

# CERTIFICATION OF THE WAREHOUSE IN RUM FACTORY

**Ing. Ernesto González Cabrera**

*Industrial Engineering Department, Universidad Central "Marta Abreu" de Las Villas, Cuba  
ergcabrera@uclv.cu*

**DrC. Roberto Cespón Castro**

*Industrial Engineering Department, Universidad Central "Marta Abreu" de Las Villas, Cuba*

**Prof. Dr.-Ing. Dr. h.c. Norge Isaias Coello Machado**

*Mechanical Engineering Department, Universidad Central "Marta Abreu" de Las Villas, Cuba*

**Prof. Dr.-Ing. Elke Glistau**

*Institute of Materials Flow and Logistics. Otto von Guericke University, Germany*

## Abstract

Today's business world is becoming increasingly complex and unpredictable for companies. The accelerated development of science and technology, together with the globalization of the market, makes organizations face the need to find solutions that ensure their position in the market, lead to optimizing processes and make them more competitive. An important aspect in this regard is the certification of the entire process, including the warehouse areas. In the research, an extensive review of the current literature was carried out, especially the current resolutions, which allowed us to incorporate elements of logistics 4.0 and human-machine interaction. A procedure is developed that allows self-evaluation according to the level of certification that is chosen. Quality management tools are used, the application increases in complexity as excellence is sought in the storage of finished products. The case study is carried out as a way to improve the current certification level of the finished products warehouse at the Ron Cubay factory.

Keywords: certification, warehouse, quality management, logistics 4.0

## 1. Introduction

Starting in the new millennium, different norms and resolutions were created in Cuba that regulate the procedure to certify storage systems in the country;

as well as who was authorized to categorize them. Since 2007, with Resolution 153 [1], one of the first steps was taken in the creation of a logistics file (EXPELOG) that allows evaluating storage systems in companies; later it is complemented by other subsequent resolutions that consolidate the implementation in Cuba. In 2020, the accreditation procedure for storage systems and the requirements to achieve the certifications in Resolution 47 [2] are updated. In addition, Resolution 64 [3] creates the National Commission of Experts in Warehouse Logistics, with the aim of controlling and certifying everything related to the category obtained by warehouses in the country and the content of the courses for overcoming logistics in warehouses.

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

certification is the lowest of the categories awarded.

According to the aforementioned, the general objective is defined as: to improve the logistics of the finished products warehouse of the Central Rum Factory. To achieve the general objective set, the following specific objectives are established:

- Carry out an extensive bibliographic review, which allows to have all the theoretical bases and fundamental applications related to the research topic.
- Design a procedure for the continuous improvement of the storage logistics of the different presentations of Cubay rum.
- Apply the proposed procedure to the finished products warehouse of the Central Rum Factory.

## **2. Research background**

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

### **2.1. Logistics and Supply Chain Management**

The current literature registers more than 35 terminologies to refer to logistics: complexes with an integrating, systemic and rationalizing concept, fundamentally oriented to the satisfaction of the end customer of the chain, with the minimum costs and the quality and the time required and the quantity and place specified; or simple to give a general idea of the objectives and functions that it pursues. Researchers and companies use them interchangeably according to the circumstances and objectives they intend to achieve. Some of these authors are: [5], [6], [7], [8], [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 the information related from the point of view of origin to the point of view of consumption, in order 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 includes the processes of supply, production, distribution, marketing and its inverse chain, which are developed between suppliers and customers, implying the effective and efficient management of

material, financial, information and waste flows, taking customer satisfaction as a premise [10].

### **2.2. Industry 4.0**

Currently the world is entering the fourth industrial revolution, which is named by various 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 as a synonym for 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 from information and data at any time and the realization of an information of the integrated process of the added value [11].

The relevant technologies of Logistics 4.0 are: identification, mobile communication, location, electronic data interchange, data analysis methods and data analysis processing [12]. This includes transportation, warehouses and the management of raw materials and finished productions. In this paper, the fourth industrial revolution or Industry 4.0 of the logistics that accompanies this evolution is approached and with this it is also appropriate to identify Warehouses 4.0 [13].

