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PROCEDURE FOR IMPROVEMENT OF THE ADMINISTRATION OF WAREHOUSES IN THE FACTORY RUM CUBAY

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Abstract: In the research, a wide review of the current literature was carried out, especially of everything related to the storage of products in general, food, international certification of warehouses, warehouses 4.0 and the Cuban resolutions of certification in force. Based on this, a procedure was developed that allows the self-assessment of warehouses with a view to their certification. The work steps it includes consider quality management tools, specific to warehouse management and management in general. Its application increases in complexity as excellence is sought. It was applied to the case study of the finished products warehouse of the Cubay Rum factory in Cuba.

Keywords: Warehouse Management, Warehouse Certification, Warehouses 4.0

INTRODUCTION

Today's business world is becoming increasingly complex and unpredictable for global companies. The changing conditions due to the worldwide spread of the Covid-19 virus pandemic led to increased competition for certain products. The accelerated development of science and technology, together with the globalization of the market, make all organizations, especially Cuban ones, face a race to find solutions that ensure the satisfaction of the population's needs, optimize their processes and improve their competitiveness.

The research takes into account the impact of the fourth industrial revolution or Industry 4.0, and especially observes the Logistics 4.0 that accompanies this evolution. In this context, there are also 4.0 warehouses. Although these technologies are far from the possibilities of most countries, including Cuba, it is interesting to know about them. The interconnection between solutions and software, together with robotics and the management of interaction with people, which connects flexible and intelligent automated solutions with the capacity to expand and adapt to change, are part of the 4.0 version of warehouses.

In the world, warehouses are certified with different standards that respond or adapt to the regulations and standards that the country deems necessary for rigorous compliance with the storage of products according to their characteristics, destinations and consumers. The most common certifications for warehouses are for the construction of the building and the management systems that operate it.

Since the new millennium, different norms and resolutions have been created in Cuba that regulate the procedure for certifying storage systems in the country, as well as who is authorized to categorize them. Since 2007, with Resolution 153 [1] one of the first steps was taken in the creation of a logistic file (EXPELOG) that allows the evaluation of storage systems in companies; it is later complemented with other

ministerial resolutions that consolidate the implementation in Cuba. In 2020, the accreditation procedure for storage systems and the requirements to obtain certifications are updated in Resolution 47[2] In addition, Resolution 64[3] creates the National Commission of Experts in Warehouse Logistics, with the objective of controlling and certifying everything related to the category obtained by warehouses in the country and the content of warehouse logistics improvement courses.

Cubay Rum Factory produces high volumes of rums with the premise of satisfying the requirements of its customers, assuring the quality and innocuousness of the productions. Among the expansion plans is the insertion in new markets in Europe; but there are weaknesses, among which is the lack of certification of finished product warehouses by any international European standard for food and beverages. Cuba does not have agencies qualified to certify with these specific international standards; but the new regulation aims to have warehouses evaluated by standards comparable to the most widely used standards or systems in the world, to generate customer confidence and preserve the final quality of the stored product.

Among the methodological tools consulted, several were found to be provided by the authors in the international and national arena. From their study, it was found that they have relevant aspects such as Lean Logistics and the different national procedures for the improvement of warehouse logistics. In the latter, it is always necessary to make adjustments considering the types of products stored, aspects related to the warehouse itself, international experiences and the emergence of new national regulations, in addition to the fact that this procedure can be better structured. The entry into force in May 2020 of the new regulation places the rum company in a position to improve, since it was certified with the first technical level by this regulation. The top management of the company and the Cuba Ron group are not satisfied with the result achieved,

since the first technical level of certification is the lowest of the categories granted.

According to the above, the general objective is defined as: to improve the logistics of the warehouse of finished products of the Cubay Rum Factory.

To achieve the general objective, the following specific objectives are established:

1. Carry out a thorough bibliographic review, which allows to have all the theoretical bases and fundamental applications linked to the subject of the research.
2. Design a procedure for the continuous improvement of the storage logistics of the different presentations of Cubay rum.
3. Apply the proposed procedure to the warehouse of finished products of the Cubay Rum Factory.

