

ANALYSIS AND IMPROVEMENT OF THE WAREHOUSE OF FINISHED PRODUCTS IN RUM FACTORY

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Abstract:

The development of the global economy and consumer demands make the manufacture and production of items more reliable and transparent every day, in the case of food, it is essential in today's market to ensure the safety of food and beverages.

One of the fundamental tools to guarantee this process is the certification of the areas destined to store the products, for their distribution or reception by the clients. In the present investigation, an extensive review of the literature is carried out; where performance indicators used by different companies responsible for certifying the structures of the warehouses or the storage system used are evaluated. The best practices used for its improvement and better performance in the entities and the safety and hygiene required by the product are taken into account. As an application, a case study is presented with a view to the certification of the building for the storage of the finished production of its logistics system in the Ron Cubay production process.

Keywords: certification, warehouses, performance indicators, supply chain

Today's business world is constantly changing. The increased demand for certain productions is a challenge for warehouse logistics. Insisting on streamlining processes and making warehouses more competitive and secure is imperative today.

Different authors: [1], [2] and [3] suggest that logistics today, based on the plan and direction of all activities, is necessary to acquire and channel resources to process distribution and the final customer.

There are several certifications for supply chains in the world, each with its advantages and limitations. These certifications work regardless of the country. Due to the economic bottleneck imposed on Cuba, it is not possible to certify the entire supply chain. Due to the instability of suppliers and the delay or cancellation of shipment of raw materials.

In Cuba there are specific regulations for the certification of warehouses. The most representative problems in Warehouse Logistics are:

- Product location
- Conservation
- Custody
- Rotation and manipulation

The vast majority of Cuban organizations are involved in this situation.

1. Introduction

The Ministry of Internal Trade (MINCIN), which is the governing body of Supply Chain Management in Cuba, considered it necessary to establish methodological indications to make the processes of handling, storage and conservation of consumer goods more efficient. In 2004, it establishes Resolution No.59 / 04 [4], which regulates the policy of inventories, handling, storage and conservation of food. In addition, Resolution No.153 / 07 [5] appears, which includes logistics work regulations in warehouses, procedures for the implementation of the Logistics File (EXPELOG) and the categorization of wholesale warehouses. Currently, the MINCIN is in the process of preparing the Draft Regulations for Warehouse Logistics, which was released on March 29, 2019. From its entry into force, it will legislate everything related to the subject, repealing its time the resolutions in force.

When analyzing the industrial process of rums, the different phases of production and high production volumes must be stored safely. Warehouses must meet the quality and safety requirements for finished productions at the factory. However, the Cuban rum industry has several countries in the European zone as its main clients. The management of the factory has the future objective of obtaining an international logistics certification. Thus obtaining a competitive advantage over other Cuban brands that target the same market. When carrying out internal audits and checks on the logistics system, weaknesses are found that do not affect the quality of the product; but they prevent the effective management of the warehouses by the factory. In addition, international certifications not only focus on management, but also on other aspects such as environmental impacts, use and management of waste, saving water and energy, among others. The factory: "Ronera Central Agustín Rodríguez Mena" works to achieve the certification of its warehouses to reduce the impact of this problem situation.

The general objective of this investigation is defined as: To elaborate a Procedure to guarantee the quality assurance to achieve the certification of the warehouses.

The specific objectives of the research are:

“Identify the characteristic elements of the storage system through the evaluation of the entity.

- “Prepare a guide for the evaluation of the finished product warehouse, taking into account the activities and functions of the new logistics file and international certifications.
- Analysis of possible improvements for the current system

To meet the objectives set out in the research, the current storage system of the entity studied in the finished products warehouse will be evaluated. In addition to complementing the evaluation with the review of the internal audit reports of the entity. Possible improvement measures that the factory can take to improve the system will also be considered.

2. Research background

The need for the topic under study, warehouse management and logistics certification is raised. Furthermore, the storage conditions of alcoholic drinks are analyzed.