Although these technologies are far from the possibilities of most countries, including Cuba, in all their dimensions, their knowledge is interesting. 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 ability to scale and adapt to change, are a part of version 4.0 of warehouses. For several years now, there have been various automation systems on the market specially designed to provide automatic collection and storage solutions, which allow increasing 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). Either in the administration 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 keep your properties in good condition and make sure that the worker performs their work in safe environments, so that the offer to the client is correct. Based on their concept of "due diligence"

(the ability to be able to demonstrate that all reasonable measures have been taken to avoid an incident), European retailers have established specific rules to ensure the quality of goods in logistics food (and non-food) products, safety and legality in the CS of food and beverages. Food safety standards such as:

- The English British Retail Consortium (BRC)
- The German International Features Standards (IFS)
- The Australian 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 supplier compliance, taking into account storage, transportation and distribution, to ensure the skills of the retailer and guarantee the quality and safety of the food products they sell [16]. All these certifications have one point in common, the standards for storing the products to be evaluated. This is caused by the different priorities that countries give to products and their storage conditions.

### 2.3.1. Warehouse certification regulations at the national level.

The Ministry of Internal Commerce (MINCIN) is the governing body of the logistics activity of warehouses in Cuba and therefore in charge of regulating the development of this discipline in the national territory. The most important resolutions related to warehouse activity and those that are currently in force are briefly explained below. These are:

Resolution 47/2020 [2] defines as objectives: to establish the main regulations in the processes, activities and operations in the logistics of warehouses of the entities that operate 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 organisms with regulatory functions that interact with the warehouses. It also explains that: EXPELOG is a mandatory tool for use 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 carried out according to the technological levels:

- First level: When the products are stored in conditions that guarantee an adequate control and conservation of the same.
- 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.
- Uncategorized: When a requirement is breached in the evaluation process for the First Level categorization.

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 its responsibility in the fulfillment of logistics activities. In this study, the resolutions issued at the country level in 2020 will be considered, in the case of the storage of supplies and products in general and in the case of beverages in particular.

## 3. Methodology

The procedure developed is the result of the bibliographic analysis carried out, as it contains in a rational way what was raised 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.

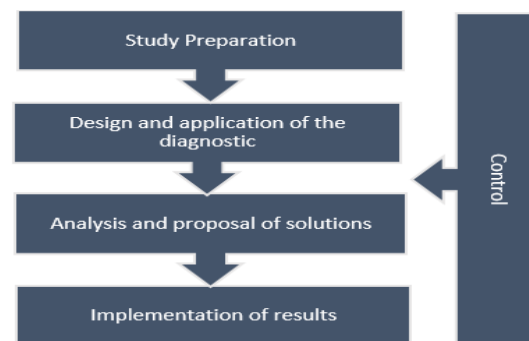


Figure 1: Methodology

### 3.1. Study Preparation

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: the corporate purpose, the mission, the vision, the integrated management policy, the product lines, the strategic analysis of the organization, the distribution of the warehouse floor plan, the analysis of the storage technology, the technical state of the equipment, among others. As the object of practical study is a logistics operator, all the elements described come together 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.

When assessing the requirements and restrictions demanded by stored products, compliance with the standards and resolutions established for each type of product stored or intended to be stored must be taken into account, as well as the specifications described by the manufacturers in terms of its handling, storage and conservation. It is necessary to evaluate all the activities that take place 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 effectiveness 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.

### 3.2. Design and application of the diagnostic tool

This stage of work constitutes the core of the diagnosis that is made to the warehouse and includes 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, warehouse organization, reception and dispatch of merchandise, planning and control, documentation, protection and security, and conservation standards.

For the evaluation, several essential tools were used that are analyzed in the system since they complement each other. These are: checklist (prepared to detect problems from a qualitative point of view), storage space utilization indicators, warehouse operation and customer service indicators and cause-effect diagram, which constitutes a qualitative tool, recommended in this case to integrate all the problems detected graphically. In table 1.1 you can see a summary of the checklists and their scores by key areas.

Table 1.1: Summary of the areas and evaluations in the checklists.

| Checklist 1                              |         | Checklist 2                              |         | Checklist 3                               |         |
|--|---------|--|---------|---|---------|
| Aspects to evaluate                      | Poi nts | Aspects to evaluate                      | Poi nts | Aspects to evaluate                       | Poi nts |
| 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      |
| Documentati on in the warehouse          | 10      | Documentati on in the warehouse          | 10      | Planification and control                 | 10      |
| Conservation and pest control standards  | 10      | Conservation and pest control standards  | 10      | Documentat ion in the warehouse           | 15      |
| Protection, Safety and health of workers | 15      | Protection, Safety and health of workers | 10      | Conservatio n 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 to reach a level of categorization it is necessary to comply with all the aspects of the previous level and the level chosen. This is represented in the checklists, as this avoids the loss of achievements that had already been achieved. The three checklists will have a value of 100 points each, although the values of the evaluated areas and the aspects vary according to the technological level.