In order to meet the objectives, set out in the research, the current storage system in the finished products warehouse of the entity studied is evaluated. In addition to complementing the evaluation with the review of the reports of the audits carried out. Possible corrective actions that the factory can take to improve the system will also be taken into account.

METHODOLOGY

The referential theoretical framework is the search and study of all the literature that is directly related to the research topic[4] Based on the above, the need for the topic under study, the research and analysis of the specialized international and national literature, the review of the state of the art and practice on the subject of warehouse management in logistics chains in general and in particular those of beverages is raised.

— Logistics and Supply Chain Management

Current literature registers more than 35 terminologies to refer to logistics: complex with an integrating, systemic and rationalizing concept, fundamentally oriented to the satisfaction of the final customer of the chain, with the minimum costs and the quality and time required and the quantity and place specified; or simple to give a general idea of the objectives and functions pursued by the same. Researchers and companies use them indistinctly according to the circumstances and objectives they intend to achieve, some of these authors are: [5-9] define that: logistics is that part of supply chain management, which plans, implements and controls the direct and reverse flow and the effective and efficient storage of goods and services, with all related information from the point of origin to the point of consumption, in order to meet customer requirements.

As can be noted, there are many coincidences in the existing definitions that can be summarized in that logistics is a system that comprises the processes of supply, production, distribution, marketing and its reverse chain, which are developed between suppliers and customers, involving the effective and efficient management of material, financial, information and waste flows, having as a premise customer satisfaction.[10].

— Industry 4.0

The world is currently entering the fourth industrial revolution, which is referred to by various authors as the digital revolution or Industry 4.0, where the role of digitalization and IT interconnectivity within industries is prioritized. The term “Industry 4.0” was first used in a high-tech strategy project of the German government. It is based on software nomenclature and is used as a synonym for the fourth industrial revolution. The basic concepts of Industry 4.0 ensure the availability of relevant information in real time by networking all elements involved in value creation, the ability to derive optimal value-adding processes from information and data at any time, and the realization of integrated value-adding process reporting. [11]

Relevant Logistics 4.0 technologies are: identification, mobile communication, localization, electronic data interchange, data analysis methods and data analysis processing. [12] This includes transportation, warehousing and management of raw materials and finished products.

For several years now, there have been several automation systems on the market specially designed to provide automatic picking and storage solutions that increase productivity indicators, reducing the number of movements, transport tasks and space requirements [13]. In this paper we have talked about the fourth industrial revolution or Industry 4.0, the logistics that accompanies this evolution and with it it is also appropriate to identify the Warehouses 4.0. Although these technologies are far from the possibilities of many countries, including Cuba, it is interesting to learn about them in order to incorporate small elements of the same. The interconnection between solutions and software, together with robotics and the management of interaction with people, which connects flexible and intelligent automated solutions with the capacity to expand and adapt to change, are part of the 4.0 version of warehouses.

— Certifications

Considering the author’s idea,[14] companies require a rational use of limited resources (inventories, human capital, equipment, space and economic resources). Whether in the management of medicines, industrial supplies, perishable products, electronics, fabrics, food, beverages and others. It is not only important to maintain optimal inventory levels, but also to maintain its properties in good condition and ensure that the worker performs his work in safe environments, so that the offer to the customer is accurate. Based on their concept of “due diligence” (the ability to be able to demonstrate that all reasonable steps have been taken to avoid an incident), European retailers have established specific standards to ensure logistical, food (and non-food) product quality, safety and legality in the food and beverage supply chain. Food safety standards such as:

- ≡ The British Retail Consortium (BRC)
- ≡ Germany’s International Features Standards (IFS)
- ≡ Australia’s Small Quantity Generator (SQG)
- ≡ The Dutch Hazard Analysis Critical Control Point (HACCP)

These standards are safe and operational management systems, applicable to both food and non-food products. They were created to ensure compliance by the supplier, taking into account storage, transportation and distribution, to ensure the retailer's ability to guarantee the quality and safety of the food products they sell.[15]

All these certifications have one thing in common, the storage standards of the products to be evaluated. This is caused by the different priorities that countries give to the products and their storage conditions.

