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DEVELOPMENT TECHNOLOGY FOR WELDING IN MIG-MAG SHIELDING GAS ENVIRONMENT

ABSTRACT:
The information system is a coherently structured assembly, made of electronic computing and communication equipments, software, processes, automated and manual procedures, used as automatic data processing tool within a field of activity.
In the process of welding in shielding gas environment with fusible electrode, there are used either inert or active gases. Therefore, we make the distinction between welding in an inert gas environment with fusible electrode (MIG) and welding in an active gas environment with fusible electrode (MAG). This paper presents the technology development for welding in MIG-MAG shielding gas environment and a new calculation methodology for major welding parameters using an informatics application.
This publication aims to expose the collaborative work and the experiences of our project team in order to design and implement a training tool in the welding domain, which includes interactive educational resources organized into a database. The goal of the project is to design a more attractive multimedia training content, with multimodal character.

KEYWORDS:
welding, Mig-Mag, informatics, software

INTRODUCTION

The information system is a coherently structured assembly, made of electronic computing and communication equipments, software, processes, automated and manual procedures, used as automatic data processing tool within a field of activity.
The designing and developing of computer systems is appropriate in new IT systems, or for developing, upgrading or maintaining the existing ones.
In case of designing, the information system development team must carry out the following successive modelling processes [5], [6]:

- information modelling that provides the critical description of the existing system and defines the functional requirements measured by the objectives to be met by the new information system;
- conceptual modelling that describes the structure and functional solution of the new system to meet in the best possible conditions the required objectives, independent of computer, operating system or data management system;
- technical or detailed modelling that implies the transformation of the functional solution into an operational solution on a particular type of computer and data management system.

In database applications, the tables are updated by means of specialized models, called forms, which provide:

- end-user friendly interface, achieved through various controls (buttons, text boxes, etc.) or other embedded graphics;
- simultaneous updating of multiple tables through subforms;
- validation rules in addition to those defined in the tables.

THE MIG-MAG WELDING PROCEDURE

Today, the shielded metal arc welding procedure - sometimes referred to by its subtypes metal inert gas (MIG) welding or metal active gas (MAG) welding - is the most common industrial welding process, preferred for its versatility, speed and the relative ease of adapting the process to robotic automation. Unlike welding processes that do not employ a shielding gas, such as shielded metal arc welding, it is rarely used outdoors or in other areas of air volatility. The shielded metal arc welding procedure is currently one of the most popular welding methods, especially in industrial environments. It is used extensively by the sheet metal industry and, by extension, the automobile industry, which uses this procedure welding almost exclusively. Another advantage is the extremely high productivity that MIG-MAG welding makes possible. It is a versatile method which offers a lot of advantages.

Welding in protective environment is the generic term for all the welding processes in which the weld pool and the metal transferred into it are protected, by a shielding gas, against the action of the atmosphere. The arc between the electrode and work piece burns visible.

The processes of welding in shielding gas environment can be classified according to the type of electrode, shielding gas and the electric arc protection used.

A first classification can be done by electrode type [1], [2]. Thus, the processes can be divided into non-fusible electrode processes and fusible electrode processes.

The non-fusible electrode – or "permanent" – is made of tungsten, and that's why this procedure is called gas-shielded arc welding with a non-fusible electrode.

In case of fuse welding electrode, this is simultaneously one of the electric arc poles, and filler. It has the same chemical composition or very close to that of base material. This procedure is called gas-shielded arc welding with a fusible electrode.

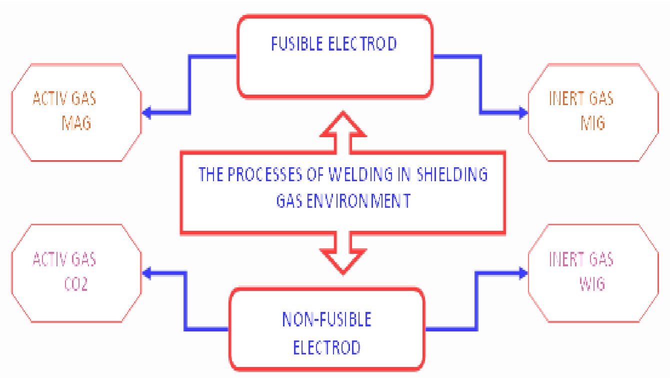

Fig. 1. The processes of welding in shielding gas environment

These two categories can be differentiated by the shielding gas they use [1].

In the process of welding in shielding gas environment with non-fusible electrode, there are used inert or noble gases. The term "inert" comes from Greek and means "indifferent'' or „slow in reaction". Among the noble gases available, for welding in inert gas environment with fusible electrode (WIG) there are mainly used argon or helium, or mixtures thereof.

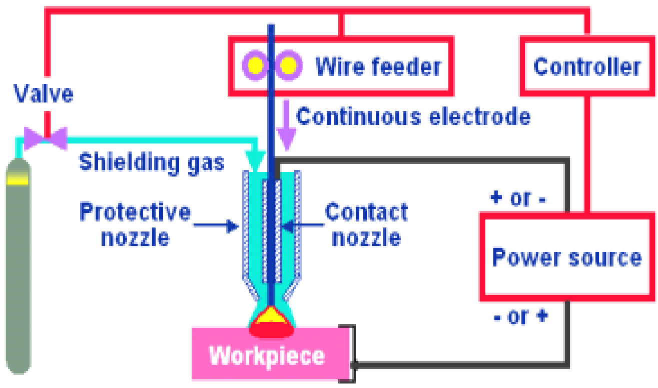

Fig. 2. MIG / MAG welding process

In the process of welding in shielding gas environment with fusible electrode, there are used either inert or active gases. Therefore, we make the distinction between welding in an inert gas environment with fusible electrode (MIG) and welding in an active gas environment with fusible electrode (MAG).

