conference on Mechanical, Industrial, and Manufacturing Technologies (MIMT 2011) Singapore Singapore
All registered papers of MIMT 2011 will be published into Conference proceeding by the IEEE Press. The accepted papers will be indexed by the major indexing services, such as INSPEC, EI (Compendex), and Thomson ISI (ISTP).
26 2011 3rd IEEE International Conference on Machine Learning and Computing (ICMLC 2011) Singapore Singapore
ICMLC 2011 will be included in the IEEE Xplore, and indexed by INSPEC, Thomson ISI Proceeding (ISTP), Ei Compendex.
26 2011 3rd International Conference on Machine Learning and Computing (ICMLC 2011) Singapore Singapore
ICMLC 2011 will be published in the conference proceedings by IEEE, which will be included inIEEE Xplore and indexed by INSPEC, ISI and EiCompendex.
26 2011 2nd International Conference on Mechanical, Industrial, and Manufacturing Technologies (MIMT 2011) Singapore Singapore
The accepted papers will be indexed by major indexing services such as INSPEC, EI (Compendex) and Thomson ISI (ISTP).
26 2011 3rd International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
The proceedings will be listed in IEEE Xplore and indexed by the Thomson ISI and Ei Compendex. A selection of the best papers will be invited for a special issue of a mainstream journal
28 Safety in Design and Construction: A Lifecycle Approach Boston Massachusetts

March 2011

04 International Conference on Recent Advances in Technology, Engineering, Management and Science Tiruchengodu India
04 MIT Energy Conference Boston MA
05 3rd National Civil Engineering Students' Symposium(NCESS) Mumbai India
06 Mediterranean Conference for Academic Disciplines Gozo Malta
07 INTELLECTBASE INTERNATIONAL CONSORTIUM PHUKET Thailand
07 International Conference for Academic Disciplines Las Vegas
07 INTED2011 (International Technology, Education and Development Conference) Valencia Spain
INTED2011 will be an international forum to present and share your experiences in the fields of Technology, Education, Development and International Collaboration. There will be 3presentation modalities for authors: Oral, Poster or Virtual
11 2011 3rd IEEE International Conference on Computer Research and Development (ICCRD 2011) Shanghai China
ICCRD 2011 will be indexed by IEEE Xplore, Thomason ISI, Ei Compendex and other major indexing services.
11 2011 International Conference on Systems Engineering and Modeling (ICSEM 2011) Shanghai China
The ICSEM 2011 conference proceedings will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex and other indexing services.
11 2011 International Conference on Solid-State and Integrated Circuit (ICSIC 2011) Shanghai China
ICSIC 2011 will be published in the conference proceedings by IEEE, which will be included in the IEEE Xplore, and indexed by INSPEC and Ei Compendex.
14 2011 New Orleans International Academic Conference New Orleans Louisiana
Please join us for our 2011 New Orleans International Academic Conference, March 14-16,2011 convening at the New Orleans Marriott with tracks in: Business & Economics, Education, Engineering Education, & Health Sciences.
16 International MultiConference of Engineers and Computer Scientists Hong Kong Hong Kong
19 2011 International Conference on Control, Robotics and Cybernetics (ICCRC 2011) New Delhi India
All papers will also be published in the ICCRC2011 conference proceeding by IEEE Press, which will be included in IEEE Xplore, and indexed by Thomason ISI and Ei Compendex.

19 2011 International Conference on Mechanical and Aerospace Engineering (CMAE 2011) New Delhi India
CMAE 2011 will be published in the conference proceeding by IEEE, which will be included in IEEEXplore, and indexed by INSPEC, ISI and Ei Compendex.
19 2011 International Conference on Network Communication and Computer ¨C ICNCC 2011 New Delhi India
ICNCC 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex.
21 ACM SAC 2011 - Intelligent Robotic Systems (ROBOT Track) TaiChung, Taiwan Taiwan
21 International Conference for Academic Disciplines Orlando Florida
25 INTELLECTBASE INTERNATIONAL CONSORTIUM -15TH ACADEMIC CONFERENCE San Antonio TX
Intellect base International Academic Consortium is Multidisciplinary and accepts papers from BUSINESS, EDUCATION, SCIENCE, TECHNOLOGY,MANAGEMENT, ADMINISTRATION, POLITICS, SOCIAL, etc. Devoted to Refereed Publications.
25 2011 Faculty Student Multidiscipline Global Conference Peterborough Canada
25 2011 International Conference on Key Engineering Materials(ICKEM 2011) Sanya China
All papers accepted for ICKEM 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
26 ISAC-2011 Lucknow India
26 Aceh Development International Conference 2011 (ADIC2011) Kuala Lumpur Malaysia

April 2011

01 2011 IEEE International Conference on Industrial and Intelligent Information (ICIII 2011) Bali Island Indonesia
ICIII 2011 conference proceedings will be included in the IEEE Xplore, and indexed by INSPEC, Thomson ISI, Ei Compendex.
01 2011 International Conference on Fluid Dynamics and Thermodynamics Technologies (FDTT 2011) Bali Indonesia
All registered papers of FDTT 2011 will be published into Conference proceedings by the IEEE, which will be included in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.
01 2011 International Conference on Environment Science and Engineering - ICESE 2011 Bali Island Indonesia
The ICESE 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex, ISI Proceeding and other indexing services.
04 Senior Road Executive Programme 2011 Birmingham United Kingdom
04 2nd Annual Global IEEE Engineering Education Conference Amman Jordan
04 Dimensions of Goodness South Bend IN
06 FIFTH AFRICAN REGIONAL CONFERENCE ON SUSTAINABLE DEVELOPMENT Ambrose Alli University, Ekpoma, Edo State Nigeria
08 2011 3rd International Conference on Electronics Computer Technology(ICECT 2011) Kanyakumari India
The ICECT 2011 conference proceedings will be published by IEEE, which will be included in IEEEXplore, and indexed by the Ei Compendex, ISI Proceedings and other indexing services.
08 2011 International Conference on Network and Computer Science (ICNCS 2011) Kanyakumari India
All conference papers will be published inthe proceedings of the ICNCS 2011 conference and will be included in IEEE Xplore, and indexed by the Ei Compendex and Thomson ISI (ISTP).
08 National Conference on Sustainable Development in Energy Sector Dehradun India
10 34th International Symposium for Remote Sensing of the Environment (ISRSE) Sydney Australia
10 Engineering Sustainability 2011: Innovation and the Triple Bottom Line Pittsburgh PA
12 Smart Substations 2011 Sydney Australia
13 39th Annual Convention - National Structure Concrete Specification: Use and application Daventry United Kingdom
14 VII EUROPEAN CONGRESS IAGG-ER: HEALTHY AND ACTIVE AGEING FOR ALL EUROPEANS II BOLOGNA Italy
15 2011 International Conference on Knowledge Discovery (ICKD 2011) Chengdu China
The ICKD 2011 conference papers will be published into conference proceedings by IEEE, and will be included in the IEEE Xplore, and indexed by EiCompendex, Thomson ISI and INSPEC.
15 2011 International Conference on Engineering and Information Management (ICEIM 2011) Chengdu China
The ICEIM 2011 conference papers will be published into conference proceedings by IEEE, and will be included in the IEEE Xplore, and indexed by EiCompendex and INSPEC.
19 ICMSAO 2011-FOURTH INTERNATIONAL CONFERENCE ON MODELING, SIMULATION AND APPLIED OPTIMIZATION kuala lumpur Malaysia
25 The Fourth International Conference on Modelling and Simulation (ICMS2011) Phuket Island, Thailand
26 Building Envelopes Asia 2011 Singapore Singapore
26 Compliance in the Global Supply Chain Houston Texas
29 2011 Faculty Student Multidiscipline Global Conference Hong Kong China
29 2011 Faculty Student Multidiscipline Global Conference Yerevan Armenia
29 2011 International Conference on Applied Physics and Mathematics (ICAPM 2011) Chennai India
The ICAPM 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex andother indexing services.

May 2011

09 Sustainability through Resource Conservation and Recycling (SRCR '11) Falmouth United Kingdom
09 Fluid Structure Interaction 2011 Orlando Florida
10 Automation and Control for Energy Manchester United Kingdom
11 Climate Change and the Minerals Industry (CCMI '11) Falmouth United Kingdom
12 5th Symposium on Advances in Science and Technology Mashhad Iran
12 Advances in Applied Physics and Materials Science Congress Antalya Turkey
12 The 2nd International Leather Engineering Congress on Innovative Aspects for Leather Industry - IAFLI 2011 Izmir Turkey
13 Risk-Based Approaches to Major Decisions (Risk '11) Falmouth United Kingdom
13 Ferrocement Society 2011 Pune India
16 V Latin American Congress on Biomedical Engineering Havana Cuba

17 1st International Conference on Light in Engineering, Architecture and the Environment Poznan Poland
20 Second International Symposium on Compliant Mechanisms (CoMe2011) Delft Netherlands
22 World Environmental and Water Resources Congress Palm Springs California
22 5th Annual Cost-Effective Sustainable Design & Construction Middle East Abu Dhabi United Arab Emirates
23 American Canadian Conference for Academic Disciplines Toronto Canada
26 Global Management, Finance & Information Technology Research Conference, New York New York New York
26 DEMI 2011 Banjaluka Bosnia and Herzegovina
The Faculty of Mechanical Engineering at the University of Banjaluka every second year organizes a traditional conference on achievements of electrical, mechanical and informatic engineering, with acronym DEMI.
27 The 2011 International Conference on Computer Applications and Network Security (ICCANS 2011) Maldives Maldives
27 2011 Faculty Student Multidiscipline Global Conference Paris France
28 2011 International Conference on Circuits, System and Simulation Bankok Thailand
29 The 2011 International Congress on Advances in Measurements, Testing and Instrumentation Orlando Florida
30 Second International Conference for Academic Disciplines at Harvard Boston
31 Computational Methods and Experimental Measurements 2011 New Forest United Kingdom

June 2011

01 The 13th IASTED International Conference on Control and Applications ~CA 2011~ Vancouver Canada
01 The 13th IASTED International Conference on Control and Applications Vancouver Canada
01 FOURTH INTERNATIONAL CONFERENCE ON RESEARCH AND DEVELOPMENT Universite de Lome, Republic of Togo Togo
01 ABSRC 2011 Venice - Advances in Business-Related Scientific Research Conference 2011 in Venice - Venezia Venice Italy
ABSRC is an important international gathering of business and business-related sciences scholars and educators.
02 Management, Finance and Accouting Research Conference, Hawaii Honolulu Hawaii
05 Festival of International Conferences on Caregiving, Disability, Aging and Technology Toronto Canada
06 2011 Barcelona European Academic Conference Barcelona Spain
Please join us for our 2011 Barcelona European Academic Conference, June 6-9, 2011 convening at the NH Calderon. We offer four tracks at this conference: Business & Economics, Education, Engineering Education, and Health Sciences.
07 INTERNATIONAL Building and Infrastructure Technology Conference 2011 PENANG Malaysia
07 Euro-American Conference for Academic Disciplines Aix-en-Provence France
08 Cell Line Development and Engineering Boston MA
13 International Conference on Advanced Research and Applications in Mechanical Engineering Beirut Lebanon
16 International Business, Finance and Economics Research Conference, Los Angeles Los Angeles California
16 ignite 2011 Suisse Geneva Switzerland
16 2011 ACSA Teachers Seminar: Performative Practices: Architecture and Engineering in the Twenty-First Century New York New York
16 SIBR Conference on Interdisciplinary Business and Economics Research: Advancing Knowledge from Interdisciplinary Perspectives Bangkok Thailand
The SIBR Conference invites submission of papers/abstracts from all business and economics disciplines. Refereed journals edited by SIB Committee members will publish selected papers.
21 Euro-American Conference for Academic Disciplines Prague Czech Republic
21 Computational Modelling '11 Falmouth United Kingdom
22 ACSSSR2011 - ASEAN Conference on Scientific and Social Science Research 2011 Penang Malaysia
23 Physical Separation '11 Falmouth United Kingdom
24 2011 Faculty Student Multidiscipline Global Conference Roorkee India
28 33rd International Conference on Boundary Elements and other Mesh Reduction Methods New Forest United Kingdom

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ECOLOGY CONFERENCES WORLDWIDE
Upcoming events in Ecology and related fields

January 2011

21 Environmental Innovations for Resource Sustainability (EIRS-2011) JALGAON India
31 14th Annual EUEC - Energy & Environment Conference Phoenix AZ

February 2011

02 THE INTERNATIONAL EXHIBITION FOR GREEN GROWTH PROFESSIONALS Cannes France
03 INTERNATIONAL GREEN GROWTH AND ENVIRONMENTAL SOLUTIONS EXHIBITION Cannes France
06 Environmental Health 2011 - Resetting Our Priorities Salvador Brazil
12 14th International poster session Ecosystems, Organisms, Innovations - 14 Amherst Massachusetts
18 Reading Coastal Footprints: Ecology and Maritime Archaeology in the Pacific Hilo Hawaii
19 2011 IEEE International Conference on Prudent Development and Renewable Energy Resources Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEE Xplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Product Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex and ISI.
23 Cooperation for Waste Issues Kharkiv Ukraine
25 UGC SPONSORED TWO DAYS NATIONAL CONFERENCE ON OCCUPATIONAL HEALTH AND STRESS Dindugul- Gandhigram India
26 2011 International Conference on Bioscience, Biochemistry and Bioinformatics - ICBBB 2011 Singapore Singapore
ICBBB 2011 proceedings will be published by IEEE. All the presented papers will be archived in IEEEXplore and Indexed by Ei Compendex and ISI.

March 2011

05 GLOBAL CONFERENCE ON ENTOMOLOGY Chiang Mai Thailand
07 International Conference for Academic Disciplines Las Vegas
22 International Symposium on Ecosystem-Based Management Burgos Spain
25 2011 International Conference on Future Environment and Energy (ICFEE 2011) Sanya China
All the registered papers will be published into conference proceedings by IEEE, and distributed at the conference. The proceedings will be included in the IEEE Xplore, and indexed by INSPEC, EiCompendex and Thomson ISI.
25 Recent Trends in Civil & Mechanical Engineering Tiruchirappalli India
25 2011 3rd International Conference on Bioinformatics and Biomedical Technology (ICBBT 2011) Sanya China
The ICBBT 2011 will be published in conference proceedings, and will be included in IEEEXplore and indexed by Ei Compendex, Thomson ISIand INSPEC.
30 ECOSMART-2011, 1st International Forum of Clean Technologies in Ukraine Kyiv Ukraine

April 2011

01 2011 International Conference on Fluid Dynamics and Thermodynamics Technologies (FDTT 2011) Bali Indonesia
All registered papers of FDTT 2011 will be published into Conference proceedings by the IEEE, which will be included in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.
01 2011 2nd International Conference on Biotechnology and Food Science(ICBFS 2011) Bali Island Indonesia
ICBFS 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEE Xplore, and indexed by EiCompendex and Thomson ISI.
05 ECClima - Estuaries in a Changing Climate Oporto Portugal
10 European Conference for Academic Disciplines Gottenheim near Freiburg Germany
11 5th IOTM - Fifth International Oligochaete Taxonomy Meeting Beatenberg Switzerland
13 7th EE & RES Congress and Exhibition for South East Europe Sofia Bulgaria
Ínergy efficient & RES solutions in the SEEuropean market will be presented. The forum incorporates the Congress, b2b Exhibition, Networking with 500+ high level industry representatives from the South-East European Region, Matchmaking, et
13 ECOSUD 2011 Alicante Spain
20 Society for Human Ecology Las Vegas Nevada
29 2011 International Conference on Applied Physics and Mathematics (ICAPM 2011) Chennai India
The ICAPM 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex and other indexing services.