— Warehouse certification regulations at the national level

The Ministry of Domestic Trade (MINCIN) is the governing body of the country's warehouse logistics activity and therefore in charge of regulating the development of this discipline in the national territory. The following is a brief explanation of the most important resolutions related to warehousing activities and those currently in force. These are: NC 492:2014 [16]: Food Storage. General Sanitary Requirements, currently in force; it establishes the general sanitary requirements to be taken into account for the storage of food products, raw materials and materials used in their preparation.

In 2020; as of May, the Resolution "General Sanitary Requirements for the Storage of Foodstuffs" will be incorporated [2] Resolution 47/2020 defines as objectives: to establish the main regulations in the processes, activities and operations in warehouse logistics of the entities operating in the national economy and to increase the effectiveness and efficiency of the processes, activities and operations related to warehouse logistics based on continuous improvement. It clarifies the agencies with regulatory functions that interact with warehouses. It also explains that: EXPELOG is a mandatory tool to be used in the warehouse and a necessary aspect for its categorization.

Referring to the categorization of warehouses, the resolution states "The categorization process is an institutional act that is executed free of charge, to achieve greater effectiveness in warehouse logistics processes". It is performed according to technological levels:

- ≡ First level: When the products are stored in conditions that guarantee their adequate control and conservation.
- ≡ Second level: When an adequate organization and operation of the warehouse is achieved.
- ≡ Third level: When a correct operation of the warehouse is carried out with a focus on the customer and constitutes a reference warehouse.
- ≡ No categorization: When any requirement is not fulfilled in the evaluation process for the categorization of the First Level.

The National Commission of Warehouse Logistics Experts is regulated by Resolution 64/2020[3] This resolution establishes the members and the hierarchy in the commission, as well as their responsibility in the fulfillment of logistics activities.

This study will consider the resolutions issued at the country level in 2020, for the case of storage of inputs and products in general and in particular for the case of beverages.

METHODOLOGY

The procedure developed is the result of the bibliographic analysis carried out, as it contains in a rational manner what has been proposed by the different authors with respect to warehouse logistics, the different resolutions in force in the country related to this activity and the different certifications studied. Figure 1 shows the procedure for improving the storage of Ron Cubay.

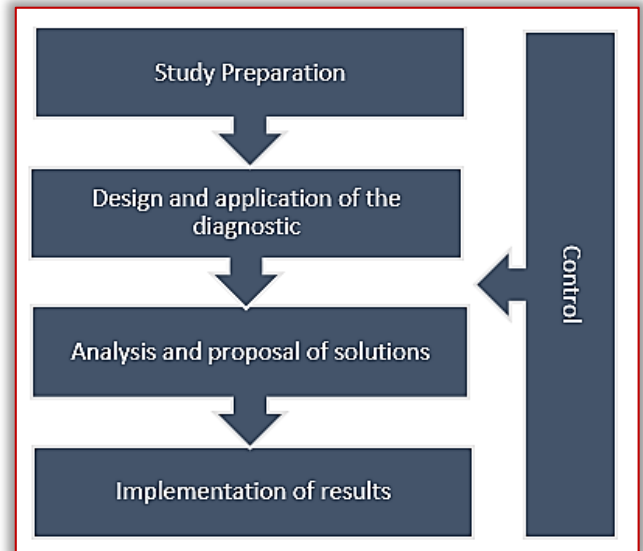


Figure 1: Procedure for improving the storage of Cubay Rum

— Study Preparation

The characterization of the current situation, as the first step or stage of the work, is important in order to have a general knowledge of the organization and in particular of the warehouse under study. For this purpose, it is necessary to describe a whole set of aspects that are detailed below: the corporate purpose, mission, vision, integrated management policy, product lines, strategic analysis of the organization, warehouse layout, analysis of storage technology, technical condition of the equipment, among others.