2.1 Logistics.

The current literature registers more than 35 terminologies to refer to logistics: with an integrating, complexes, systemic and rationalizing concept, fundamentally oriented to the satisfaction of the end customer of the chain. All this, with the minimum costs and the appropriate quality, the required time and the quantity and specified place. Also simple concepts to give a general idea of the objectives and functions that it pursues the same one. Several authors such as: [6], [7], [8], [9], [10] defines 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 the information related from the point of view of origin to the point of view of consumption, to meet customer requirements.

As can be seen, 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, commercialization and its inverse chain, which are developed between suppliers and customers, involving the effective and efficient management of material, financial,

informational and waste flows, based on customer satisfaction [11].

2.2 Industry 4.0

Currently the world is entering the fourth industrial revolution, which is named by several authors as the digital revolution or Industry 4.0, where the role of digitization and computer interconnectivity within Industries is prioritized. The term "Industry 4.0" was first used in a German government high-tech strategy project. It is based on software nomenclature and is used synonymously with the fourth industrial revolution. The basic concepts of Industry 4.0 guarantee the availability of relevant information in real time through the network connection of all the elements involved in the creation of value, the ability to deduce optimal value-added processes of information and data at any time and the realization of information on the integrated process of added value. [12]

The relevant technologies of Logistics 4.0 are: identification, mobile communication, location, electronic data interchange, data analysis methods and data analysis processing. [13]. This includes transportation, warehouses, and the management of raw materials and finished productions.

In the Industry 4.0, the logistics accompanies this evolution and with it is adapted, also, to identify the Warehouses 4.0. Although these technologies are far in all their dimension from the possibilities of most countries, including Cuba, their knowledge is interesting. The interconnection between solutions and software, together with robotics and human interaction management, which connects flexible and intelligent automated solutions with the ability to scale and adapt to change, are part of version 4.0 of the warehouses.

For several years now, there have been various automation systems on the market specially designed to provide automatic collection and storage solutions, which increase productivity indicators, reducing the number of movements, transport tasks and space [14].

2.3 Certifications

Taking into account the author's idea, [15] companies require a rational use of limited resources (inventories, human capital, equipment, space and economic resources). Be it in the administration of industrial supplies,

perishable products, electronics, fabrics, food, beverages and others. It is not only important to maintain optimal inventory levels, but also to maintain their properties in good condition and ensure that the worker performs his tasks in safe environments, so that the offer to the client is correct.

In the world, warehouses are certified with different standards which fulfill a specific function but all have in common the aforementioned aspects. The most popular certifications in recent years are:

- IFS Logistic (International Food Standard) for logistics activities such as loading and unloading, transportation, treatment and subsequent distribution.
- BRCS (Global Standard for Storage & Distribution)
- SQG (Small Quantity Generator)
- HACCP (Hazard Analysis Critical Control Point)

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

3. Methodology:

The procedure developed is the result of the bibliographic analysis carried out, as it contains in a rational way what was stated by the different authors regarding warehouse logistics, the different resolutions in force in the country related to this activity and the different certifications studied are shown in the Figure 1.

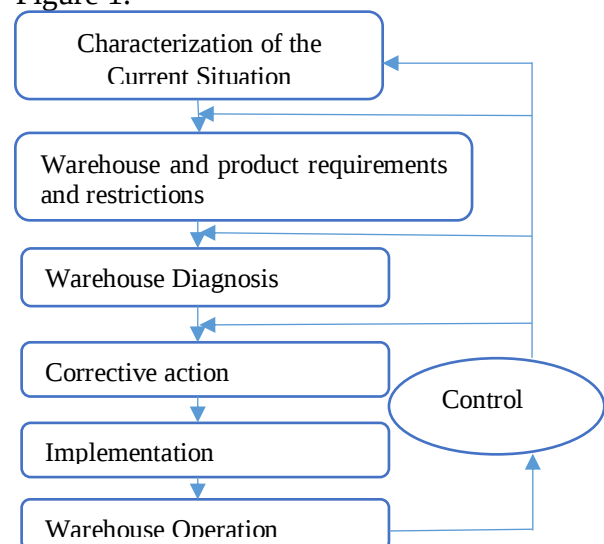


Figure 1: Methodology

Source: self-made

3.1 Characterization of the current situation

The characterization of the current situation, as a first step or stage of work, is important to have a general knowledge of the organization and in particular of the warehouse studied. For this, it is necessary to describe a whole set of aspects that are detailed below:

- Social object.
- Mission.
- View.
- Product lines.
- Organizational management structure.
- Strategic analysis of the organization•
- Storage technology.
- Technical condition of the equipment.

In a logistical operator, all the elements described previously converge in the same organization. In the case of warehouses that exist in companies whose corporate purpose is not a logistics service, it is necessary to differentiate those that characterize the organization from those of the warehouse, although they must also be present.

3.2 Warehouse and product requirements and restrictions

When evaluating the requirements and restrictions demanded by stored products, consideration must be given to compliance with the standards and resolutions established for each type of product stored or intended to be stored, as well as the specifications described by manufacturers regarding its 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 may lead to a significant decrease in logistics costs.

3.3 Warehouse diagnosis

This work step or stage constitutes the core of the diagnosis carried out at the warehouse and encompasses the study of the physical installation and its management, preferably in a qualitative and quantitative way. The aspects that must be analyzed are:

- Use of space.
- Organization of the warehouse.
- Reception and dispatch of merchandise.
- Planification and control.

- Documentation.
- Conservation regulations.
- Protection and security.

For the evaluation of these aspects, four essential tools were used, which are analyzed in Table 1, since they complement each other. These are:

Tools	Description
Check list.	Allows the detection of problems from a qualitative point of view.
Space use indicators	Area utilization coefficient. Height utilization coefficient. Volume utilization coefficient
Indicators of operation and customer service	Percentage of orders served on time. Percentage of errors in exit orders. Percentage of orders rejected. Percentage of completed orders delivered. Default assortment percentage. Percentage of assortments in excess. Loss percentage. Failure rate. Inventory rotation
Cause-effect diagram	Integrates all the detected problems graphically.

Table1 Tools for diagnosis.

Source: self-made

3.4 Corrective action development

The development of the corrective action, start from an analysis of the storage technology, starting with calculating the degree of massiveness, which is the relationship between the volume of products to be stored and the assortments that make up that volume, in m^3 / assortments. . The lower the degree of massiveness, the greater the number of assortments for a given volume. This factor is decisive in defining the form of storage to select.

For the generation of corrective measures, the use of the expert method known as "Brainstorming" is recommended, in which workers, specialists and managers must participate, the following being essential:

- Warehouse clerks.
- Economic specialist.
- Commercial manager (recommended as facilitator).
- Members of the inventory commission.

- Commercial analyst.
- Distribution specialist.

3.5 Implementation

This stage of work constitutes an ordering of the results of the previous step. The aim is to prepare an implementation plan for the proposed corrective measures, using the format in Table 1.

Deficiency	Measure	Responsible	Participants	Compliance Date

Table 1: Implementation

Source: [5]

3.6 Warehouse operation

In this stage, the application of the warehouse technological reorganization design is considered for a trial period of 3 months. The commercial manager will systematically gather those responsible for applying each measure and verify compliance with the implementation plan. If any corrective action requires training personnel, this manager will coordinate with the human resources area.

3.7 Control

The last step of the procedure is a control loop that allows any deviation detected in the 3-month period of operation of the warehouse to be rectified. The checklist and the indicators proposed in the diagnostic stage are used again to verify if the problems have been mitigated or eliminated and the indicators satisfy the requirements established in Resolution 09/07 [5]. If this does not happen, return to the working 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.