May 2011

02 Conference on Wind Energy and Wildlife Impacts Trondheim Norway
07 2011 International Conference on Food Engineering and Biotechnology(ICFEB 2011) Bangkok Thailand
ICFEB 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEE Xplore, and indexed by EiCompendex.
16 Hands-on Workshop on Molecular Biotechnology and Bioinformatics Pune India
25 River Basin Management 2011` Riverside California
30 Int'l End-of-Academic-Year Multidisciplinary Conference Bad Hofgastein (outside Salzburg) Austria

June 2011

01 2011 International Symposium on Environmental Science and Technology Dongguan China
01 2nd International Conference on ECOLOGICAL THEOLOGY AND ENVIRONMENTAL ETHICS (ECOTHEE 2011) Chania Greece
EcoTHEE11 conference addresses the need for human response to ecological crisis. It aims at multi-disciplinary exchanges and insights, with a focus on religious-based and scientific approaches to environmental issues and human responsibility
07 Euro-American Conference for Academic Disciplines Aix-en-Provence France
08 International Conference on Eco-Dyeing/Finishing and Green Chemistry Hangzhou China
21 Euro-American Conference for Academic Disciplines Prague Czech Republic

July 2011

08 10th Global Conference: Environmental Justice and Global Citizenship Oxford United Kingdom
This event aims to explore the role of ecology and environmental thinking in the context of contemporary society and international affairs, and assess the implications for our understandings of fairness, justice and global citizenship.
17 9th International Plant Cold Hardiness Seminar (IPCHS) Luxembourg Luxembourg
18 15th International Congress of Myriapodology Brisbane Australia
18 The 2011 International Conference on Bioinformatics and Computational Biology (BIOCOMP'11) Las Vegas Nevada
18 The 2011 International Conference on Scientific Computing (CSC'11) Las Vegas Nevada
18 International Workshop on Innovation in Health Informatics (IWIHI'11) Las Vegas Nevada
29 2011 International Biodiversity Conference Banos Ecuador
We invite college professors and field experts to join an international group of researchers and field experts in wildlife conservation, ecology, tropical biology, and biogeography to present their findings and participate in Banos.

August 2011

17 International Conference on Environmental Pollution and Remediation (ICEPR'11) Ottawa Canada
24 15th IALS Conference Aberdeen India
30 Frontiers in Historical Ecology Birmensdorf Switzerland

September 2011

08 12th International Conference on Environmental Science and Technology (CEST2011) Rhodes Greece
11 The 19th International Conference on Environmental Indicators (September 11-14th, 2011) (ISEI) Haifa Israel
19 Groundwater: Our Source of Security in an Uncertain Future Pretoria South Africa
19 19th International Conference on Modelling, Monitoring and Management of Air Pollution Malta Malta
20 GEOMED2011 4th International Conference on Medical Geology BARI Italy
22 IN SEARCH OF SOLUTIONS: THE CONVENTIONAL, THE EXPERIMENTAL AND THE BIZARRE Hyderabad India
22 Feminist Theory and Music Tempe Arizona
23 The Caribbean: Aesthetics, Ecology, Politics Warwick University United Kingdom

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CONFERENCE ALERTS – ACADEMIC CONFERENCES WORLDWIDE IN 2011

ENVIRONMENTAL CONFERENCES WORLDWIDE
Upcoming events in Environmental Science, Ecology, Sustainable Development and related fields

January 2011

17 Pharmaceutical Microbiology London United Kingdom
17 The 45th Annual Convention of ISAE and International Symposium Nagpur India
17 3rd Annual Australian Cycling Conference Adelaide Australia
17 NATIONAL WORKSHOP ON OFFICIAL STATISTICS IN NATIONAL DEVELOPMENT Jalgaon India
18 4th USM-JIRCAS Joint International Symposium Malaysia
19 The third International Conference on the Integrated Healthy Hospital and Health Care Facilities Environment Alexandria Egypt
19 EU Energy Law & Policy - 6h Annual Conference Brussels Belgium
20 Webinar On IFRS Fixed Assets - Banking and Financial Webinar By ComplianceOnline Palo alto California
21 ICSE11 - International Conference on Science and Engineering Rohtak India
The scope of the Conference includes all the areas of Engineering Sciences. It encourages a broad spectrum of contribution in the engineering sciences. Articles of interdisciplinary nature are particularly welcome.
21 Environmental Innovations for Resource Sustainability (EIRS-2011) JALGAON India
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 2011 International Conference on Advanced Material Research (ICAMR 2011) Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
26 Retrofit Salford 2011 Salford United Kingdom
28 WATERCON 2011 - International Conference on Community based Water Resource Management GUWAHATI (INDIA) India
28 2011 International Winter Conference on Environmental Innovations and Sustainability Beppu Japan
28 National Conference on Biological wastewater treatment towards Green Environment Calicut India
29 National Conference on Recent trends and advances in the field of eco friendly operation of plant machineries, Automobile and Material handling system Bishnupur India
31 5th Quality Conference in the Middle East Dubai United Arab Emirates
31 "AGRICULTURE: PROMOTING LIVELIHOODS IN CONFLICT-AFFECTED ENVIRONMENTS" Monterey California
31 14th Annual EUEC - Energy & Environment Conference Phoenix AZ
31 Hamdan Bin Mohammed e-University Annual Congress Dubai United Arab Emirates
Hamdan Bin Mohammed e-University cordially welcomes all those engaged in triggering and managing educational change, healthcare and social governance in submitting abstracts on the related themes.

February 2011

01 National Conference on Research in Chemical Sciences 2011 Beed India
01 Rational Recreation: Histories of Travel, Tourism and Leisure Manchester United Kingdom
02 THE INTERNATIONAL EXHIBITION FOR GREEN GROWTH PROFESSIONALS Cannes France
02 SIX INTERNATIONAL CONFERENCE ON DEVELOPMENT STUDIES Benue State University, Markudi Nigeria
02 The 2011 Athens Tourism Symposium Athens Greece
03 Implementing the Human Right to Water in the West Salem Oregon
03 INTERNATIONAL GREEN GROWTH AND ENVIRONMENTAL SOLUTIONS EXHIBITION Cannes France
03 Water NI Belfast United Kingdom
06 Environmental Health 2011 - Resetting Our Priorities Salvador Brazil
07 Endangerment and Its Consequences Berlin Germany
10 National Seminar on Recent Advances on Synthesis and Catalysis Dibrugarh India
10 TOWARDS ELECTRICITY INFRASTRUCTURE FOR A CARBON NEUTRAL EUROPE Brussels Belgium
11 CE Marking: Obtaining and Maintaining EU Compliance Under the Medical Device Directive - Medical Device Webinar By ComplianceOnline Palo alto California
11 Health, Environment and Sustainable Development Tirupathi India
11 Clean India 2011 Hyderabad India

12 14th International poster session Ecosystems, Organisms, Innovations - 14 Amherst Massachusetts
14 National Seminar on Spatial Strategies for Sustainable Management SSSM 2011 Tiruchirappalli India
14 The 31st IASTED International Conference on Modelling, Identification and Control - MIC 2011 Innsbruck Austria
14 International Conference on Energy Systems and Technologies Cairo Egypt
14 PHEV - Delivering a low risk fleet with Intelligent Energy London United Kingdom
17 Policy Seminar: Geographical perspectives on food, water and energy security to 2030 (A Perfect Storm Ahead) London United Kingdom
18 Reading Coastal Footprints: Ecology and Maritime Archaeology in the Pacific Hilo Hawaii
19 2011 IEEE International Conference on Prudent Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Product Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and Allthe presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Technological Advancements in Civil Engineering(ICTACE 2011) Hyderabad India
The conference proceedings will be published byIEEE Press, which will be included in the IEEEXplore, and indexed by INSPEC, Ei Compendex, ISIProceeding and other indexing services.
19 2011 International Conference on Technological Advancements in Civil Engineering (ICTACE 2011) Hyderabad India
The ICTACE 2011 proceeding will be published by IEEE Press, which will be included in the IEEE Xplore, and indexed by INSPEC, Ei Compendex, ISI Proceeding and other indexing services.
19 Modern Answers to Ancient Mysteries York United Kingdom
22 Hospital Waste Management 2011 Sydney Australia
22 Environmental Management in Mining 2011,Perth Perth Australia
22 1st Regional Health Sciences and Nursing Conference 2011 Shah Alam Malaysia
22 Eilat-Eilot Int'l Renewable Energy Conference Eilat Iceland
23 Cooperation for Waste Issues Kharkiv Ukraine
23 Sustainable Development 2011: 1st Annual European Postgraduate Symposium, Ireland Dublin Ireland
23 Sustainable Development: harnessing the energy of communities London United Kingdom
24 International Conference on "Relevance of Policy Reforms on Development: Challenges before Emerging Economies New Delhi India
25 India Emerging: Opportunity and Challenges Greater Noida India
25 Tribes, Land & the Environment Washington DC
26 2010 3rd IEEE International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
ICSAP 2011 will be published in the conference proceeding by IEEE, and all papers in the proceedings will be listed in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.
26 2011 2nd International Conference on Environmental Science and Technology(ICEST 2011) Singapore Singapore
ICEST 2011 will be published in the conference proceeding by IEEE, and all papers will be included in the IEEE Xplore, and indexed by the INSPEC, Ei Compendex and Thomson ISI.
26 2011 2nd International Conference on Environmental Science and Technology Singapore Singapore
ICEST 2011 will be published in the conference proceedings by IEEE. All papers will be included in the IEEE Xplore, and indexed by the INSPEC, EiCompendex and Thomson ISI.
26 2011 International Conference on Bioscience, Biochemistry and Bioinformatics - ICBBB 2011 Singapore Singapore
ICBBB 2011 proceedings will be published by IEEE. All the presented papers will be archived in IEEEXplore and Indexed by Ei Compendex and ISI.
27 WM Symposia 2011 Phoenix Arizona

March 2011

01 Carbon Market Insights (CMI) 2011 Amsterdam Netherlands
02 2011 EHS MIS Conference San Antonio TX
03 CleanEquity Monaco 2011 Monte Carlo Monaco
03 Green Investment Congress India 2011 Mumbai India
04 1st INTERNATIONAL CONFERENCE ON GOVERNANCE FOR SUSTAINABLE DEVELOPMENT OF CARIBBEAN SMALL ISLAND DEVELOPING STATES Willemstad Netherlands Antilles
Introducing the UNESCO Chair Caribbean Small Island Developing States The governance of Caribbean SIDS for sustainable development is a big challenge. Besides nature human behavior puts a lot of pressure on this development.
05 Education and Development Conference 2011 Bangkok Thailand
05 GLOBAL CONFERENCE ON ENTOMOLOGY Chiang Mai Thailand
05 Valuing Lives New York NY
05 3rd National Civil Engineering Students' Symposium(NCESS) Mumbai India
06 Mediterranean Conference for Academic Disciplines Gozo Malta
07 INTERNATIONAL CONFERENCE ON WATER RESOURCES ENGINEERING & MANAGEMENT 2011 Lahore Pakistan
07 International Conference for Academic Disciplines Las Vegas
08 Subtropical Cities 2011: Subtropical Urbanism Beyond Climate Change Fort Lauderdale Florida
The 3rd biennial Subtropical Cities conference will address cross-cutting and interdisciplinary themes concerning the future of subtropical cities. Themes include: Built environment and ecology, Social Economics, and Cultural/Place Identity
11 2011 3rd IEEE International Conference on Computer Research and Development (ICCRD 2011) Shanghai China
ICCRD 2011 will be indexed by IEEE Xplore, Thomason ISI, Ei Compendex and other major indexing services.
12 National Conference on Water & Environment Bhopal (M.P.) India
17 Sustainable living London United Kingdom
17 Material Environment and Durability Hammamet Tunisia

17 The Sustainable Business Summit - Business in Evolution London United Kingdom
The Sustainable Business Summit will show you how putting environmental and social responsibility at the heart of management practices is key to securing the long-term future of your company
17 Westminster Energy, Environment & Transport Forum Keynote Seminar - Aviation in the 21st century: prospects for growth and greater sustainability London United Kingdom
18 Armed Forces Public Health Conference Hampton Roads Virginia
18 Air and Water components of the Enviroment Cluj-Napoca Romania
20 18th International Farm Management Congress Christchurch New Zealand
Biennial International Congress - 3 days presentations, 2 days field trip options, contributed papers peer review and non-peer review and posters - submit in full by Sept 30th.Accompanying Person Programme. Pre and PostCongress Tours
20 ST Environment : International Congress on Environmental Science and Technologies for a Sustainable Development Hammamet - TUNISIA Tunisia
21 International Conference for Academic Disciplines Orlando Florida
21 Gathering Our Voices 2011 Aboriginal Youth Conference Prince Rupert Canada
21 AOP' Tunisia : International conference on Advanced Oxidation Process "for sustainable water management" Hammamet Tunisia
22 International Symposium on Ecosystem-Based Management Burgos Spain
22 Oil and Gas Field Services London United Kingdom
22 The 1st Environment Asia International Conference Bangkok Thailand
22 Greenbelts: Local Solutions for Global Challenges Toronto Canada
23 The International Conference on Sustainable Systems and the Environment Sharjah United Arab Emirates
23 Energizing South East Asia Perth Australia
23 Spatial Statistics 2011 - Mapping Global Change Enschede Netherlands
24 International Conference on Thermal Energy and Environment Madurai India
25 The International Conference on Management and Sustainable Development Wuhan China
25 Recent Trends in Civil & Mechanical Engineering Tiruchirappalli India
25 2011 3rd International Conference on Bioinformatics and Biomedical Technology (ICBBT 2011) Sanya China
The ICBBT 2011 will be published in conference proceedings, and will be included in IEEEXplore and indexed by Ei Compendex, Thomson ISI and INSPEC.
25 2011 International Conference on Key Engineering Materials(ICKEM 2011) Sanya China
All papers accepted for ICKEM 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
25 2011 International Conference on Future Environment and Energy (ICFEE 2011) Sanya China
All the registered papers will be published into conference proceedings by IEEE, and distributed at the conference. The proceedings will be included in the IEEE Xplore, and indexed by INSPEC, EiCompendex and Thomson ISI.
27 Keystone Symposia: Environmental Epigenomics and Disease Susceptibility Asheville North Carolina
30 GLOBALCON 2011 Philadelphia PA
30 ECOSMART-2011, 1st International Forum of Clean Technologies in Ukraine Kyiv Ukraine
31 International Conference on Agricultural Engineering Pattaya Thailand
31 Sustainable Environment Technologies SET2011 at The Los Angeles Convention Center Los Angeles California
31 SET2011 Los Angeles CA
31 Sustainable Environment Technologies-SET 2011 Los Angeles CA
31 Following the Foresight project on Global Food and Farming Futures - next steps for policy London United Kingdom