When assessing the requirements and restrictions demanded by the stored products, compliance with the standards and resolutions established for each type of product stored or to be stored should be taken into account, as well as the specifications described by the manufacturers regarding handling, storage and conservation. It is necessary to evaluate all the activities carried out in the warehouse in order to guarantee the correct handling and conservation, since this result can lead to a significant reduction in logistics costs.

The result of this assessment will make it possible to evaluate the efficiency of the type of installation selected and to propose the optimal-viable technological variant to achieve the best management results. All the requirements and restrictions demanded by the products and the warehouse under study.

— Design and application of the diagnostic tool

This work stage is the core of the warehouse diagnosis and includes the study of the physical installation and its management, preferably qualitatively and quantitatively. The aspects to be analyzed are: space utilization, warehouse organization, reception and dispatch of goods, planning and control, documentation, safety and security, and conservation standards.

For the evaluation of these aspects, several essential tools were used, which are analyzed in the system. These are: checklist (developed to detect problems from a qualitative point of view), storage space utilization indicators, warehouse operation and customer service indicators and cause-effect diagram, which is a qualitative tool, recommended in this case to integrate all the problems detected graphically. Table 1 shows a summary of the checklists and their scores by key areas.

Table 1: Summary of the areas and assessments in the checklists.

Source: Own elaboration

| Checklist 1 | | Checklist 2 | | Checklist 3 | |
|--|--------|--|--------|--|--------|
| Aspects to evaluate | Points | Aspects to evaluate | Points | Aspects to evaluate | Points |
| Constructive state | 10 | Constructive state | 10 | Constructive state | 10 |
| - | - | Use of space | 10 | Use of space | 10 |
| Warehouse organization | 30 | Warehouse organization | 20 | Warehouse organization | 15 |
| Planification and control | 15 | Planification and control | 10 | Reception and dispatch of the merchandise | 10 |
| Documentation in the warehouse | 10 | Documentation in the warehouse | 10 | Planification and control | 10 |
| Conservation and pest control standards | 10 | Conservation and pest control standards | 10 | Documentation in the warehouse | 15 |
| Protection, Safety and health of workers | 15 | Protection, Safety and health of workers | 10 | Conservation and pest control standards | 10 |
| - | - | Equipment | & | Protection, Safety and health of workers | 10 |
| - | - | Cleaning and disinfection | 10 | Equipment | & |
| Product contamination | 10 | Product contamination | 10 | Product contamination; Cleaning and disinfection | 10 |
| Total | 100 | Total | 100 | Total | 100 |

It is important to point out that in order to reach a level of categorization, all aspects of the previous level and the level for which it is chosen must be fulfilled. This is represented in the checklists, as this avoids losing achievements that have already been reached. The three checklists will have a value

of 100 points each, although the values of the evaluated areas and aspects vary according to the technological level. Checklist 2 is applied in the research, by way of example some of its unique characteristics are highlighted in the points that most affect the evaluation of the warehouse. These are:

- ≡ Use of space:
 - ✓ Digital organization of the warehouse.
 - ✓ I work with the scanner and codes on the secondary packaging.
 - ✓ Use of machinery to avoid double manipulation.
- ≡ Organization of the warehouse:
 - ✓ The effectiveness of control methods.
 - ✓ Construction facilities for reception and dispatch.
 - ✓ Procedures or technologies to reduce handling.
 - ✓ Training of workers in logistics and in the use of equipment in their work area.
- ≡ Warehouse documentation:
 - ✓ Traceability.
 - ✓ Skills with computers and data processing.
- ≡ Equipment
 - ✓ The equipment on the technological floor is connected by network or WIFI in the warehouse.
 - ✓ There is human-machine interaction in the automatic or semi-automatic activities of the warehouse.