Another distinction is made depending on the type of shielding gas used, i.e. between the MAGM welding, where there are used mixtures of argon-based gasses with addition of active components, as CO_2 and O_2 (also known as GMMA = "gas-mixture metal arc" welding), and the MAGC welding, where it is used technical carbon dioxide, CO_2 (also known as GMA-CO_2).

TECHNOLOGY DEVELOPMENT FOR WELDING IN MIG/MAG SHIELDING GAS ENVIRONMENT

Classically, this technology involves the following stages [4], figure 3:

- presentation of backlash shape and establishing the actual sizes;
- choice of welding materials;
- calculation of parameters and welding technology;
- tabulation.

The first stage, presentation of backlash shape and establishing the actual sizes, figure 4, will be based on the following features [3]:

- reduced diameter of the electrode wire;
- lack of coating material;
- high current densities.

Fig. 3. User interface

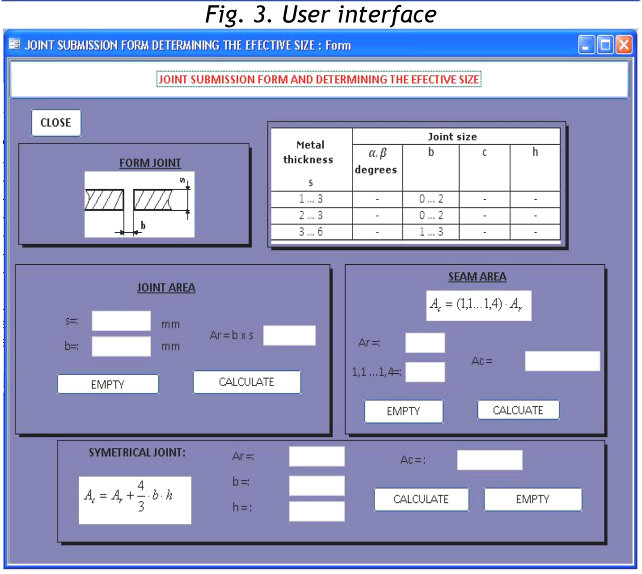

Fig. 4. Joint submission form and determining the effective size

Fig. 5. MIG / MAG welding technologies

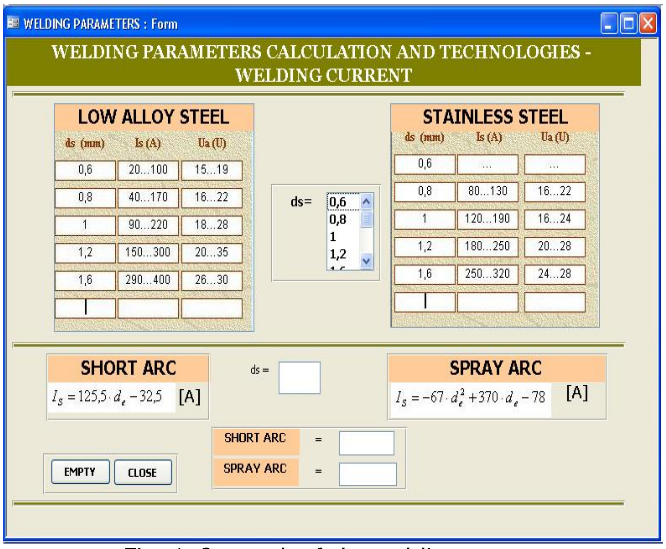

Fig. 6. Strength of the welding current

The inadequately chosen of backlash sizes and the mismatch of technological welding parameters can lead to malfunctions, as follows:

- puncture and drainage of molten metal material at the root;
- electrode wire passing among components without arc ignition, or its discontinuation;
- lack of penetration at the root;
- root unmelting.

The second stage, choice of welding materials, includes:

- choosing the wire brand and shielding gas;
- establishing the electrode wire diameter;
- determining the number of passes;
- arrangement of passes.

The third stage, calculation of parameters and welding technology, aims to establish, figure 6:

- the welding variance;
- free length of electrode wire;
- current amperage;
- spring tension

The first form of application is called Interface and allows the launching of the other options of the application, figure 3.

The program requires data entry in the afferent fields. Then, by pressing the button „CALCULATE", the requested result is automatically displayed.

CONCLUSIONS

This type of information system enables the development of welding technology automatically, saving time, because the engineer disposes of a comprehensive database, from where he extracts the values of the imposed welding parameters.

So, the values of the other parameters are going to be calculated based on the extracted values, through an intuitive and friendly interface, create of interactive learning resources structured in database, for the acquisition of knowledge and skills in the welding field.

This publication aims to expose the collaborative work and the experiences of our project team in order to design and implement a training tool in the welding domain, which includes interactive educational resources organized into a database.

The goal of the project is to design a more attractive multimedia training content, with multimodal character (accessible on keywords-based consultation, or in training route mode), which will contribute to the development of personal and professional autonomy of the employees, students and European people in training and further training activities in welding domain, since the practitioner level until the welding engineer.

This publication was developed to promote the visibility of the project and its progress, and is dedicated, also, to the intent of dissemination and exploitation of the project results.

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