In the investigation, checklist 2 is applied, as an example some of its unique characteristics are highlighted in the points that most affect the evaluation of the warehouse. These are:

- Use of space:
  - Computer organization of the warehouse.
  - Work with scanner and codes in secondary packaging.
  - Use of machinery to avoid double manipulation.
- Warehouse organization:
  - Efficiency of control methods.
  - Construction facilities for reception and dispatch.
  - Procedures or technologies to reduce manipulation.
  - Training of workers in logistics and use of equipment in their work area.
- Warehouse documentation
  - Efficiency of control methods
  - Traceability
  - Computer skills and data processing.
- Equipment
  - Warehouse connectivity is connected to the factory computer network or the company's cloud.
  - Human-machine interaction in the warehouse's automatic or semi-automatic activities

Also clarify that the higher the technological level, the more areas to evaluate appear and there are differences in the score of the areas at the different levels.

### 3.3. Analysis and solution proposals

For the development of the corrective action, we start from an analysis of the storage technology. This factor is decisive to define the storage method to select. Once the problems have been identified, the proposal of a set of measures aimed at eliminating or minimizing the problems detected

corresponds. For the execution of the corrective measures, the conditions of the warehouse and the factory product must be taken into account, where possible solutions tend to increase economic results and customer service. 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: quality specialist, warehouse employees, economic specialist, commercial manager (recommended as facilitator), members of the inventory commission, business analyst, distribution specialist.

### 3.4. Implementation of the results

This stage of work constitutes an ordering of the results of the previous step. The aim is to develop an implementation plan for the proposed corrective measures. The plan must have the following data: deficiency, measure, responsible, participants and date of fulfillment.

At this stage, the application of the technological reorganization design of the warehouse is proposed for a test period of 6 months. The commercial manager will systematically bring together those responsible for applying each measure and verifying compliance with the implementation plan. If any corrective action requires staff training, this manager will coordinate with the human resources area.

### 3.5. Control

The last step of the procedure is a control loop that allows rectifying any deviation that is detected in the 6-month period of warehouse operation. The checklist and the indicators proposed in the diagnosis stage are used again to verify if the problems have been mitigated or eliminated and the indicators meet the requirements established by Resolution 47/2020 [2]. If this does not happen, return to the work step of the corresponding procedure and repeat the rest of the procedure. Instead, if the warehouse is ready for categorization, the EXPELOG is made, with the format suggested in the aforementioned resolution.

## 4. Results

The warehouse is in the first level of categorization, the checklist is applied to obtain the second level of categorization; a value of 67.40 points is obtained. The warehouse is considered to have a fair rating. In the following figures 2-5 are shown the aspects that presented the greatest difficulties in the application of checklist 2:

| No. | Aspectos a evaluar   | Calfificación a Obtener | Calfificación del Almacén | Observaciones |
|-----|--|-------------------------|---------------------------|---------------|
|     | <b>Aprovechamiento del espacio.</b>  | <b>10</b>               | <b>5,5</b>                |               |
| 8   | Tiene señalizadas las áreas de recepción y despacho.   | 0,5                     | 0,5                       |               |
| 9   | No tiene productos bloqueados que implique una doble manipulación.   | 1                       | 0                         |               |
| 10  | Tiene definida un área para los productos esterilizados, separada del resto de los productos.  | 1                       | 1                         |               |
| 11  | Tiene área definida para el almacenamiento de los medios unitarizados vacíos.  | 1                       | 1                         |               |
| 12  | Poseer esta permitida en almacenes a cielo abierto, base de almacenes, o en aquellos techados que así lo requieran.  | 1                       | 1                         |               |
| 13  | Aplicación de normas y técnicas para el empleo de medios unitarizados.   | 1                       | 1                         |               |
| 14  | Empleo esquemas de óptima carga de medios unitarizados. (Siempre, Ocasional, Nunca)  | 0,5                     | 0,5                       |               |
| 15  | Cumplimiento de las marcas gráficas en embalaje secundario. (Siempre, Ocasional, Nunca)  | 0,5                     | 0,5                       |               |
| 16  | Se cumple con la altura de los almacenamientos de las estanterías.   | 0,5                     | 0                         |               |
| 17  | Se cumple el aprovechamiento de las estanterías.   | 0,5                     | 0                         |               |
| 18  | Se cumple con la altura de las mercancías que se encuentran en estibas directas. Solamente se pueden utilizar con medios unitarizados que posean hielitos de 1L. | 1                       | 0                         |               |
| 19  | Se cumple con la disposición de estantes respecto a la nave.   | 0,5                     | 0                         |               |
| 20  | Se cumple con el ancho de pasillos en correspondencia con equipos de manipulación.   | 0,5                     | 0                         |               |
| 21  | Se cumple con la disposición de pasillos de trabajo respecto a la nave.  | 0,5                     | 0                         |               |