It should also be noted that as the level of certification increases, the number of areas to be evaluated increases and the scores between the areas in the different levels of certification also change.

— Analysis and proposals for solutions

For the development of corrective actions, the starting point is an analysis of the storage technology. This factor is a determining factor in defining the form of storage to be selected.

Once the problems have been identified, a set of actions aimed at eliminating or minimizing the problems detected must be proposed. For the execution of the corrective actions, the conditions of the warehouse and the product of the factory must be taken into account, where the possible solutions tend to increase the economic results and the service to the client.

For the generation of corrective actions, the use of the expert method known as Brainstorming is recommended, in which workers, specialists and managers should participate, being essential the following: quality specialist, warehouse clerks, economic specialist, commercial manager (recommended as facilitator), members of the inventory commission, commercial analyst, distribution specialist.

— Implementation of the results

This work step constitutes an ordering of the results of the previous step. It involves drawing up an implementation plan for the proposed corrective actions, using the format in Table 2.

Table 2. Implementation Plan

| Deficiency | Measure | Responsible | Participants | Compliance Date |
|------------|---------|-------------|--------------|-----------------|
| | | | | |

At this stage, the implementation of the technological reorganization design of the warehouse is proposed for a trial period of 6 months. The commercial manager will systematically meet with those responsible for applying each measure and verify compliance with the implementation plan. If any corrective action requires staff training, this manager will coordinate with the Human Resources area.

— Control

The last step of the procedure is a control loop to rectify any deviations detected during the 3-month period of operation of the warehouse. The checklist and indicators proposed in the diagnostic stage are used again to verify whether the problems have been mitigated or eliminated and the indicators meet the requirements of Resolution 47/2020.[2] If this does not occur, return to the work step of the corresponding procedure and repeat the rest of the procedure. On the other hand, if the warehouse is ready for categorization, the EXPELOG is prepared in the format suggested in the aforementioned resolution.

RESULTS AND DISCUSSION

The warehouse is in the first level of categorization, the checklist is applied to obtain the second level of categorization; a value of 76 points is obtained. Figure 2 shows a summary of the main problems that affect the evaluation of the warehouse in a Cause-Effect or Ishikawa diagram.

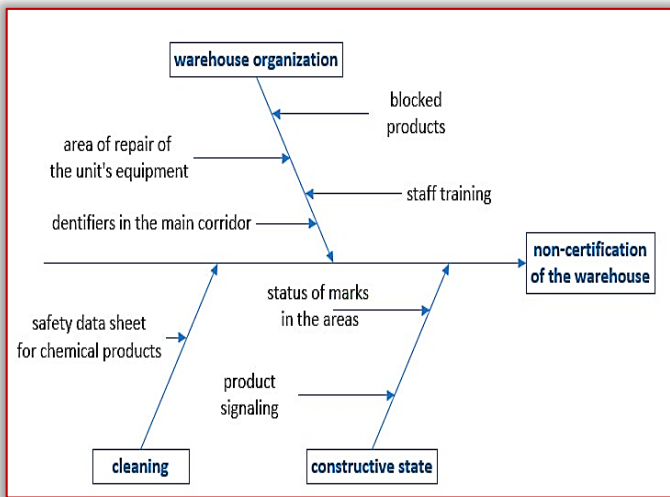


Figure 2: Cause-Effect diagram or Ishikawa

Once the problems have been identified, a set of actions aimed at eliminating or minimizing the problems detected must be proposed. For the execution of the corrective actions, the conditions of the warehouse should be taken into account, where the possible solutions tend to increase the economic results and customer service. A series of actions are recommended according to the results implementation plan, which are shown in Figure 3.