April 2011

01 2011 International Conference on Fluid Dynamics and Thermodynamics Technologies (FDTT 2011) Bali Indonesia
All registered papers of FDTT 2011 will be published into Conference proceedings by the IEEE, which will be included in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.
01 2011 2nd International Conference on Biotechnology and Food Science(ICBFS 2011) Bali Island Indonesia
ICBFS 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEE Xplore, and indexed by EiCompendex and Thomson ISI.
01 2011 International Conference on Environment Science and Engineering - ICESE 2011 Bali Island Indonesia
The ICESE 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex, ISI Proceeding and other indexing services.
03 Brownfields 2011: Sustainable Communities Start Here Philadelphia Pennsylvania
04 Zoosemiotics and Animal Representations Tartu Estonia
05 ECClima - Estuaries in a Changing Climate Oporto Portugal
06 FIFTH AFRICAN REGIONAL CONFERENCE ON SUSTAINABLE DEVELOPMENT Ambrose Alli University, Ekpoma, Edo State Nigeria
06 Water & Environment 2011: CIWEM's Annual Conference London United Kingdom
07 5th PCF World Summit Zurich Switzerland
07 Fix a Lake and Grow a City - A Case Study of Rotorua Rotorua New Zealand
08 CR3 Conference: The Power of Responsibility Helsinki Finland
08 National Conference on Sustainable Development in Energy Sector Dehradun India
10 Engineering Sustainability 2011: Innovation and the Triple Bottom Line Pittsburgh PA
10 European Conference for Academic Disciplines Gottenheim near Freiburg Germany
10 CleanMining 2011: 9th International Conference on Clean Technologies for the Mining Industry Santiago Chile
11 Energy and Sustainability 2011 Alicante Spain
11 5th IOTM - Fifth International Oligochaete Taxonomy Meeting Beatenberg Switzerland
11 Energy Efficiency for Business London United Kingdom
12 Environmental Conference 2011 Kuala Lumpur Malaysia
12 AAG Annual Meeting Seattle Washington

13 7th EE & RES Congress and Exhibition for South East Europe Sofia Bulgaria
Energy efficient & RES solutions in the SE European market will be presented. The forum incorporates the Congress, b2b Exhibition, Networking with 500+ high level industry representatives from the South-East European Region, Matchmaking, et
13 The Right to Education: Reaching Every Child New Orleans Louisiana
13 The Right to Education: Reaching Every Child New Orleans Louisiana
13 ECOSUD 2011 Alicante Spain
13 Environmental International Forum SAVE the Planet - Waste & Water Management, Recycling Sofia Bulgaria
14 Electrical Interconnection of the Caribbean Gurabo Puerto Rico
14 Advances in Tourism Economics 2011 Lisbon Portugal
ATE2011 is the 4th edition of the biennial conference series on Advances in Tourism Economics(ATE). The 2011 conference welcomes papers in all areas of tourism research, given that inappropriate economic background is provided.
20 CONSIDERING RESEARCH: Reflecting upon current themes in Architectural Research Detroit Michigan
20 Society for Human Ecology Las Vegas Nevada
22 Clean India 2011 Hyderabad India
27 2nd International Conference on Physical Coastal Processes, Management and Engineering Naples Italy
28 Keewatin Country Graduate History Conference Moose Jaw Canada
29 The Death + Life of Social Factors: A Conference Reexamining Behavioral and Cultural Research in Environmental Design Berkeley CA
29 2011 International Conference on Applied Physics and Mathematics (ICAPM 2011) Chennai India
The ICAPM 2011 conference proceeding will be published by IEEE, which will be included in the IEEEXplore, and indexed by the Ei Compendex andother indexing services.

May 2011

02 Conference on Wind Energy and Wildlife Impacts Trondheim Norway
02 New Developments in Theory and Applications of Statistics: An International Conference in Memory of Professor Moti Lal Tiku ANKARA Turkey
03 The Responsible Business Summit London United Kingdom
05 The City: 2nd International Conference - Culture, Society, Technology Vancouver Canada
Present your research at our second international The City' conference in the beautiful setting of Vancouver. Proposals for papers and posters in all disciplines that address the concept of The City are welcome. Papers will be published.
07 2011 International Conference on Food Engineering and Biotechnology(ICFEB 2011) Bangkok Thailand
ICFEB 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEEXplore, and indexed by EiCompendex.
08 International Sustainable Development Research Conference New York New York
08 Waste - The Social Context. People, Policies, Persuasions and Payoffs Edmonton Canada
10 6th Asia Pacific Biotechnology Congress and 40th Annual Convention and Scientific Meeting of the Philippine Society for Microbiology, Inc. Manila Philippines
10 World Conference on Drowning Prevention Danang Vietnam
11 Disaster Management 2011 Orlando Florida
11 Asian Congress on Biotechnology 2011 (ACB-2011) Shanghai China
11 17th International Energy and Environment Fair and Conference Istanbul Turkey
11 Human Rights and Ethics Qom Iran
13 Sustainable Enterprise Conference Rohnert Park CA
13 Environmental Pollution and Public Health (EPPH2011) Special Track within iCBBE2011 Wuhan China
13 The 17th International Symposium on Society and Resource Management (ISSRM) Kota Kinabalu Malaysia
16 Hands-on Workshop on Molecular Biotechnology and Bioinformatics Pune India
16 6th Annual International Symposium on Environment Athens Greece
17 1st International Conference on Light in Engineering, Architecture and the Environment Poznan Poland
18 9th International JTEFS/BBCC Conference Sustainable Development. Culture. Education Siauliai Lithuania
18 Consuming Asian America New Orleans Other
18 3rd. International and 12th. National Socioeconomic and Environmental Research Conference on Livestock Farming Morelia Mexico
19 Revisiting the Socio-Political and Technological Dimensions of Climate Change Preston United Kingdom
22 World Environmental and Water Resources Congress Palm Springs California
23 16th International Conference on Education 2011 Bandar Seri Begawan Brunei Darussalam
23 Water Resources Management 2011 Riverside California
23 International Conference on Chemical Innovation (ICCI 2011) Kemaman Malaysia
23 American Canadian Conference for Academic Disciplines Toronto Canada
25 EDRA 42 - 2011 Chicago Illinois
25 Growing Old in a Changing Climate Vancouver Canada
25 4th International Congress of Energy and Environment Engineering and Management (CIIEM) Mérida Spain
25 River Basin Management 2011` Riverside California
28 International Conference On Rural Development And Enterpreneurship (ICORE 2011) Kuching Malaysia
This conference will explore policies avenues and experiences and contributing factors for promoting rural development.
30 Second International Conference for Academic Disciplines at Harvard Boston
30 Int'l End-of-Academic-Year Multidisciplinary Conference Bad Hofgastein (outside Salzburg) Austria
31 2nd Annual Greening Government Conference Toronto Canada

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NANOTECHNOLOGY & SMART MATERIALS CONFERENCES WORLDWIDE
Upcoming events in Nanotechnology and related fields

January 2011

14 2011 International Conference on Information and Industrial Electronics(ICIIE 2011) Chengdu China
The conference proceeding of ICIIE 2011 will be published by IEEE Press, which will be included inthe IEEE Xplore, and indexed by INSPEC, EiCompendex and other indexing services.
21 2011 3rd IEEE International Conference on Computer and Automation (ICCAE 2011) Chongqing China
ICCAE 2011 will be published in the conference proceeding, and will be included in the IEEEXplore, and indexed by INSPEC, Thomson ISI Proceeding (ISTP), Ei Compendex.
21 2011 International Conference on Security Science and Technology(ICSST 2011) Chongqing China
The ICSST 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex, ISI Proceeding and other indexing services.
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 2011 IEEE 3rd International Conference on Computer and Automation Engineering (ICCAE 2011) Chongqing China
The ICCAE 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and be indexed by Ei Compendex and Thomason ISI Proceeding.
26 2011 International Conference on Information and Computer Networks(ICICN 2011) Guiyang China
The ICICN 2011 proceedings will be published byIEEE and All the papers will be archived in the IEEE Xplore and indexed by Ei Compendex.
27 National Conference on Emerging trends in VLSI, Embedded and Nano Technologies,NC-EVENT 2011,27-28 JANUARY, 2011 (IEEE,Electron Devices Sponsored) CHENNAI India
28 Jigyasa-11 Nagpur India
29 Current Trends in Biological Sciences Ulhasnagar India

February 2011

06 Environmental Health 2011 - Resetting Our Priorities Salvador Brazil
09 76th ICS meeting Celebrating the year of Chemistry Tel Aviv Israel
10 National Seminar on Recent Advances on Synthesis and Catalysis dibrugarh India
13 32nd Australasian Polymer Symposium (32APS) Coffs Harbour Australia
14 International Conference on Intelligent Systems and Networks. Yamunanagar,Haryana. India
16 1st National Conference on Nano Science and Technology Yazd Iran
18 International Multiconference on Intelligent Systems, Sustainable, New and Renewable Energy Technology & Nanotechnology (IISN-2011) Yamunanagar India
19 2011 IEEE International Conference on Prudent Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEE Xplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Technological Advancements in Civil Engineering (ICTACE 2011) Hyderabad India
The ICTACE 2011 proceeding will be published by IEEE Press, which will be included in the IEEE Xplore, and indexed by INSPEC, Ei Compendex, ISI Proceeding and other indexing services.
19 2011 International Conference on Technological Advancements in Civil Engineering(ICTACE 2011) Hyderabad India
The conference proceedings will be published by IEEE Press, which will be included in the IEEEXplore, and indexed by INSPEC, Ei Compendex, ISI Proceeding and other indexing services.
23 XV NATIONAL SEMINAR ON CRYSTAL GROWTH (with international participation) Tirunelveli, India India
26 2011 3rd IEEE International Conference on Machine Learning and Computing (ICMLC 2011) Singapore Singapore
ICMLC 2011 will be included in the IEEE Xplore, and indexed by INSPEC, Thomson ISI Proceeding (ISTP), Ei Compendex.
26 2011 2nd International Conference on Mechanical, Industrial, and Manufacturing Technologies (MIMT 2011) Singapore Singapore
MIMT 2010 will be published in the conferenceproceeding, and will be included in the IEEEXplore, and indexed by INSPEC, Thomson ISI Proceeding (ISTP), Ei Compendex.
26 2010 3rd IEEE International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
ICSAP 2011 will be published in the conference proceeding by IEEE, and all papers in the proceedings will be listed in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.

26 2011 3rd International Conference on Machine Learning and Computing (ICMLC 2011) Singapore Singapore
ICMLC 2011 will be published in the conference proceedings by IEEE, which will be included in IEEE Xplore and indexed by INSPEC, ISI and EiCompendex.
26 2011 2nd International Conference on Mechanical, Industrial, and Manufacturing Technologies (MIMT 2011) Singapore Singapore
The accepted papers will be indexed by major indexing services such as INSPEC, EI (Compendex), and Thomson ISI (ISTP).
26 International Conference on Nanoelectronics (ICONE 2011) Salem India
27 TMS2011 - 140th Annual Meeting & Exhibition San Diego California
27 Nanotech Insight "Because Small Matter is No Small Matter." Cairo Egypt

March 2011

04 National Conference on Emerging Trends and Applications in Computer Science-2011 Shillong India
07 International Conference for Academic Disciplines Las Vegas
11 2011 3rd IEEE International Conference on Computer Research and Development (ICCRD 2011) Shanghai China
ICCRD 2011 will be indexed by IEEE Xplore, Thomason ISI, Ei Compendex and other major indexing services.
11 2011 International Conference on Solid-State and Integrated Circuit (ICSIC 2011) Shanghai China
ICSIC 2011 will be published in the conference proceedings by IEEE, which will be included in the IEEE Xplore, and indexed by INSPEC and Ei Compendex.
13 First International Conference on Value addition & innovation in Textile Faisalabad Pakistan
13 Pittcon 2011 Atlanta Georgia
19 2011 International Conference on Control, Robotics and Cybernetics (ICCRC 2011) New Delhi India
All papers will also be published in the ICCRC2011 conference proceeding by IEEE Press, which will be included in IEEE Xplore, and indexed by Thomason ISI and Ei Compendex.
19 2011 International Conference on Mechanical and Aerospace Engineering (CMAE 2011) New Delhi India
CMAE 2011 will be published in the conference proceeding by IEEE, which will be included in IEEEXplore, and indexed by INSPEC, ISI and Ei Compendex.
19 2011 International Conference on Network Communication and Computer ¨C ICNCC 2011 New Delhi India
ICNCC 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex.
21 World Congress on Biotechnology Hyderabad Other
25 2011 International Conference on Key Engineering Materials(ICKEM 2011) Sanya China
All papers accepted for ICKEM 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
25 National Conference on Natural Products Research-NCNPR2011 Coimbatore India
30 National Conference on Advancement and Future trends in VLSI Design (NCVD'11) krishnankoil(near madurai) India

April 2011

01 2011 IEEE International Conference on Industrial and Intelligent Information (ICIII 2011) Bali Island Indonesia
ICIII 2011 conference proceedings will be included in the IEEE Xplore, and indexed by INSPEC, Thomson ISI, Ei Compendex.
01 2011 International Conference on Industrial and Intelligent Information (ICIII 2011) Bali Island Indonesia
The ICIII 2011 conference papers will be published as conference proceedings by IEEE, and will be included in IEEE Xplore, and indexed by EiCompendex, Thomson ISI and INSPEC.
05 The First International Conference on Small Satellites Systems - CSSS2011 Paris France
08 2011 3rd International Conference on Electronics Computer Technology(ICECT 2011) Kanyakumari India
The ICECT 2011 conference proceedings will be published by IEEE, which will be included in IEEEXplor, and indexed by the Ei Compendex, ISIProceedings and other indexing services.
08 2011 International Conference on Network and Computer Science (ICNCS 2011) Kanyakumari India
All conference papers will be published in the proceedings of the ICNCS 2011 conference and will be included in IEEE Xplore, and indexed by the Ei Compendex and Thomson ISI (ISTP).
10 European Conference for Academic Disciplines Gottenheim near Freiburg Germany
11 GRAPHENE 2011 Bilbao Spain
13 EV Battery Forum (the 3rd) Barcelona Spain
Speakers already confirmed include: RENAULT, MAHINDRA & MAHINDRA, LUXGEN, OPEL, NISSAN, TOYOTA. The conference features a separate full day on EV Charging Infrastructure and a series of workshop in parallel to the exhibition.
14 1st Geant4 Australian User Workshop Wollongong Australia
15 2011 International Conference on Knowledge Discovery (ICKD 2011) Chengdu China
The ICKD 2011 conference papers will be published into conference proceedings by IEEE, and will be included in the IEEE Xplore, and indexed by EiCompendex, Thomson ISI and INSPEC.
15 2011 International Conference on Engineering and Information Management (ICEIM 2011) Chengdu China
The ICEIM 2011 conference papers will be published into conference proceedings by IEEE, and will be included in the IEEE Xplore, and indexed by EiCompendex and INSPEC.
27 CAPE 2011 - 22nd International Conference on Computer-Aided Production Engineering Alexandria Egypt
29 2011 International Conference on Applied Physics and Mathematics (ICAPM 2011) Chennai India
The ICAPM 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex and other indexing services.