Figure 2: Aspect use of space in the checklist

| No. | Aspectos a evaluar   | Calfificación a Obtener | Calfificación del Almacén | Observaciones |
|-----|--|-------------------------|---------------------------|---------------|
|     | <b>Organización del almacén.</b>   | <b>20</b>               | <b>12,5</b>               |               |
| 22  | Existe una correcta rotación de los productos.   | 0,5                     | 0,5                       |               |
| 23  | Las estibas y productos no tienen peligro de derrumbe.   | 0,5                     | 0,5                       |               |
| 24  | Está señalizada la entrada del almacén, el horario de atención al cliente.   | 0,5                     | 0,5                       |               |
| 25  | Se refleja en la entrada del almacén, la relación de los cargos con acceso al mismo.   | 0,5                     | 0,5                       |               |
| 26  | Está señalizada el área de recepción de la mercancía.  | 0,5                     | 0,5                       |               |
| 27  | Está señalizada el área de despacho de la mercancía.   | 0,5                     | 0,5                       |               |
| 28  | Es eficiente el método de control de existencia.   | 0,5                     | 0,5                       |               |
| 29  | Los pasillos y puertas de acceso al almacén están libres de productos y objetos que obstaculicen o entorpezcan el paso de los equipos de manipulación y el personal. | 0,5                     | 0,5                       |               |
| 30  | Se observan productos bloqueados en el almacén.  | 1,5                     | 0                         |               |
| 31  | Se observan productos directamente sobre el piso.  | 0,5                     | 0,5                       |               |
| 32  | Dispone de facilidades constructivas para la recepción y despacho.   | 1                       | 0                         |               |
| 33  | Existen procedimientos para disminuir manipulación.  | 0,5                     | 0,5                       |               |
| 34  | Posee el expediente logístico (EXPELOG) actualizado y en buen estado de conservación.  | 0,5                     | 0,5                       |               |
| 35  | Existe la información básica sobre el almacén.   | 0,5                     | 0,5                       |               |
| 36  | Existe la distribución en planta potencial.  | 0,5                     | 0,5                       |               |
| 37  | Existen los parámetros técnicos del almacén.   | 0,5                     | 0,5                       |               |
| 38  | Existe el estado constructivo del almacén.   | 0,5                     | 0,5                       |               |
| 39  | Existe el sistema de iluminación.  | 0,5                     | 0,5                       |               |

Figure 3: Aspect warehouse organization in the checklist.

| No. | Aspectos a evaluar   | Calfificación a Obtener | Calfificación del Almacén | Observaciones                  |
|-----|--|-------------------------|---------------------------|--------------------------------|
|     | <b>Organización del almacén.</b>   | <b>20</b>               | <b>12,5</b>               |                                |
| 40  | Existe un sistema de ventilación.  | 0,5                     | 0,5                       |                                |
| 41  | Existe el inventario de los equipos de manipulación e izaje.   | 0,5                     | 0,5                       |                                |
| 42  | Están los documentos normativos vigentes.  | 0,5                     | 0,5                       |                                |
| 43  | Está definido el sistema de seguridad y protección.  | 0,5                     | 0,5                       |                                |
| 44  | Está definida área de reparación de los medios unitarizados.   | 1                       | 0                         |                                |
| 45  | Están los esquemas de carga para cada producto.  | 0,5                     | 0,5                       |                                |
| 46  | Tiene todos los productos unitarizados que así lo requieran, en la misma cartón y forma.                     | 0,5                     | 0,5                       |                                |
| 47  | Mantener controlada la temperatura, no puede ser menos de 0 y mayor de 20.                                   | 0,5                     | 0,5                       |                                |
| 48  | El almacenamiento del ron se realiza por producciones y surtidos.  | 0,5                     | 0,5                       |                                |
| 49  | Tienen los lotes un identificador en el pasillo principal.   | 1,5                     | 0                         |                                |
| 50  | Personal con nivel requerido para el desempeño de sus funciones. (Trabajadores capacitados en logística 80%) | 2,5                     | 0                         | El personal no está capacitado |
| 51  | Cumple la Resolución 47/2020 sobre expediente logístico (EXPELOG).   | 0,5                     | 0,5                       |                                |