| Deficiencia | Acciones correctoras propuestas | Responsable | Ejecutor | Fecha de cumplimiento |
|--|--|--------------------|----------------------------|-----------------------|
| Mal estado de las líneas del piso en las áreas de estibas directas. | Pintar las áreas de estibas directas, con líneas preferentemente amarillas de diez (10) centímetros de ancho. | Jefe de almacén | Departamento Mantenimiento | Julio 2021 |
| Se observan productos bloqueados en el almacén. | Organizar por pedidos de los clientes, para evitar la doble manipulación y los productos bloqueados. | Jefe de almacén | Trabajadores del almacén | Julio 2021 |
| No existe el área de reparación, los medios unitarizadores se mueven con la mercancía. | Exigir la recepción en buen estado de los medios unitarizadores por parte de los clientes. Además, la reposición en caso de roturas. | Director comercial | Jefe de almacén | Julio 2021 |
| Los lotes no tienen un identificador en los pasillos principales. | Facilitar marcadores o tarjetas para identificar los lotes en los pasillos principales. | Director comercial | Jefe de almacén | Julio 2021 |
| El personal no está capacitado. | Crear plan de capacitación para el personal del almacén. | Director de RRHH | Trabajadores del almacén | Septiembre 2021 |
| No existen las fichas de datos de seguridad para todos los productos químicos de limpieza. | Agregar al plan de limpieza la ficha de los datos de seguridad de los productos químicos utilizados. | Director comercial | Jefe de almacén | Julio 2021 |
| No se señalizan los diferentes grupos de productos. | Marcar en los pasillos principales los diferentes tipos de productos. | Director comercial | Jefe de almacén | Julio 2021 |

Figure 3: Implementation Plan

The way to validate the result is to apply again the checklist for the second level of certification, considering that most of the problems are solved. Table 3.1 summarizes the results of the application of the checklist in the warehouse. This checklist revealed the following problems in the different aspects evaluated in the warehouse.

Table 3. Summary of the results of the re-qualification of checklist two for the second technological level

| Aspects to be evaluated | Qualification | Quantitative evaluation | Qualitative assessment |
|--|---------------|-------------------------|------------------------|
| Constructive state | 10 | 10 | Not bad |
| Use of space | 10 | 10 | Not bad |
| Warehouse organization | 20 | 16.5 | Not bad |
| Planning and control | 10 | 9 | Not bad |
| Warehouse documents | 10 | 10 | Not bad |
| Conservation and pest control standards | 10 | 10 | Not bad |
| Protection, Safety and health of workers | 10 | 10 | Not bad |
| Computers | & | | Not good |
| Cleaning and disinfection | 10 | 10 | Not bad |
| Product contamination | 10 | 10 | Not bad |
| Total | 100 | 95.5 | Not bad |

Progress is being made in the ratings obtained in several aspects, but the aspect related to the waterproofing of the roof is an invalidating aspect. Although Cubay Rum Factory has designed a training plan for warehouse personnel, it has not been possible to implement it due to Covid-19 restrictions.

CONCLUSIONS

- ≡ The literature consulted provided the theoretical basis, among which the following stand out: supply chain management, warehouse logistics, international resolutions and those existing in the country, among other aspects. This is subsequently applied according to the specific characteristics of the entity under study.
- ≡ The procedure used constitutes the main scientific contribution. It contains methods and instructions for the categorization of the warehouse, as well as qualitative and quantitative tools, ranging from the determination of indicators, to the use of checklists and cause-effect diagrams, by means of which the diagnosis and improvement of the warehouse under study is carried out.
- ≡ The main contribution is the adaptation of the checklists to each desired certification level, according to the current Cuban resolution for the certification of warehouses and with it, of the corrective actions and the implementation plan. These adaptations are based on the requirements made to the rum storage process, taking into account the logistic norms of the warehouses, the resolutions for working with food products and the new food safety law.
- ≡ It is considered that the proposed general objective was achieved by developing a procedure for the analysis and improvement of warehouse management for the finished products of Cubay Rum Factory, which will enable it to advance in its level of certification in a relatively short period of time.
- ≡ Apply the proposed procedure to other supply chains, determining the changes that the proposed tools may undergo according to the selected chain; this will allow designing and implementing new research to contribute to enhance the certification of warehouses in different food supply chains.

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ISSN: 2067-3809

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