4. Results

Validation of the measurements requires expert analysis. Taking an estimated expert error ratio of 0.02, a precision level of 0.1, and a K constant value of 3.8416 for a 95% confidence level, 8 experts are needed. The group of experts was formed as follows in Table 3:

Position they carry	Amount
Logistics Director (as facilitator)	1
Warehouse manager	1

Specialists in Quality Management	2
Specialists in Human Resources	2
Specialists in Management	1
Master Ronero	1
Distribution Specialist	1

Table 3: Members of the expert group.

Source: self made

The group of experts met and each of the problems identified in the diagnosis was explained and analyzed. The deficiencies detected in the diagnostic stage are shown in figure 2 together with the corrective actions following the model proposed in the implementation plan.

Deficiencia	Acciones correctoras propuestas	Responsable	Ejecutor	Fecha de cumplimiento
Se desaprovecha la altura.	Sustituir los transportadores.	Director UEB	Bosera, Central	A largo plazo
No se puede realizar una correcta limpieza del local habitualmente y existen desperdicios de azúcar en el piso.	Elaborar un plan de limpieza. Controlar mediante la evaluación del desempeño individual de los ejecutores	Jefe del almacén	Barrendero	Inmediato
Existe una deficiente iluminación artificial.	Sustituir las luminarias defectuosas y colocar las que faltan.	Jefe de mantenimiento	Electricista	Inmediato
Deficiente ventilación.	Colocar extractores de aire.	Director UEB	Bosera, Central	A largo plazo
No existen marcas horizontales.	Hacer las marcas con pintura del color y la calidad adecuada.	Jefe del almacén	Encargado del mantenimiento	Inmediato
El personal no está capacitado en logística de almacenes.	Capacitar al personal en logística de almacenes.	Especialista B en RRHH	Jefe del almacén	Inmediato
No definida el área de reparación de los medios unitarizadores.	Definir y señalizar el área de reparación de los medios unitarizadores.	Jefe del almacén	Jefe de mantenimiento	Inmediato
Los viales de acceso al almacén requieren ser reparados.	Hegociar con organizaciones del territorio la reparación.	Director UEB	Contratados	Mediano plazo
No se registra fecha de fumigación (trazabilidad).	Confeccionar una tarjeta para este fin (ver Anexo 12).	Jefe del almacén	Jefe del almacén	Inmediato
Es insuficiente la cantidad de extintores en correspondencia con el área a proteger.	Ubicar la cantidad necesaria de extintores. Capacitar al personal sobre su uso.	Especialista B en Gestión de Recursos Humanos	Jefe del almacén	Inmediato
El personal no posee los medios de protección y seguridad necesarios. (vestuario, guantes, fajas, zapatos)	Entregar al personal todos los medios de protección y seguridad requeridos para la ejecución de las tareas.	Especialista B en Gestión de Recursos Humanos	Especialista B en Gestión de Recursos Humanos	Inmediato

Figure 2: Implementation Plan

Source: self made

It is assumed that it is possible to improve storage management starting with those feasible aspects in the short term. Except for only those measures that are essential, since the Ron Cubay product, in addition to being a food, is a source of exports.

The consensus index exceeds 70%, which is considered applicable. The arithmetic mean values express a result between adequate and very adequate, the median and the mode behave identically according to these central tendency statisticians. It is concluded that the measures proposed through the application of the procedure are adequate.

5. Conclusions

- The proposed procedure constitutes a practical tool aimed at the continuous improvement of warehouse logistics, with a view to achieving its certification. It contemplates the application of the main resolutions in force in the country, integrated into the approaches to storage that appear in the scientific literature.

- The tools that are applied as part of the procedure are a combination of qualitative and quantitative methods. A practical contribution is made up of the checklist drawn up, as it includes everything related to the material and information flows present in the warehouse.
- The proposed procedure constitutes a closed loop with feedback intended for continuous improvement. It does not end with the control and preparation phase of EXPELOG, but achieves the systematic adaptation to changes in the environment.

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