Figure 4: Aspect warehouse organization in the checklist.

| No. | Aspectos a evaluar   | Calfificación a Obtener | Calfificación del Almacén | Observaciones |
|-----|--|-------------------------|---------------------------|---------------|
|     | <b>Equipos</b>   |                         |                           |               |
| &   | Los equipos del piso tecnológico están conectado por red o WiE en el almacén.                |                         | no                        |               |
| &   | Hay interacción hombre-máquina en las actividades automáticas o semiautomáticas del almacén. |                         | si                        |               |
| &   | Los medios informáticos están conectados a los equipos del piso tecnológico.                 |                         | no                        |               |
| &   | Se realizan análisis de datos o minerías de datos con los resultados obtenidos.              |                         | no                        |               |
| &   | Existen tareas automatizadas en el almacén   |                         | no                        |               |
| &   | El almacén está conectado a la red informática de la fábrica o la nube de la empresa.        |                         | no                        |               |
| &   | Los trabajadores del almacén están capacitados para trabajar con equipos automáticos.        |                         | no                        |               |

Figure 4: Aspect equipment in the checklist.

A series of measures is recommended according to the results implementation plan, which are seen in Figure 6.

| Deficiency   | Measure   | Responsible                                      | Participants                                    | Compliance Date |
|--|---|--|---|-----------------|
| The height is wasted.  | Substitute the transports.  | Managing   | Factory Rum                                     | long term       |
| It cannot habitually be carried out a correct cleaning of the local.                         | Elaborate a plan of cleaning. Control by means of the evaluation of the individual acting of the execution. | Boss of the warehouse                            | Worker of Cleaning                              | Immediate       |
| A faulty artificial illumination exists.   | Substitute the faulty stars and to place those that lack.   | Maintenance boss                                 | Electrician                                     | Immediate       |
| Faulty ventilation.  | Place extractors of air.  | Managing   | Factory Rum                                     | long term       |
| Horizontal marks don't exist.  | Make the marks with paintings of the color and the appropriate quality.                                     | Boss of the warehouse                            | Worker of maintenance                           | Immediate       |
| The personnel is not qualified in logistics of warehouses.                                   | Qualify the personnel in logistics of warehouses.   | Specialist in Administration of human resources. | Boss of the warehouse                           | Immediate       |
| Not defined the area of repair of the means.   | Define and to signal the area of repair of the means.   | Boss of the warehouse                            | Worker of maintenance                           | Immediate       |
| The access to the warehouse requires to be expanded.   | Negotiate with organizations of the territory the zone.   | Commerce or boss                                 | Head  | Medium term     |
| It lacks of the illumination registration.   | Make a card for this end.   | Boss of the warehouse                            | Boss of the warehouse                           | Immediate       |
| It is insufficient the quantity of extinguishers in correspondence with the area to protect. | Locate the necessary quantity of extinguishers. Qualify the personnel on their use.                         | Specialist in Administration of human resources  | Boss of the warehouse                           | Immediate       |
| The personnel doesn't possess the protection means and necessary security.                   | To give the personnel all the protection means and security required for the execution of the tasks.        | Specialist in Administration of human resources  | Specialist in Administration of human resources | Immediate       |

Figure 6: Implementation Plan

The analysis of the consensus index among the experts is higher than 80%, which is why it is considered acceptable. The analysis of the central tendency statistics show a behavior between adequate and very adequate. It is concluded that the proposed measures are adequate. Following what is proposed by the methodology, the checklist for the second level of categorization is applied, reaching a score of 88.20 points. You get a rating of good; although there are measures to be applied. A

new distribution in the warehouse floor is proposed, with it the aim is to improve several of the organizational deficiencies found and the rates of use of areas and volumes of the warehouse. The future layout of the plant can be seen in Figure 7.