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CHEMISTRY, POLYMERS AND PLASTICS CONFERENCES WORLDWIDE
Upcoming events in Chemistry and related fields, Polymer and Plastic Research and Technology

January 2011

20 Best Practices for Regulatory Safety Testing: Assessing the Potential for Chemically Induced Allergic Contact Dermatitis Washington DC
21 Keystone Symposia: Epithelial Plasticity and Epithelial to Mesenchymal Transition Vancouver Canada
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 2011 International Conference on Advanced Material Research (ICAMR 2011) Chongqing China
All accepted papers of ICAMR 2011 will bepublished by Advanced Materials Research Journal, which will be indexed by EI Compendex.
28 National Conference on Biological wastewater treatment towards Green Environment Calicut India

February 2011

01 Bioplastics -Reshaping and Industry Las Vegas NV
01 National Conference on Research in Chemical Sciences 2011 Beed India
07 ISRANALYTICA 2011 Tel Aviv Israel
07 InformexUSA 2011 Charlotte North Carolina
09 76th ICS meeting Celebrating the year of Chemistry Tel Aviv Israel
13 32nd Australasian Polymer Symposium (32APS) Coffs Harbour Australia
13 32nd Australasian Polymer Symposium (32APS) Coffs Harbour Australia
13 Gordon Research Conference on Nitric Oxide Ventura Other
14 World Cards & Payments Summit 2011 Dubai United Arab Emirates
19 2011 IEEE International Conference on Prudent Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEE Xplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Product Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and Allthe presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex and ISI.
23 SECOND INTERNATIONAL CONFERENCE ON MATERIAL FOR THE FUTURE(ICMF 2011) THRISSUR India
24 China Bio-Agriculture Industry Summit 2011 Shanghai China
24 Recent Trends in Organic Synthesis-2011 Tiruchirappalli India
25 UGC SPONSORED TWO DAYS NATIONAL CONFERENCE ON OCCUPATIONAL HEALTH AND STRESS Dindugul- Gandhigram India
25 National Conference On Emerging Trends in Engineering & Technology Kozhikode India
26 2010 3rd IEEE International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
ICSAP 2011 will be published in the conference proceeding by IEEE, and all papers in the proceedings will be listed in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.
26 2011 International Conference on Bioscience, Biochemistry and Bioinformatics - ICBBB 2011 Singapore Singapore
ICBBB 2011 proceedings will be published by IEEE. All the presented papers will be archived in IEEEXplore and Indexed by Ei Compendex and ISI.
26 2011 2nd International Conference on Mechanical, Industrial, and Manufacturing Technologies (MIMT 2011) Singapore Singapore
The accepted papers will be indexed by major indexing services such as INSPEC, EI (Compendex) and Thomson ISI (ISTP).
27 iECS 2011 - International Edelstein Color Symposium: The Science & Art of Color Ramat-Gan Israel

March 2011

01 National Technical Symposium About Bioplastics & Biopolymers Aurangabad India
06 Mediterranean Conference for Academic Disciplines Gozo Malta
10 5th Glycan Forum Berlin Germany
13 First International Conference on Value addition & innovation in Textile Faisalabad Pakistan

13 Pittcon 2011 Atlanta Georgia
18 PlastAvenues Summit 2011 Mumbai India
18 International Conference on Innovative Science & Engineering Technology Rajkot India
19 2011 International Conference on Mechanical and Aerospace Engineering (CMAE 2011) New Delhi India
CMAE 2011 will be published in the conference proceeding by IEEE, which will be included in IEEEXplore, and indexed by INSPEC, ISI and Ei Compendex.
21 International Conference for Academic Disciplines Orlando Florida
23 BIT Life Sciences' 4 th Annual Protein and Peptide Conference(Pepcon-2011) Beijing China
23 Exploring Chemical Space: Synthesising the Drugs of Tomorrow London United Kingdom
25 2011 3rd International Conference on Bioinformatics and Biomedical Technology (ICBBT 2011) Sanya China
The ICBBT 2011 will be published in conference proceedings, and will be included in IEEEXplore and indexed by Ei Compendex, Thomson ISI and INSPEC.
25 2011 International Conference on Key Engineering Materials(ICKEM 2011) Sanya China
All papers accepted for ICKEM 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
28 MedChem Europe Munich Germany
30 City Gas Asia 2011 Kuala Lumpur Malaysia
30 34th Annual Meeting of the German Society of Cell Research (DGZ) Bonn Germany
30 Energy from Waste - Avoid wasting the opportunities Manchester United Kingdom

April 2011

01 2011 2nd International Conference on Biotechnology and Food Science(ICBFS 2011) Bali Island Indonesia
ICBFS 2011 will be published in the conference proceeding, and all papers in the proceedings willbe included in IEEE Xplore, and indexed by EiCompendex and Thomson ISI.
03 Brownfields 2011: Sustainable Communities Start Here Philadelphia Pennsylvania
04 ChemOrbis 2nd Annual Meeting Singapore Singapore
08 International Conference on Innovative Science & Engineering Technology Rajkot Gujarat India India
11 11 th International Conference of Chemistry & its Role in Development Mansoura & Sharm - ElSheikh Egypt
14 VII EUROPEAN CONGRESS IAGG-ER: HEALTHY AND ACTIVE AGEING FOR ALL EUROPEANS II Bologna Italy
19 The Sixth Jordanian International Conference of Chemistry Irbid Jordan
26 Compliance in the Global Supply Chain Houston Texas

May 2011

06 1st European Symposium in Male aesthetic medicine and surgery Barcelona Spain
07 2011 International Conference on Food Engineering and Biotechnology(ICFEB 2011) Bangkok Thailand
ICFEB 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEE Xplore, and indexed by EiCompendex.
07 2011 International Conference on Chemistry and Chemical Process(ICCCP 2011) Bangkok Thailand
ICCCP 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEEXplore, and indexed by EiCompendex.
12 The 2nd International Leather Engineering Congress on Innovative Aspects for Leather Industry - IAFLI 2011 Izmir Turkey
16 Plastics Modification via Additives, Compounding & Coatings Chicago IL
16 6th Annual International Symposium on Environment Athens Greece
16 Hands-on Workshop on Molecular Biotechnology and Bioinformatics Pune India
23 International Conference on Chemical Innovation (ICCI 2011) Kemaman Malaysia
23 American Canadian Conference for Academic Disciplines Toronto Canada
24 14th International Conference on Aerospace Sciences and Aviation Technology (ASAT-14) Cairo Egypt
30 Int'l End-of-Academic-Year Multidisciplinary Conference Bad Hofgastein (outside Salzburg) Austria
30 Second International Conference for Academic Disciplines at Harvard Boston

June 2011

01 The 5th Palestinian International Chemistry Conference (PICC 2011) Nablus Palestine
05 22nd North American Catalysis Society Detroit Michigan
07 Euro-American Conference for Academic Disciplines Aix-en-Provence France
19 12th Conference of the European Ceramic Society Stockholm Sweden
23 1st HEALING International Meeting on Hh-Gli Signalling in Development, Regeneration and Cancer Kolymbari Greece
27 25th National Chemistry Congress with International Participation Erzurum Turkey
30 Advances in Protein Crystallography Hamburg
30 Screening Europe - Compound Management Hamburg Germany

July 2011

04 ACE-X 2011 Algarve Portugal
04 The 12th International Conference on Quality in Research (QiR 2011) Bali Indonesia
After peer-review, papers will be published in the journal of Advanced Materials Research (ISSN:1662-8985).
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After peer-review, papers will be published in the journal of Advanced Materials Research (ISSN:1662-8985).
05 Science, Technology, Higher Education and Society in the Conceptual Age Krakow Poland
06 2011 Plastic Surgery Congress The Gold Coast Australia
10 The international conference in nanotechnology ICWEN Egypt 2011 Cairo Egypt
18 The 2011 International Conference on Scientific Computing (CSC'11) Las Vegas Nevada

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WATER & SOIL CONFERENCES WORLDWIDE
Upcoming events in Water Management, Soil and related areas

January 2011

17 The 45th Annual Convention of ISAE and International Symposium Nagpur India
17 Asian Pacific Aquaculture Kochi India
17 Infrastructure Middle East Manama Bahrain
17 45th Annual Convention of ISAE and International Symposium College of Agriculture, Maharajbag, Nagpur India
21 Environmental Innovations for Resource Sustainability (EIRS-2011) JALGAON India
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
24 Microbes in Wastewater & Waste Treatment, Bioremediation and Energy Production Goa India
24 DESALINATION O&M 2011 Abu Dhabi United Arab Emirates
26 Oil Sands Water Management Initiative Calgary Canada
28 WATERCON 2011 - International Conference on Community based Water Resource Management GUWAHATI (INDIA) India

February 2011

01 Water Demand Management in a Changing Climate Birmingham United Kingdom
01 The UK Renewable Energy Strategy: progress and next steps London United Kingdom
02 38th Annual PURC Conference Gainesville Florida
03 Implementing the Human Right to Water in the West Salem Oregon
11 Health, Environment and Sustainable Development Tirupathi India
17 Policy Seminar: Geographical perspectives on food, water and energy security to 2030 (A Perfect Storm Ahead) London United Kingdom
17 A National Conference on Urban Policy & Planning: A Case Perspective of Pune Pune India
19 2011 IEEE International Conference on Prudent Development and Renewable Energy Resources Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEE Xplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Technological Advancements in Civil Engineering (ICTACE 2011) Hyderabad India
The ICTACE 2011 proceeding will be published by IEEE Press, which will be included in the IEEE Xplore, and indexed by INSPEC, Ei Compendex, ISI Proceeding and other indexing services.
22 Drilling Fluids and Cuttings Management Asia 2011 Bangkok Thailand
22 1st World Congress & Exhibition Infrastructure Asset Management Kuala Lumpur Malaysia
22 Piling & Deep Foundations Europe 2011 Warsaw Poland
23 Cooperation for Waste Issues Kharkiv Ukraine
26 2010 3rd IEEE International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
ICSAP 2011 will be published in the conference proceeding by IEEE, and all papers in the proceedings will be listed in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.
26 2011 2nd International Conference on Environmental Science and Technology (ICEST 2011) Singapore Singapore
ICEST 2011 will be published in the conference proceeding by IEEE, and all papers will be included in the IEEE Xplore, and indexed by the INSPEC, Ei Compendex and Thomson ISI.
27 4th Annual Produced Water Management Summit Cairo Egypt
27 Nanotech Insight "Because Small Matter is No Small Matter." Cairo Egypt

March 2011

01 GLOBALG.A.P TOUR2011 - New Delhi New Delhi India
03 Green Investment Congress India 2011 Mumbai India
03 INTERNATIONAL CONFERENCE ON THE IMPACT OF CLIMATE CHANGE ON FOOD SECURITY mavelikara India
04 1st INTERNATIONAL CONFERENCE ON GOVERNANCE FOR SUSTAINABLE DEVELOPMENT OF CARIBBEAN SMALL ISLAND DEVELOPING STATES Willemstad Netherlands Antilles
Introducing the UNESCO ChairCaribbean Small Island Developing StatesThe governance of Caribbean SIDS for sustainabledevelopment is a big challenge. Besides naturehuman behavior puts a lot of pressure on thisdevelopment.
05 3rd National Civil Engineering Students' Symposium(NCESS) Mumbai India
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07 INTERNATIONAL CONFERENCE ON WATER RESOURCES ENGINEERING & MANAGEMENT 2011 Lahore Pakistan
07 International Conference for Academic Disciplines Las Vegas
11 2011 3rd IEEE International Conference on Computer Research and Development (ICCRD 2011) Shanghai China
ICCRD 2011 will be indexed by IEEE Xplore, Thomason ISI, Ei Compendex and other major indexing services.
14 Water Utilities Africa Cape Town South Africa
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17 Water Innovation, Technology and Sustainability (WITS) Sao Paulo Brazil
18 Air and Water components of the enviroment Cluj-Napoca Romania
20 18th International Farm Management Congress Christchurch New Zealand
Biennial International Congress – 3 days presentations, 2 days field trip options, contributed papers peer review and non-peer review and posters - submit in full by Sept 30th.Accompanying Person Programme. Pre and PostCongress Tours
25 Recent Trends in Civil & Mechanical Engineering Tiruchirappalli India
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All the registered papers will be published into conference proceedings by IEEE, and distributed at the conference. The proceedings will be included in the IEEE Xplore, and indexed by INSPEC, EiCompendex and Thomson ISI.
30 ECOSMART-2011, 1st International Forum of Clean Technologies in Ukraine Kyiv Ukraine
30 Mining Water Management Initiative Las Vegas Nevada
31 12th Aquaculture Insurance and Risk Management Conference Kinsale, Ireland
A conference for Insurance Underwriters, Brokers, Loss Adjusters, Surveyors, Lawyers, Fish Farm RiskManagers, University Experts, Investors and all those interested in insurance, risk management and loss prevention in Aquaculture.
31 15th International Water Technology Conference Alexandria Egypt
31 International Conference on Agricultural Engineering Pattaya Thailand

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May 2011

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EcoTHEE11 conference addresses the need for human response to ecological crisis. It aims at multi-disciplinary exchanges and insights, with a focus on religious-based and scientific approaches to environmental issues and human responsibility
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27 The 64th CWRA Conference Our Water - Our Life - The Most Valuable Resource St. John's Canada

CONFERENCE ALERTS – ACADEMIC CONFERENCES WORLDWIDE IN 2011

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MANAGEMENT CONFERENCES WORLDWIDE
Upcoming events in Management, Leadership and related fields