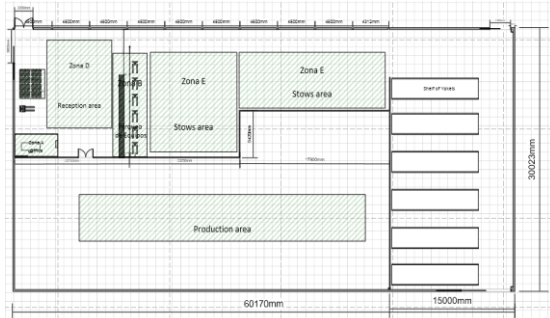


Figure 7: Future plant distribution of the finished products warehouse.

## 5. Conclusions

- The proposed procedure constitutes a practical tool aimed at improving the logistics and quality of the warehouse, with a view to increasing its level of certification.
- The tools applied as part of the procedure are a combination of qualitative and quantitative methods. A practical contribution of the application of the elaborated checklists show the improvement in the warehouse.
- The proposed procedure constitutes a closed cycle with regeneration designed for improvement. It does not end with preparing and obtaining categorization; prepares the factory to achieve systematic adaptation to changes in the environment.

## Bibliography

1. MINCIN, M.d.C.I., Resolución 153/07. Procedimiento para la implementación del Expediente Logístico de Almacenes y la Categorización de los Almacenes, in 46, MINCIN, Editor. 2007, Gaceta Oficial Extraordinaria: Cuba.
2. MINCIN, Resolución 47/2020 Reglamento de la logística de almacenes para las entidades que operan en la economía nacional. 2020, Gaceta Oficial de la República de Cuba: La Habana.
3. MINCIN, Resolución 64/2020 Creación de la Comisión Nacional de Expertos de Logística de Almacenes. 2020, Gaceta Oficial de la República de Cuba: La Habana.
4. Gliustau, E., S. Trojahn, and M. Schenk. The Dissertation: Way and Aim. in 11th International Doctoral Students Workshop on Logistics. 2018. Magdeburgo: Institute of Logistics and Material Handling Systems.
5. Acevedo-Suárez, J.A.G.-A., M, La logística moderna en la empresa., ed. F. Varela.

2010:

<https://scholar.google.es/scholar/Acevedo-Suárez/Gómez-Acosta/La-logística-moderna-en-la-empresa/>.

6. Cespón-Castro, D.R., Manual para estudiantes de la especialidad de Ingeniería Industrial. 2013, Universidad Tecnológica Centroamericana de Honduras: <https://scholar.google.es/scholar/Cespón-Castro/Manual-para-estudiantes-de-la-especialidad-de-Ingeniería-Industrial>.
7. Viu Roig, M., Logística y cadena de suministro en la nueva era digital. Oikonomics Revista de economía, empresa y sociedad, 2018. 9.
8. Lopes-Martínez, I., et al., Diseño de una metodología para la estandarización de los sistemas de codificación y clasificación de productos en empresas cubanas, 2019. Cuadernos Latinoamericanos de Administración, 2019. 16(28): p. 22.
9. Calzado-Girón, D., La gestión logística de almacenes en el desarrollo de los operadores logísticos. Ciencias Holguin, 2020. 26.
10. Ashok-Kumar, L.C.C., Col M.P. Vishal Marwaha, Col. Mukti Sharma, Maj Gen. Brig Manu Arora Improving medical stores management through automation and effective communication, in Elsevier. 2015, <https://scholar.google.es/scholar?lookup=0&q=improving+medical+stores+management+through+automation+and+effective+communication>.
11. Glistau, E. and N.I. Coello Machado, LOGISTICS CONCEPTS AND LOGISTICS 4.0. Advanced Logistic Systems, 2018. 12: p. 10.
12. Glistau, E. and N.I. Coello Machado, LOGISTICS 4.0 – BASICS, IDEAS AND USEFUL METHODS. 2019.
13. Zakoldaev, D.A., et al., Industry 4.0 vs Industry 3.0: the role of personnel in production, in IOP Conference. 2020, IOP Publishing.
14. Khan, A., J.-F. Brethé, and F. Guérin. An Autonomous Solution for for Warehouse Palletization. in 12th International Doctoral Students Whorkshop on Logistics. 2019. Magdeburg.
15. Valencia-Granados, J.A., Metodología de diagnóstico logístico de almacenes y centros de distribución. Realidad y Reflexión, 2019. 49.
16. DNV.GL, Care For Food Safety on the Road, D.N. Veritas, Editor. 2019, BUSINESS ASSURANCE: Høvik, Noruega.