January 2011

13 Military Construction Contracting Safety Regulations - OSHA & the EM385-1-1, what you don't know could cost you your contract! - OSHA Webinar Palo alto California
13 MANAGEMENT AND SOCIAL WELFARE ISSUES: CONTEMPORARY PERSPECTIVES Kolkata, India India
13 International conference on Global Financial Crisis: Challenges and Opportunities Udaipur India
The International Conference on Global Financial Crisis: Challenges & Opportunities is devised to create a platform for discussion. Interested delegates may submit papers and participate in the conference.
14 International Conference on "Challenges of Globalization and Strategy for Competitiveness". Ghaziabad-India India
18 Compensation and Rewards Summit 2011 New York New York
18 Nuclear Power Asia Hanoi Viet Nam
18 World Conference on Leadership and Innovation San Jose Costa Rica
20 INTERNATIONAL CONFERENCE ON BUSINESS RESEARCH Kattankulathur, Chennai India
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 National Conference on INDIA INC : THE DECADE AHEAD Navi Mumbai India
23 2011(January) International Conference on Asia Pacific Business Innovation and Technology Management Bali Indonesia
24 Cannexus 2011 Ottawa Canada
Cannexus 2011 is a National Career Development Conference designed to promote the exchange of information & explore innovative approaches in the areas of career counseling and career development.
24 HR Strategies in the Digital Era Kuala Lumpur Malaysia
24 HR Directors Business Summit 2011 Birmingham United Kingdom
24 4th International Colloquium on Business & Management (ICBM 2011) Bangkok Thailand
Abstract deadline: 3rd December 2010. Interesting papers on any aspects of business and management are invited for presentation at the 4thInternational Colloquium on Business & Management, Bangkok, Thailand.
25 6th Annual Pharma Marketing and Branding Excellence Milan Italy
26 Leadership Legacy and Challenges 2011 Kuala Lumpur Malaysia
26 AASCF 3rd Annual Conference Strengthening Today Building Tomorrow Edmonton Canada
26 Annual Conference on Innovations in Business & Management London United Kingdom
27 Leadership for an Inclusive and Sustainable World Berlin Germany
28 IBA LeadershOp Conference 2011 Karachi Pakistan
29 NATIONAL CONFERENCE ON Contemporary Issues in Corporate Finance Delhi India
30 The North African Drilling Conference 2011 Cairo Egypt
31 5th Quality Conference in the Middle East Dubai United Arab Emirates

February 2011

01 3rd International Conference on Integrating Spirituality & Organizational Leadership Shirdi, India
01 International Conference on the Restructuring of the Global Economy, PUNE, INDIA 2011 Pune India
In the light of recent international economic turmoil there is intense pressure on both governments and businesses to perform. Fresh ideas and ground breaking theories are required if purposeful and lasting solutions are to be found.
01 Hradec Economic Days 2011 Hradec Kralove Czech Republic
02 The 2011 Athens Tourism Symposium Athens Greece
03 International Conference on Operational Excellence for Global Competitiveness - ICOEGC-2011 Bengalooru India
04 Pr C O N - 2 0 1 1 Fourth National Conference on 'Managing Business Development in Globalized World: Strategies for Excellence' Dewas India
05 5th Annual Research Conference on Services Management KHANDALA India
05 GLOBALIZING MANAGEMENT EDUCATION: ISSUES AND CHALLENGES FOR INDUSTRY & ACADEMIA NEW DELHI India
05 Entrepreneurship and Innovation: The New Age Mantra New Delhi India
06 3rd International conference on Wireless Information Networks & Business Information System (WINBIS'11) Kathmandu Nepal
08 Airport and Aviation Security Summit London United Kingdom
09 Ottawa Public Sector Quality Fair Ottawa Canada

12 ATHENAEUM 2011 Tiruchirappalli India
Athenaeum 2011 is an international event of grand proportions, with participation of 200 scholars coming from more than 15 countries. The proceedings of the conference would be brought out on a CD and considered for publishing in JOCMAR.
14 Human Capital Management For Defense (HCMD) 2011 Arlington, VA
14 Legal Process Outsourcing Summi New York New York
15 10th International Research Conference on Quality, Innovation & Knowledge Management Kuala Lumpur Malaysia
15 National Conference on HR Policies are market driven Mumbai India
16 2nd International Accounting and Business Conference 2011 (IABC2011) Johor Bahru Malaysia
16 4th Annual Bancassurance Forum Rome Italy
16 Leadership Fusion Houston Texas
17 4th Annual SPMA International Conference on Public Administration Pretoria South Africa
17 21 CFR Part 11: Complete Manual For Compliance Success - GlobalCompliancePanel Virtual Seminar - Webinar By GlobalCompliancePanel Wilmington DE
17 Best Management Practices Institute Clearwater Beach Florida
18 Opportunities and challenges in Managing Millenial Generation Pune India
19 National Conference on Management Of Innovation In Business And Technology: New Strides Varanasi India
19 SAMSKRIT11 CHENNAI India
21 Tonkin's 6th Annual industrial relations Summit Sydney Australia
21 OMAN 2011 INTERNATIONAL BUSINESS CONFERENCE Business and Society in the Middle East: Opportunities and Challenges in the Third Millennium Muscat Oman
21 Asia-Pacific Business Research Conference Kuala Lumpur Malaysia
22 Staffing and Structuring a Successful Marketing Department Online Webcast
23 The National Leadership Psychology Conference 2011 on 23 & 24 February 2011 Melbourne Other
23 Learning@School Rotorua New Zealand
23 EMPIRICAL RESEARCH IN COMMERCE Medinipur India
23 UGC Sponsored National Seminar on EMPIRICAL RESEARCH IN COMMERCE Midnapur India
23 Cooperation for Waste Issues Kharkiv Ukraine
24 ASBBS 18th Annual Conference Las Vegas
Interdisciplinary conference with 60 tracks covering all areas of business and behavioral sciences. Opportunity to publish in ASBBS sponsored 4 refereed journals listed in Cabell's directory and other indices.
24 2nd International Conference on Small Business and Entrepreneursip Nicosia Cyprus
25 National Seminar Raipur India
25 India in the Emerging Order - A Potential Market for World Malout India
25 "Organized Retailing- the Wal-Mart way: Growth of Organized Retailing in Emerging Economies: Challenges and Opportunities Pune India
26 2011 International Conference on Economics and Finance Research C ICEFR 2011 Singapore Singapore
Proceeding of the ICEFR 2010 International Conference will be published by the IEEE. All the registered papers will be included in the IEEEXplore and indexed by Thomson ISI and Ei Compendex.
26 The Physician 2-Day MBA Conference Atlanta Georgia
27 3rd International conference on Wireless Information Networks & Business Information System (WINBIS'11) Kathmandu Nepal
28 Veterinary Management 2011: Employee Contracts and Associate/Owner Compensation Live Webcast Series

March 2011

01 2nd Annual Asia HR Summit 2011 Kuala Lumpur Malaysia
02 ASAC 2011 (Management Science Division) Montreal Canada
03 RBAC International Management Conference 2011 Bangkok Thailand
04 Global Mindset Development in Leadership and Management Los Angeles California
04 Two- days National Seminar on Changing Paradigm on Management Education and its Relevance to Business Corporations HYDERABAD India
06 Mediterranean Conference for Academic Disciplines Gozo Malta
07 International Conference for Academic Disciplines Las Vegas
07 INTELLECTBASE INTERNATIONAL CONSORTIUM PHUKET Thailand
08 Mission Driven Performance Summit Washington, DC
09 Southwest Decision Sciences Institute 42nd Annual Conference Houston TX
10 Milestones in leadership Newport Beach California
10 International Finance Conference 6 Hammamet Tunisia
10 changing perspective of management: Revisit the existing and explore the novel ideas Kathmandu Nepal
10 Enterprise and the competitive environment Brno Czech Republic
10 International Conference on Accounting and Finance Manipal India
11 Fourth Indian Conference on Management (11th March 2011) Gandhinagar India
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11 2011 2nd International Conference on Financial Theory and Engineering (ICFTE 2011) Shanghai China
The ICFTE 2011 conference proceedings will be included in the IEEE Xplore, and indexed by INSPEC, Thomson ISI Proceeding, and Ei Compendex.
12 Human Resource Executive® Forum New York NY

14 2011 New Orleans International Academic Conference New Orleans Louisiana
Please join us for our 2011 New Orleans International Academic Conference, March 14-16,2011 convening at the New Orleans Marriott with tracks in: Business & Economics, Education, Engineering Education, & Health Sciences.
14 2nd International Conference on Business and Economic Research (ICBER) Langkawi Malaysia
14 2nd International Conference on Business and Economic Research - 2nd ICBER 2011 Langkawi Malaysia
15 Reduce COTS Software Validation using the risk-based approach - FDA Validation Webinar By ComplianceOnline Palo Alto California
15 Tri-State CAMP Conference (This is a Conference for Owners, Directors and Staff of Children's Summer Camps) Atlantic City New Jersey
15 KM Middle East 2011 Abu Dhabi United Arab Emirates
17 University College of the Cayman Islands International Conference George Town Cayman Islands
20 18th International Farm Management Congress Christchurch New Zealand
Biennial International Congress - 3 days presentations, 2 days field trip options, contributed papers peer review and non-peer review and posters - submit in full by Sept 30th.Accompanying Person Programme.
20 GBDI 14th International Conference Las Vegas Nevada
21 Adobe Learning Summit 2011 Orlando Florida
21 Health Care Talent Management Summit Houston Texas
Speakers will discuss and outline current policy requirements as well as the latest solutions to recurring issues of recruitment, retention, employee engagement, leadership development and patient care.
21 International Conference for Academic Disciplines Orlando Florida
23 Great Place to Work(r) Conference Denver Colorado
23 Future Organization - The 30th annual International Conference on Organizational Science Development Portorol' Slovenia
24 Third Annual Global Business Summit Conference Chennai India
The main aim of the Conference is bringing together academicians, researchers, government officials and business leaders from all over the world in order to identify the best Economic Development and Business Strategies.
24 AABRI International Conference Nashville 2011 Nashville Tennessee
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24 Indian Industry : Fostering Economic Development Chennai India
25 The International Conference on Management and Sustainable Development wuhan China
25 INTELLECTBASE INTERNATIONAL CONSORTIUM -15TH ACADEMIC CONFERENCE San Antonio TX
Intellect base International Academic Consortium is Multidisciplinary and accepts papers from BUSINESS, EDUCATION, SCIENCE, TECHNOLOGY,MANAGEMENT, ADMINISTRATION, POLITICS, SOCIAL, etc. Devoted to Refereed Publications.
26 Aceh Development International Conference 2011 (ADIC2011) Kuala Lumpur Malaysia
26 Conference on Contemporary Issues in Marketing & Intellectual Property Rights Delhi India
28 Field Service & Workforce Mobility 2011 Sydney Australia
29 Energy Asia Summit Risk Management and Hedging Strategies Singapore Singapore
30 16th Congress of the EAHP Vienna Austria
30 Solvency II Forum London United Kingdom

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03 IRMS 14th Annual Conference Brighton United Kingdom
04 Pipeline Technology Conference Hanover Germany
04 The 3rd iMedia Brand Summit, ASEAN Bali Indonesia
05 CSSS2011- The First International Conference on Small Satellites Systems Paris France
06 HR Summit Sydney Sydney Australia
07 Celebrating Nursing Theory's Contribution to Leadership Bozeman Montana
07 International Conference on Enterprise Marketing and Globalization (EMG 2011) Penang Malaysia
08 3rd Annual For Nurses By Nurses Educational Conference and Formal Gala 2011 Virginia Beach Virginia
08 CR3 Conference: The Power of Responsibility Helsinki Finland
08 National Conference on Sustainable Development in Energy Sector Dehradun India
10 European Conference for Academic Disciplines Gottenheim near Freiburg Germany
11 Citizenship in HTESL Management Manchester United Kingdom
13 8th Edition of Augustin Cournot Doctoral Days (doctoral conference), April 13th-15th 2011 Strasbourg France
14 Advances in Tourism Economics 2011 Lisbon Portugal
ATE2011 is the 4th edition of the biennial conference series on Advances in Tourism Economics(ATE). The 2011 conference welcomes papers in all areas of tourism research, given that anappropriate economic background is provided.
15 International Conference on Business and Management Izmir Turkey
16 International Management Conference 2011 - IMaC2011 Kuala Terengganu Malaysia
18 CAPSTONE Business Simulation - Faculty Dev Workshop Kozhikode India
Capstone Business Simulation Faculty Dev Workshop. Delivery by Dr. Craig Watters, CEO, CAPSIM® Management Simulations, Inc. USA. The workshop will enable attendees to teach CAPSIM Simulations to their internal audience.

20 Business Culture / Corporate Culture Area, 2011 PCA/ ACA Conference San Antonio Texas
22 International Conference on Networks and Computer Communications (ETNCC2011) Udaipur India
24 Disaster Management & Crisis Response 2011 Abu Dhabi United Arab Emirates
25 Infrastructure Invesment World Americas 2011 Bridge waters
25 The Fourth International Conference on Modelling and Simulation (ICMS2011) Phuket Island, Thailand
26 ANNUAL CFL INTENTIONAL, EFFECTIVE AND PRODUCTIVE LEADERSHIP CONFERENCE, UK (26th, 27th & 28 APRIL) 2011 BIRMINGHAM United Kingdom
This conference is aimed at inspiring, equipping and intentionally creating effective, productive and living leadership cultures in small, medium and big organizations, influencing academicians and government officials.
27 2nd International Conference on Information Management and Evaluation Toronto Canada
28 14th International Business Research Conference Dubai United Arab Emirates
Abstracts and/or full papers relating to all areas of Accounting, Banking, Finance, Economics, Management, Marketing are invited for this international conference supported by eight journals and previously attended by more than 70countries
29 2011 International Conference on Traffic and Logistic Engineering (ICTLE 2011) Chennai India
The conference will be held every year to make it an ideal platform for people to share views and experiences in Traffic and Logistic Engineering and related areas.

May 2011

04 Global Academy of Business and Economic Research Dubai United Arab Emirates
GABER has organized several international conferences with an attendance of over one hundred participants with more than fifty different nationalities. For submissions and details visit: http://www.GABERIC.ORG
04 Global Management Conference Budapest/Godollo Hungary
07 2011 International Conference on Management and Service Science - ICMSS 2011 Bangkok Thailand
The ICMSS 2011 conference proceedings will be published by IEEE, which will be included in theIEEE Xplore and indexed by the Ei Compendex and other indexing services.
07 2011 International Conference on Economics and Business Information - ICEBI 2011 Bangkok Thailand
The ICEBI 2011 conference proceedings will be published by IEEE, which will be included in the IEEE Xplore and indexed by the Ei Compendex and other indexing services.
09 Pan-European HR Forum 2011 Brussels Belgium
09 2011 International Conference on Management Learning and Business Technology Education Kaohsiung Taiwan
13 8th Annual SOLES Action Research Conference San Diego Other
13 The 2011 International Conference on Intelligent Building and Management (ICIBM 2011) Sydney Australia
16 6th International Conference on Earthquake Engineering and Seismology Tehran Iran
16 International Conference on Applied Energy Perugia Italy
17 PINC.12 Conference Zeist (nearby Amsterdam) Netherlands
17 The First Iranian International Conference of Management, Futurism, Entrepreneurship and industry in Higher Education Sanandaj, Iran Iran
18 Second International Conference on Recent Trends in Information Processing & Computing IPC 2011 Proc. Archived by IEEE Xplore Chennai India
18 5th International Conference on Business Market Management Tampere Finland
19 International Conference on International Business (ICIB) 2011 Thessaloniki Greece
19 18th International Economic Conferences IECS 2011 - CRISES AFTER THE CRISIS. INQUIRIES FROM A NATIONAL, EUROPEAN AND GLOBAL PERSPECTIVE Sibiu Romania
20 XIth International Scientific Conference Perspectives in physical education and sport Constanta Romania
23 TMForum - Management World Conference Dublin Ireland
23 American Canadian Conference for Academic Disciplines Toronto Canada
24 7th Consumer Psychology of Tourism, Hospitality and Leisure Chiangmai Thailand
24 2011 COSTA RICA GLOBAL CONFERENCE ON BUSINESS AND FINANCE San Jose Costa Rica
Applied, theoretical and empirical papers in all areas of business, finance, economics, management, marketing, accounting, teaching and related fields are welcome. Refereed conference proceedings, peer-reviewed journal publications &Awards
24 3rd International Conference on Qualitative and Quantitative Methods in Libraries- QQML 2011 Athens Greece
24 Executive Workshop - 12 Brain Rules by Dr John Medina Kuala Lumpur Malaysia
25 International Trade and Finance Association 21st International Conference Labuan Malaysia
IT&FA invites proposals on all aspects of international trade and finance. IT&FA is a multi-disciplinary association, and welcomes all those with an interest in the global economy.
26 Global Management, Finance & Information Technology Research Conference, New York New York New York
27 THE 12TH DOCTORAL CONFERENCE OF THE FACULTY OF FINANCE AND ACCOUNTING Prague Czech Republic
30 Int'l End-of-Academic-Year Multidisciplinary Conference Bad Hofgastein (outside Salzburg) Austria
30 Second International Conference for Academic Disciplines at Harvard Boston
30 2011 MAG Scholar Conference Christchurch New Zealand
30 Leaders With A Life Conference Adelaide Australia
30 International Conference of Corporate Strategies and Governance Canberra Australia

June 2011

01 EBES 2011 Conference - Istanbul Istanbul Turkey
01 ABSRC 2011 Venice - Advances in Business-Related Scientific Research Conference 2011 in Venice - Venezia Venice Italy
ABSRC is an important international gathering of business and business-related sciences scholars and educators.
02 ACSS 2011 - The Second Asian Conference on the Social Sciences Osaka Japan
ACSS 2011 - International Interdisciplinary Conference held in Osaka Japan by IAFOR in affiliation with the UNWFP, Auburn University(USA), UFWH and other global partners. Conference Theme: 'Sustaining the Future'.
02 Management, Finance and Accouting Research Conference, Hawaii Honolulu Hawaii

07 Euro-American Conference for Academic Disciplines Aix-en-Provence France
08 6th Annual Leadership Conference London United Kingdom
08 13th International Conference on Enterprise Information Systems (ICEIS) Beijing China
12 Leadership and Management in a Changing World: Lessons from Ancient East and West Philosophy Athens Greece
13 International Conference on Management (ICM 2011) Penang Malaysia
14 PacRim IT Service Management World 2011 gold coast Australia
16 International Business, Finance and Economics Research Conference, Los Angeles Los Angeles California
16 SIBR Conference on Interdisciplinary Business and Economics Research: Advancing Knowledge from Interdisciplinary Perspectives Bangkok Thailand
The SIBR Conference invites submission of papers/abstracts from all business and economics disciplines. Refereed journals edited by SIBR Committee members will publish selected papers.
19 Advances in Hospitality and Tourism Marketing and Management Istanbul Turkey
20 10th European Conference on Research Methodology for Business and Management Studies Caen France
21 Euro-American Conference for Academic Disciplines Prague Czech Republic
22 The Tenth IASTED European Conference on Power and Energy Systems (EuroPES 2011) Crete Greece
22 ACSSSR2011 - ASEAN Conference on Scientific and Social Science Research 2011 Penang Malaysia
24 The 24th annual meeting of the Association of Japanese Business Studies (AJBS) Nagoya Japan
24 The 1st International Conference on Safety and Crisis Management in the Construction, Tourism and SMEs Sectors (1st CoSaCM) Nicosia Cyprus
27 10th Annual International Conference on Health Economics, Management & Policy Athens Greece
28 Tourism Social Science Guildford United Kingdom
28 The R&D Management Conference 2011 Norrköping Sweden
29 CIOSTA Vienna Austria
30 Seventh International Strategic Management Conference Paris France
The theme of this year's annual strategic management conference is: "Investigating Strategies of Recovery from the Recession.
30 International Education: Focus on the Learner Auckland New Zealand
30 8th International Conference on Applied Financial Economics Samos Island Greece

July 2011

01 Young Leaders' Conference Karachi Pakistan
01 Annual Conference of the Academy of Innovation and Entrepreneurship Beijing China
03 the 11th International Conference on Arts and Cultural Management (AIMAC 2011) Antwerp Belgium
04 International Conference on Business and Information (BAI) Bangkok Thailand
04 Modelling and Simulation Calgary Canada
04 2nd Regional Conference on Educational Leadership and Management JITRA Malaysia
05 Finance and Economics Conference 2011 Frankfurt am Main Germany
06 Economy: an architectural conference Cardiff United Kingdom
07 LCBR European Marketing Conference 2011 Frankfurt am Main Germany
08 II Postgraduate Conference ESGHT 2011 Faro Portugal
10 The 2011 International Conference on Asia Pacific Business Innovation and Technology Management Dalian China
APBITM Conferences cover all aspects ofCreativity, Innovation, Entrepreneurship and Business & Technology Management, including ALL Business Fields.
12 International Conference on Innovation and Management (IAM 2011) Tokyo Japan
14 Global Business, Economics & Finance Research Conference, London London United Kingdom
18 5th International Consumer Science Research Conference Bonn Germany
18 The 2011 International Conference on e-Learning, e-Business, Enterprise Information Systems, and e-Government (EEE'11) Las Vegas Nevada
24 Leadership in the Multicultural World - 7th Conference International Academy for Intercultural Research Hosted By Center for Creative Leadership Singapore
27 The 2011 International Conference of Organizational Innovation Kuala Lumpur Malaysia
28 INTERNATIONAL CONFERENCE ON LEADING BEYOND THE HORIZON - ENGAGING FUTURE (ICLBH - 2011) CHIDAMBARAM India

August 2011

01 8th Annual International Conference on Small and Medium Sized Enterprises: Management - Marketing - Economic Aspects Athens Greece
01 31st Annual Meeting of the International Institute for Advanced Studies in Systems Research and Cybernetics Baden-Baden Germany
01 23rd International Conference on Systems Research, Informatics and Cybernetics Baden-Baden Germany
08 Strategies, Governance and Social research Conference Doha Qatar
10 Global Research in Business and Economics 2011 International Conference Beijing China
Academic papers in all areas of business &economics are welcome. Special sessions will be accepted in all fields. Publishing opportunities in Refereed conference proceedings, peer-reviewed international journals, and in edited books.
12 The 5th International Conference on Management and Service Science Wuhan China
12 2011 International Conference on Information System and Management (ISM 2011) Wuhan China
17 Shanghai International Conference on Social Science 2011 shanghai China
17 Shanghai International Conference on Social Science (SICSS) 2011 Shanghai China
27 Social Entrepreneurship in Europe Linz Austria
28 2nd Bangkok International Forum on Indigenous Management Practices Bangkok Thailand
The goal of this timely forum is to provide a lively and informal venue where a variety of questions and ideas regarding Indigenous management can be presented and discussed in an interdisciplinary and creative environment.
29 Conference on Quality and Service Sciences ICQSS 2011 San Sebastian Spain

September 2011

01 Second International Conference on Recent Trends in Information Processing & Computing - IPC 2011 Proc. published by Springer LNCS-CCIS Malaysia
08 The Business of Wisdom Sydney Australia
08 Sixth International Conference on Discourse, Communication and The Enterprise (DICOEN VI) Hunghom Hong Kong
08 Sixth International Conference on Discourse, Communication and the Enterprise (DICOEN VI) Hong Kong Hong Kong
08 2nd World Biodiversity Congress KUCHING Malaysia
13 BAM Conference 2011 Birmingham United Kingdom
14 6th Asia Pacific Retailing Conference Kuala Lumpur Malaysia
19 Fashion colloquia - London London United Kingdom
21 ADM2011: 4th International Conference on Advanced Design and Manufacture Kunming China
All papers included in ADM2011 conference proceedings will be indexed in EI Compendex and other major abstract media. Papers presented at the conference will be offered opportunities for publication in refereed international journals.
22 Management Horizons in Changing Economic Environment: Visions and Challenges Kaunas Lithuania
23 International Conference on Consultation & Experience Sharing on Role of Humanities & Social sciences in Holistic Development of Future Technocrats Solan India
23 Asian Academy of Management International Conference 2011 Penang Malaysia
28 Business Management Conference Durban South Africa
International multi-disciplinary business management conference to be held by the Faculty of Management Studies, University of KwaZulu-Natal.
30 5th International Seminar on Innovate...Lead...Succeed Mandi Gobindgarh (Distt. Fatehgarh Sahib) India

October 2011

03 14th Annual HR Technology® Conference & Expo Las Vegas Nevasa
17 The 3rd IASTED International Conference on Advances in Management Science and Risk Assessment ~AMSRA 2011~ Beijing China
19 Ulearn11 Christchurch New Zealand
21 Conference on Social Media in Hospitality and Tourism Verona Italy
26 International Leadership Association Global Conference on Leadership London United Kingdom

November 2011

01 1st International Conference on Accounting, Business and Economics Kuala Terengganu Malaysia
09 The 4th International HR Conference 2011 Bangkok Thailand
17 5th International Nursing Management Conference Antalya Turkey
17 1st NUS-NUH International Nursing Conference Singapore Singapore
17 Asia-Pacific Management Accounting Association 7th Conference Kuala Lumpur Malaysia
22 Emerging Research Paradigms in Business and Social Science Dubai United Arab Emirates
The objective of conference is to provide an opportunity for academics to discuss new concepts, progressive methodologies, embryonic approaches and innovative practices within the world of business and the wider social environment.

December 2011

06 2011 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM) Singapore Singapore

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RENEWABLE ENERGY CONFERENCES WORLDWIDE
Upcoming events in Renewable Energy and related fields

January 2011

20 Energy Investment Forum Austin Texas
23 Understanding Opportunities in Solar - Manufacturing / Solar Farms January 23 -25, 2010 Hyderabad India
31 Meeting RPS Through Large-Scale PV: The Business Drivers to Achieve the Mandates Los Angeles CA

February 2011

01 The UK Renewable Energy Strategy: progress and next steps London United Kingdom
03 INTERNATIONAL GREEN GROWTH AND ENVIRONMENTAL SOLUTIONS EXHIBITION Cannes France
07 Offshore Wind Farms: Construction & Installation 2011 Copenhagen Denmark
08 Connecting Renewable Energy to the grid London United Kingdom
10 CEP® CLEAN ENERGY & PASSIVEHOUSE Messepiazza - Flughafenrandstraße 70629 Stuttgart Germany
12 National Conference on Power , Instrumentation, Energy , and Control Aligarh India
15 PHOTON's Solar Terawatt-hours Conference Series 2011 USA San Francisco California
19 2011 IEEE International Conference on Prudent Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEE Xplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Product Development and Renewable Energy Resources ¨C ICPDRE 2011 Hyderabad India
ICPDRE 2011 proceedings published by IEEE and Allthe presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex and ISI.
22 Solar Power Australia 2011 Melbourne Australia
22 Eilat-Eilot Int'l Renewable Energy Conference Eilat Iceland
22 Eilat-Eilot Renewable Energy Conference Eilat Israel
24 National Conference on "Challenges to Indian Power Scenario by 2020" (NCCIPS2020-11) Ahmednagar India
26 2011 2nd International Conference on Environmental Science and Technology(ICEST 2011) Singapore Singapore
ICEST 2011 will be published in the conference proceeding by IEEE, and all papers will be included in the IEEE Xplore, and indexed by the INSPEC, Ei Compendex and Thomson ISI.
26 2011 2nd International Conference on Environmental Science and Technology Singapore Singapore
ICEST 2011 will be published in the conference proceedings by IEEE. All papers will be included in the IEEE Xplore, and indexed by the INSPEC, EiCompendex and Thomson ISI.
27 EnergyBiz Leadership Forum Washington D.C.

March 2011

02 World Sustainable Energy Days 2011 Wels Austria
04 MIT Energy Conference Boston MA
08 SUSTAINABILITY 2011: IS IT WORTH IT? Melbourne Florida
10 RenewCon Solar India 2011 Mumbai India
11 2011 3rd IEEE International Conference on Computer Research and Development (ICCRD 2011) Shanghai China
ICCRD 2011 will be indexed by IEEE Xplore, Thomason ISI, Ei Compendex and othermajor indexing services.
15 Biomass Conference 2011 Kuala Lumpur Malaysia
22 Offshore Wind Power Development 2011 Shanghai China
22 International Multi-Conference on Systems, Signals & Devices Sousse Tunisia
23 Energising South East Asia Perth Australia
24 Renewable Energy & Grid Integration China Summit 2011, Beijing china China
25 2011 International Conference on Future Environment and Energy (ICFEE 2011) Sanya China
All the registered papers will be published into conference proceedings by IEEE, and distributed at the conference. The proceedings will be included in the IEEE Xplore, and indexed by INSPEC, EiCompendex and Thomson ISI.
31 Sustainable Environment Technologies SET2011 at The Los Angeles Convention Center Los Angeles California
31 International Conference on Agricultural Engineering Pattaya Thailand
31 International Conference on Energy Law Poznan Poland

April 2011

01 2011 IEEE International Conference on Industrial and Intelligent Information (ICIII 2011) Bali Island Indonesia
ICIII 2011 conference proceedings will be included in the IEEE Xplore, and indexed by INSPEC, Thomson ISI, Ei Compendex.
01 2011 International Conference on Fluid Dynamics and Thermodynamics Technologies (FDTT 2011) Bali Indonesia
All registered papers of FDTT 2011 will be published into Conference proceedings by the IEEE, which will be included in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.
01 2011 International Conference on Environment Science and Engineering - ICESE 2011 Bali Island Indonesia
The ICESE 2011 conference proceeding will be published by IEEE, which will be included in theIEEE Xplore, and indexed by the Ei Compendex, ISI Proceeding and other indexing services.
03 The Sharjah International Conference on Nuclear and Renewable Energy Energies for the 21st Century (SHJ-NRE11) Sharjah United Arab Emirates
04 Housing Forum Europe & Central Asia Budapest Hungary
05 PHOTON's Solar Terawatt-hours Conference Series 2011 Europe Munich Germany
06 Energy Management in Cultural Heritage Dubrovnik Croatia
07 ENREG ENERGIA REGENERABILA® EXPO ARAD INTERNATIONAL 300, Aurel Vlaicu Street A Romania
11 Energy and Sustainability 2011 Alicante Spain
13 7th EE & RES Congress and Exhibition for South East Europe Sofia Bulgaria
Energy efficient & RES solutions in the SE European market will be presented. The forum incorporates the Congress, b2b Exhibition, Networking with 500+ high level industry representatives from the South-East European Region, Matchmaking, et
13 The First Annual Mountain & Plains ERC Occupational Health & Energy Summit Denver Colorado
14 MEDGREEN2011 Beirut Lebanon
27 Solar Energy and Environment Dakar Senegal

May 2011

02 Conference on Wind Energy and Wildlife Impacts Trondheim Norway
05 5. RENEXPO® Central Europe Budapest Hungary
05 Electrical and Control Technologies ECT-2011 Kaunas Lithuania
11 17th International Energy and Environment Fair and Conference Ýstanbul Turkey
11 The 10th World Wind Energy Conference and Renewable Energy Exibition Cairo Egypt
12 Water Supply and Sewage Systems Inside Buildings - design, construction and operation Warsaw Poland
16 Hands-on Workshop on Molecular Biotechnology and Bioinformatics Pune India
30 2011 International Conference on Green Building Technologies and Materials (GBTM 2011) Brussels Belgium
31 ISWA Conference, WasteTech-2011 Moscow Russian Federation

June 2011

02 ACSEE - The Asian Conference on Sustainability, Energy and the Environment 2011 Osaka Japan
International Interdisciplinary Conference on Sustainability, Energy and the Environment organized by the International Academic Forum(Japan) in Association with Auburn University(USA), UFWH, and the UNWFP. Call for Papers Now Open
05 International Green Energy Conference-VI (IGEC-VI) Eskisehir Turkey
14 Africa Energy Forum 2011 Paris France
19 12th Conference of the European Ceramic Society Stockholm Sweden
19 11th International Multidisciplinary Scientific GeoConference and Expo – SGEM 2011 (Surveying Geology & mining Ecology Management) Albena resort Bulgaria
24 INTERNATIONAL RENEWABLE ENERGY & ENVIRONMENT CONFERENCE 2011 Kuala Lumpur Malaysia
The International Renewable Energy & Environment Conference, 24-26 June 2011 Kuala Lumpur Malaysia is the leading forum that will bring together renowned researchers, engineers and scientists in this domain of interest.
28 Clean Power Asia Conference and Expo 2011 Bangkok Thailand
28 The R&D Management Conference 2011 Norrköping Sweden
29 CIOSTA Vienna Austria
29 AEBIOM European Bioenergy Conference & RENEXPO® Bioenergy EUROPE Albert Hall Complex, Brussels, Belgium

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CONFERENCE ALERTS – ACADEMIC CONFERENCES WORLDWIDE IN 2011

INFORMATION SCIENCE CONFERENCES WORLDWIDE
Upcoming events in Information Science and related fields

January 2011

14 2011 International Conference on Information and Industrial Electronics(ICIIE 2011) Chengdu China
The conference proceeding of ICIIE 2011 will be published by IEEE Press, which will be included in the IEEE Xplore, and indexed by INSPEC, EiCompendex and other indexing services.
17 Publishing in India: Challenges and Opportunities New Delhi India
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 2011 International Conference on Security Science and Technology(ICSST 2011) Chongqing China
The ICSST 2011 proceedings will be published by IEEE and All the papers will be archived in the IEEE Xplore and indexed by Ei Compendex and ISI.
24 KidContent 2011 London United Kingdom
26 The future of local media in the UK London United Kingdom

February 2011

01 ALIA Information Online Conference and Exhibition 2011 Sydney Australia
06 3rd International conference on Wireless Information Networks & Business Information System (WINBIS'11) Kathmandu Nepal
08 PhD Experience Conference Hull United Kingdom
10 2nd International Conference of Asian Special Libraries(ICoASL2011) on Building User Trust:The Key to Special libraries Renaissance at the Digital Era TOKYO Japan
14 International Conference on Digital Libraries and Knowledge Organization (ICDK 2011) Gurgaon (National Capital Region) India
15 International Conference on E-business & Digital Information system Kathmandu Nepal
15 International conference on the Convergence of Libraries, Archives and Museums: User Empowerment through Digital Technologies (ICLAM2011) New Delhi Indonesia
15 ICLAM 2011 New Delhi India
22 Asia-Pacific Conference on Qualitative Research in Web 2.0 Macau China
This unique and highly interactive event will bring together top academics and industry practitioners to discuss and brainstorm the latest online methodologies for qualitative research.
23 4th Annual Social Media Marketing Toronto Canada
25 ICLICC 2011 - International Conference on Logic, Information, Control and Computation Gandhigram India
25 Flat Classroom(tm) Conference 2011 Beijing China
26 2011 International Conference on Social Science and Humanity C ICSSH 2011 Singapore Singapore
Proceeding of the ICSSH 2011 International Conference will be published by the IEEE. All the registered papers will be included in the IEEEXplore and indexed by Thomson ISI and Ei Compendex.
26 2010 3rd International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
The proceedings will be listed in IEEE Xplore and indexed by the Thomson ISI and Ei Compendex. A selection of the best papers will be invited for a special issue of a mainstream journal
27 3rd International conference on Wireless Information Networks & Business Information System (WINBIS'11) Kathmandu Nepal

March 2011

03 International conference on computing business applications and legal issues (ICCBALI 2011) Ghaziabad Other
03 EDGE2011 Edinburgh Scotland
05 Information Fluency Orlando Florida
The conference will be held March 9-11, 2011 and will feature plenary sessions, keynote address, and concurrent sessions with presentations on the various aspects of Information Fluency. Learn about new and cutting edge theories in IF.
07 SITE 2010 - Society for Information Technoloy & Teacher Education Nashville Tennessee
07 International Conference for Academic Disciplines Las Vegas
07 Academic Library Planning and Revitalization Columbus OH
10 IADIS International Conference E-Society 2011 Avila Spain
10 Ontario Information Management, Access & Privacy Symposium 2011 Toronto Canada

10 National Conference on Communication and Informatics 2011 Chennai India
11 2011 3rd IEEE International Conference on Computer Research and Development (ICCRD 2011) Shanghai China
ICCRD 2011 will be indexed by IEEE Xplore, Thomason ISI, Ei Compendex and other major indexing services.
14 II-SDV Singapore Singapore
14 The 10th Somerset International Conference for Librarians and Teachers Gold Coast Australia
21 International Conference for Academic Disciplines Orlando Florida
23 International conference on Creative Industries, PACIA 2011 (Performing Arts as Creative Industries in Asia) Penang Malaysia
26 Aceh Development International Conference 2011 (ADIC2011) Kuala Lumpur Malaysia
29 2011 HDI Annual Conference & Expo Las Vegas NV
31 Travelling Goods // Travelling Moods. Cultural Appropriation of Foreign Goods, 1850-1950 Kiel Germany

April 2011

01 2011 International Conference on Industrial and Intelligent Information (ICIII 2011) Bali Island Indonesia
The ICIII 2011 conference papers will be published as conference proceedings by IEEE, and will be included in IEEE Xplore, and indexed by EiCompendex, Thomson ISI and INSPEC.
01 International Conference on Computer Supported Education & E-Learning Technology Kathmandu Nepal
08 The Figure of the Author in the Short Story in English Angers France
08 2011 International Conference on Network and Computer Science (ICNCS 2011) Kanyakumari India
All conference papers will be published inthe proceedings of the ICNCS 2011 conference and will be included in IEEE Xplore, and indexed by the Ei Compendex and Thomson ISI (ISTP).
15 Information Ethics Roundtable: Information Rights as Human Rights Tucson Arizona
25 OARIC2011; Educational Leadership, Knowledge & Technology Innovation in Cultural Diversity and Knowledge-based Society Patong Thailand

May 2011

05 CeDEM11 - Conference on e-democracy, e-participation and e-voting Krems Austria
09 2011 3RD IEEE International Conference on Information management and engineering (IEEE ICIME 2011) Zhengzhou China
09 World E-Reading Congress London United Kingdom
16 Academic Library Advancement and Development Network Conference Flagstaff Arizona
17 Political Socialization and the Emerging Political Actors in the Middle East & North Africa Kraków Poland
24 3rd International Conference on Qualitative and Quantitative Methods in Libraries- QQML 2011 Athens Greece
27 JFK Institute's 2011 Graduate Conference Berlin Germany
30 Second International Conference for Academic Disciplines at Harvard Boston

June 2011

05 ARMA Canada Conference & Tradeshow Charlottetown Canada
09 2nd International PRISEAL Conference: Publishing and Presenting Research Internationally: Issues for Speakers of English as an Additional Language Sosnowiec / Katowice Poland
18 InSITE 2011 Nova Sad Serbia
20 Information: Interactions and Impact (i4) Aberdeen United Kingdom
21 Euro-American Conference for Academic Disciplines Prague Czech Republic
27 EBLIP6 - 6th international Evidence Based Library and Information Practice Conference Salford United Kingdom
29 Fourth International Conference on the Inclusive Museum Johannesburg South Africa

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ROBOTICS CONFERENCES WORLDWIDE
Upcoming events & conferences in Robotics and related fields

January 2011

14 2011 International Conference on Information and Industrial Electronics (ICIIE 2011) Chengdu China
The conference proceeding of ICIIE 2011 will be published by IEEE Press, which will be included inthe IEEE Xplore, and indexed by INSPEC, EiCompendex and other indexing services.
21 ACCT11- International Conference on Advanced Computing and Communication Technologies Rohtak India
ACCT'11 promises to address current state of thetechnology and the outcome of the ongoing researchin the area of advance computing and communication.
21 2011 International Conference on Security Science and Technology (ICSST 2011) Chongqing China
The ICSST 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex, ISI Proceeding and other indexing services.
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 2011 IEEE 3rd International Conference on Computer and Automation Engineering (ICCAE 2011) Chongqing China
The ICCAE 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and be indexed by Ei Compendex and Thomason ISI Proceeding.
21 2011 International Conference on Security Science and Technology (ICSST 2011) Chongqing China
The ICSST 2011 proceedings will be published by IEEE and All the papers will be archived in the IEEE Xplore and indexed by Ei Compendex and ISI.
26 2011 International Conference on System Modeling and Optimization (ICSMO 2011) Guiyang China
The ICSMO 2011 proceedings will be published by IEEE and All the papers will be archived in the IEEE Xplore and indexed by Ei Compendex.
26 2011 International Conference on Information and Computer Networks (ICICN 2011) Guiyang China
The ICICN 2011 proceedings will be published by IEEE and All the papers will be archived in the IEEE Xplore and indexed by Ei Compendex.

February 2011

10 Second International Conference on Computational Intelligence Applications 2011 Nashik India
19 2011 IEEE International Conference on Prudent Development and Renewable Energy Resources Hyderabad India
ICPDRE 2011 proceedings published by IEEE and All the presented papers will be archived in the IEEE Xplore and Indexed by Ei Compendex and ISI.
19 2011 International Conference on Technological Advancements in Civil Engineering (ICTACE 2011) Hyderabad India
The ICTACE 2011 proceeding will be published by IEEE Press, which will be included in the IEEE Xplore, and indexed by INSPEC, Ei Compendex, ISI Proceeding and other indexing services.
24 International Conference on Multi Body Dynamics Vijayawada India
25 International Conference on Technology Systems and Management (ICTSM 2011) Mumbai India
25 National Conference on "Innovations and Trends in Computer and Communication Engineering" NASHIK India
26 2011 2nd International Conference on Mechanical, Industrial, and Manufacturing Technologies (MIMT 2011) Singapore Singapore
All registered papers of MIMT 2011 will be published into Conference proceeding by the IEEE Press. The accepted papers will be indexed by the major indexing services, such as INSPEC, EI (Compendex), and Thomson ISI (ISTP).
26 2011 3rd IEEE International Conference on Machine Learning and Computing (ICMLC 2011) Singapore Singapore
ICMLC 2011 will be included in the IEEE Xplore, and indexed by INSPEC, Thomson ISIProceeding (ISTP), Ei Compendex.
26 2011 2nd International Conference on Environmental Science and Technology(ICEST 2011) Singapore Singapore
ICEST 2011 will be published in the conference proceeding by IEEE, and all papers will be included in the IEEE Xplore, and indexed by the INSPEC, Ei Compendex and Thomson ISI.
26 2011 2nd International Conference on Mechanical, Industrial, and Manufacturing Technologies (MIMT 2011) Singapore Singapore
MIMT 2010 will be published in the conferenceproceeding, and will be included in the IEEEXplore, and indexed by INSPEC, ThomsonISI Proceeding (ISTP), Ei Compendex.
26 2010 3rd IEEE International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
ICSAP 2011 will be published in the conference proceeding by IEEE, and all papers in the proceedings will be listed in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.

26 2011 International Conference on Bioscience, Biochemistry and Bioinformatics - ICBBB 2011 Singapore Singapore
ICBBB 2011 proceedings will be published by IEEE. All the presented papers will be archived in IEEEXplore and Indexed by Ei Compendex and ISI.
26 2011 3rd International Conference on Machine Learning and Computing (ICMLC 2011) Singapore Singapore
ICMLC 2011 will be published in the conference proceedings by IEEE, which will be included inIEEE Xplore and indexed by INSPEC, ISI and EiCompendex.
26 2011 2nd International Conference on Mechanical, Industrial, and Manufacturing Technologies (MIMT 2011) Singapore Singapore
The accepted papers will be indexed by major indexing services such as INSPEC, EI (Compendex) and Thomson ISI (ISTP).
26 2010 3rd International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
The proceedings will be listed in IEEE Xplore and indexed by the Thomson ISI and Ei Compendex. A selection of the best papers will be invited for a special issue of a mainstream journal

March 2011

02 Computational Intelligence and signal Processing, CISP2011 Guwahati India
04 National Conference on Emerging Trends and Applications in Computer Science-2011 Shillong India
06 Mediterranean Conference for Academic Disciplines Gozo Malta
11 2011 3rd IEEE International Conference on Computer Research and Development (ICCRD 2011) Shanghai China
ICCRD 2011 will be indexed by IEEE Xplore, Thomason ISI, Ei Compendex and other major indexing services.
11 2011 International Conference on Systems Engineering and Modeling (ICSEM 2011) Shanghai China
The ICSEM 2011 conference proceedings will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex and other indexing services.
11 2011 International Conference on Solid-State and Integrated Circuit (ICSIC 2011) Shanghai China
ICSIC 2011 will be published in the conference proceedings by IEEE, which will be included in the IEEE Xplore, and indexed by INSPEC and Ei Compendex.
19 2011 International Conference on Control, Robotics and Cybernetics (ICCRC 2011) New Delhi India
All papers will also be published in the ICCRC2011 conference proceeding by IEEE Press, which will be included in IEEE Xplore, and indexed byThomason ISI and Ei Compendex.
19 2011 International Conference on Mechanical and Aerospace Engineering (CMAE 2011) New Delhi India
CMAE 2011 will be published in the conference proceeding by IEEE, which will be included in IEEEXplore, and indexed by INSPEC, ISI and Ei Compendex.
19 2011 International Conference on Network Communication and Computer ¨C ICNCC 2011 New Delhi India
ICNCC 2011 proceedings published by IEEE and Allthe presented papers will be archived in the IEEEXplore and Indexed by Ei Compendex.
21 ACM SAC 2011 - Intelligent Robotic Systems (ROBOT Track) TaiChung, Taiwan Taiwan
21 International Conference for Academic Disciplines Orlando Florida
22 International Multi-Conference on Systems, Signals & Devices Sousse Tunisia
23 26th International Conference on Computers and Their Applications (CATA-2011) New Orleans LA
25 2011 3rd International Conference on Bioinformatics and Biomedical Technology (ICBBT 2011) Sanya China
The ICBBT 2011 will be published in conference proceedings, and will be included in IEEEXplore and indexed by Ei Compendex, Thomson ISIand INSPEC.
25 2011 International Conference on Key Engineering Materials(ICKEM 2011) Sanya China
All papers accepted for ICKEM 2011 will bepublished by Advanced Materials Research Journal, which will be indexed by EI Compendex.

April 2011

01 2011 IEEE International Conference on Industrial and Intelligent Information (ICIII 2011) Bali Island Indonesia
ICIII 2011 conference proceedings will be included in the IEEE Xplore, and indexed by INSPEC, Thomson ISI, Ei Compendex.
01 2011 International Conference on Industrial and Intelligent Information (ICIII 2011) Bali Island Indonesia
The ICIII 2011 conference papers will be published as conference proceedings by IEEE, and will be included in IEEE Xplore, and indexed by EiCompendex, Thomson ISI and INSPEC.
01 2011 2nd International Conference on Biotechnology and Food Science(ICBFS 2011) Bali Island Indonesia
ICBFS 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEE Xplore, and indexed by EiCompendex and Thomson ISI.
08 3d International Conference on Recent Achievements in Mechatronics, Automation, Computer Science and Robotics (MACRo2011) Tirgu Mures Romania
08 2011 3rd International Conference on Electronics Computer Technology(ICECT 2011) Kanyakumari India
The ICECT 2011 conference proceedings will be published by IEEE, which will be included in IEEEXplor, and indexed by the Ei Compendex, ISI Proceedings and other indexing services.
08 2011 International Conference on Network and Computer Science (ICNCS 2011) Kanyakumari India
All conference papers will be published in the proceedings of the ICNCS 2011 conference and will be included in IEEE Xplore, and indexed by the Ei Compendex and Thomson ISI (ISTP).
12 2011 Association of Academic Physiatrists (AAP) Annual Meeting Phoenix AZ
15 2011 3rd International Conference on Digital Image Processing C ICDIP 2011 Chengdu China
The primary goal of the conference is to promote research and developmental activities in Physics All accepted papers will be published in the conference proceeding by SPIE, which will be indexed by Ei Compendex and Thomson ISI.
15 2011 International Conference on Engineering and Information Management (ICEIM 2011) Chengdu China
The ICEIM 2011 conference papers will be published into conference proceedings by IEEE, and will be included in the IEEE Xplore, and indexed by EiCompendex and INSPEC.
26 IEEE 2011 International Conference on Information Science and Applications (ICISA 2011) Jeju Island Korea (South)

CONFERENCE ALERTS – ACADEMIC CONFERENCES WORLDWIDE IN 2011

WASTE MANAGEMENT CONFERENCES WORLDWIDE
Upcoming events in Waste Management and related fields

January 2011

17 Infrastructure Middle East Manama Bahrain
19 7th Waste Management Finance Forum London United Kingdom
21 2011 International Conference on Advanced Material Research - ICAMR 2011 Chongqing China
All accepted papers of ICAMR 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
21 2011 International Conference on Advanced Material Research (ICAMR 2011) Chongqing China
All accepted papers of ICAMR 2011 will bepublished by Advanced Materials Research Journal, which will be indexed by EI Compendex.
24 Microbes in Wastewater & Waste Treatment, Bioremediation and Energy Production Goa India
24 DESALINATION O&M 2011 Abu Dhabi United Arab Emirates

February 2011

17 A National Conference on Urban Policy & Planning: A Case Perspective of Pune Pune India
21 Waste Management 2011 Abu Dhabi United Arab Emirates
22 Drilling Fluids and Cuttings Management Asia 2011 Bangkok Thailand
22 Hospital Waste Management 2011 Sydney Australia
22 Environmental Management in Mining 2011,Perth Perth Australia
23 Cooperation for Waste Issues Kharkiv Ukraine
26 2010 3rd IEEE International Conference on Signal Acquisition and Processing (ICSAP 2011) Singapore Singapore
ICSAP 2011 will be published in the conference proceeding by IEEE, and all papers in the proceedings will be listed in IEEE Xplore, and indexed by Ei Compendex, Thomson ISI and INSPEC.
26 2011 2nd International Conference on Environmental Science and Technology(ICEST 2011) Singapore Singapore
ICEST 2011 will be published in the conference proceeding by IEEE, and all papers will be included in the IEEE Xplore, and indexed by the INSPEC, Ei Compendex and Thomson ISI.
26 2011 2nd International Conference on Environmental Science and Technology Singapore Singapore
ICEST 2011 will be published in the conference proceedings by IEEE. All papers will be included in the IEEE Xplore, and indexed by the INSPEC, Ei Compendex and Thomson ISI.
27 WM Symposia 2011 Phoenix Arizona

March 2011

14 Public-Private Partnerships in Emerging Markets Kuala Lumpur Malaysia
15 II International Symposium on Agricultural and Agroindustrial Waste Management (SIGERA) Foz de Iguaçu Brazil
17 Municipal Waste Management Forum Vienna Austria
18 PlastAvenues Summit 2011 Mumbai India
21 AOP' Tunisia : International conference on Advanced Oxidation Process "for sustainable water management" Hammamet Tunisia
25 2011 International Conference on Key Engineering Materials(ICKEM 2011) Sanya China
All papers accepted for ICKEM 2011 will be published by Advanced Materials Research Journal, which will be indexed by EI Compendex.
25 2011 International Conference on Future Environment and Energy (ICFEE 2011) Sanya China
All the registered papers will be published into conference proceedings by IEEE, and distributed at the conference. The proceedings will be included in the IEEE Xplore, and indexed by INSPEC, EiCompendex and Thomson ISI.
30 ECOSMART-2011, 1st International Forum of Clean Technologies in Ukraine Kyiv Ukraine
30 Energy from Waste - Avoid wasting the opportunities Manchester United Kingdom

April 2011

01 2011 2nd International Conference on Biotechnology and Food Science(ICBFS 2011) Bali Island Indonesia
ICBFS 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEE Xplore, and indexed by EiCompendex and Thomson ISI.
01 2011 International Conference on Environment Science and Engineering - ICESE 2011 Bali Island Indonesia
The ICESE 2011 conference proceeding will be published by IEEE, which will be included in the IEEE Xplore, and indexed by the Ei Compendex, ISI Proceeding and other indexing services.

10 CleanMining 2011: 9th International Conference on Clean Technologies for the Mining Industry Santiago Chile
13 Environmental International Forum SAVE the Planet - Waste & Water Management, Recycling Sofia Bulgaria
14 MEDGREEN2011 Beirut Lebanon

May 2011

07 2011 International Conference on Food Engineering and Biotechnology(ICFEB 2011) Bangkok Thailand
ICFEB 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEE Xplore, and indexed by EiCompendex.
07 2011 International Conference on Chemistry and Chemical Process(ICCCP 2011) Bangkok Thailand
ICCCP 2011 will be published in the conference proceeding, and all papers in the proceedings will be included in IEEE Xplore, and indexed by EiCompendex.
08 Waste - The Social Context. People, Policies, Persuasions and Payoffs Edmonton Canada
11 17th International Energy and Environment Fair and Conference Istanbul Turkey
22 World Environmental and Water Resources Congress Palm Springs California
30 Recycling of Organics Wastes in Agriculture Esfahan Iran
31 ISWA Conference, WasteTech-2011 Moscow Russian Federation

June 2011

01 2011 International Symposium on Environmental Science and Technology Dongguan China
02 ACSEE - The Asian Conference on Sustainability, Energy and the Environment 2011 Osaka Japan
International Interdisciplinary Conference on Sustainability, Energy and the Environment organized by the International Academic Forum(Japan) in Association with Auburn University(USA), UFWH, and the UNWFP. Call for Papers Now Open
03 First Annual International Conference on Society, Technology and Sustainable Development Kochi India
06 The 8th IWA Leading-Edge Conference on Water and Wastewater Technologies Amsterdam Netherlands
06 19th European Biomass Conference and Exhibition Berlin Germany
09 Westminster Energy, Environment & Transport Forum Keynote Seminar: Future of UK Waste policy London United Kingdom
21 Air & Waste Management Association's 104th Annual Conference & Exhibition Orlando Florida

September 2011

08 12th International Conference on Environmental Science and Technology (CEST2011) Rhodes Greece
10 International Conference on Environmental Aspect of Bangladesh (and the World) Kitakyushu Japan
12 1st International Conference WASTES:Solutions,Treatments and Opportunities Guimarães Portugal
13 International Pump User Conference Johannesburg South Africa

October 2011

12 IVth International Conference on Biotechniques for Air Pollution Control (Biotechniques-2011) La Coruña Spain
13 Green Conclave New Delhi India
19 WaterMed 2011 Milan Italy
25 Sustainable Thermal Energy Management International Conference (SusTEM2011) Newcastle United Kingdom

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Tome IV (Year 2011). ISSN 2067-3809

MANUSCRIPT PREPARATION - GENERAL GUIDELINES

ABSTRACT:
A nonmathematical abstract, not exceeding 200 words, is required for all papers. It should be an abbreviated, accurate presentation of the contents of the paper. It should contain sufficient information to enable readers to decide whether they should obtain and read the entire paper. Do not cite references in the abstract.

KEYWORDS:
The author should provide a list of three to five key words that clearly describe the subject matter of the paper.

GENERAL ASPECTS REGARDING THE MANUSCRIPTS

These instructions are written in a form that satisfies all of the formatting requirements for the author manuscript. Please use them as a template in preparing your manuscript. Authors must take special care to follow these instructions concerning margins. The basic instructions are simple:

- *Manuscript shall be formatted for an A4 size page.*
- *The top and left margins shall be 30 mm.*
- *The bottom and right margins shall be 25 mm.*

The text shall have both the left and right margins justified.

STRUCTURE

The manuscript should be organized in the following order: Title of the paper, Authors' names and affiliation, Abstract, Key Words, Introduction, Body of the paper (in sequential headings), Conclusion, Acknowledgements (where applicable), References, and Appendices (where applicable).

THE TITLE

The title is centered on the page and is CAPITALIZED AND SET IN BOLDFACE (font size 14 pt). It should adequately describe the content of the paper. An abbreviated title of less than 60 characters (including spaces) should also be suggested.

AUTHOR'S NAME AND AFFILIATION

The author's name(s) follows the title and is also centered on the page (font size 11 pt). A blank line is required between the title and the author's name(s). Last names should be spelled out in full and succeeded by author's initials. The author's affiliation (in font size 11 pt) is provided below. Phone and fax numbers do not appear.

TEXT LAYOUT

The manuscript must be typed single spacing. Use extra line spacing between equations, illustrations, figures and tables. The body of the text should be prepared using Times New Roman. The font size used for preparation of the manuscript must be 11 points. The first paragraph following a heading should not be indented. The following paragraphs must be indented 10 mm. Note that there is no line spacing between paragraphs unless a subheading is used. Symbols for physical quantities in the text should be written in italics.

FIGURES AND TABLES

Figures (diagrams and photographs) should be numbered consecutively using Arabic numbers. They should be placed in the text soon after the point where they are referenced.

Figures should be centered in a column and should have a figure caption placed underneath. Captions should be centered in the column, in the format "Figure 1" and are in upper and lower case letters. When referring to a figure in the body of the text, the abbreviation "Figure" is used Illustrations must be submitted in digital format, with a good resolution.

Table captions appear centered above the table in upper and lower case letters. When referring to a table in the text, "Table" with the proper number is used. Captions should be centered in the column, in the format "Table 1" and are in upper and lower case letters. Tables are numbered consecutively and independently of any figures. All figures and tables must be incorporated into the text.

EQUATIONS AND MATHEMATICAL EXPRESSIONS

Equation numbers should appear in parentheses and be numbered consecutively. All equation numbers must appear on the right-hand side of the equation and should be referred to within the text.

CONCLUSION

A conclusion section must be included and should indicate clearly the advantages, limitations and possible applications of the paper. Discuss about future work.

ACKNOWLEDGMENT

An acknowledgement section may be presented after the conclusion, if desired. Individuals or units other than authors who were of direct help in the work could be acknowledged by a brief statement following the text.

REFERENCES

References should be listed together at the end of the paper in alphabetical order by author's surname. List of references indent 10 mm from the second line of each references. Personal communications and unpublished data are not acceptable references.

- *Journal Papers: Surname1, Initials; Surname2, Initials and Surname3, Initials: Title, Journal Name, volume (number), pages, year.*
- *Books: Surname1, Initials and Surname2, Initials: Title, Edition (if existent), Place of publication, Publisher, year.*
- *Proceedings Papers: Surname1, Initials; Surname2, Initials and Surname3, Initials: Paper title, Proceedings title, pages, year.*

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2. NAME SURMANE 2ND AUTHOR

1. 2. COMPLETE AFFILIATIONS OF THE AUTHOR(S)

SUBMISSION

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2011

January

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