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Evaluation of the Logistics Actors in the Application of the CCQI Standard in the Dispatch of Refrigerated Merchandise by the Port of Manzanillo, Mexico

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ABSTRACT: This research is focused on evaluating the dispatch of perishable merchandise through reefers (refrigerated maritime containers) with adherence to the Cold Chain Quality Indicators (CCQI) standard, which is the international standard that should apply the logistics actors that operate said chain. The general objective of the project is aimed at knowing the level of adherence that logistics actors have with international standards in transport, handling and storage of the cold chain, establishing efficiency indicators in refrigerated cargo, as well as identifying the degree application of good practices in the dispatch of merchandise and its critical control points in the maritime import process.

An information survey was carried out with the four types of logistics actors that operate in the Port of Manzanillo; shipping lines, Specialized Container Terminals (TECs), refrigerated enclosures and government agencies. A validation of the main research instrument was carried out and based on the data provided, the hypothesis raised was verified and accepted.

The author evaluated through the implementation of logistical indicators the capacity of the refrigerated maritime transport, the refrigeration infrastructure of the port area, as well as the commercial activity (storage and transport). Finally, the conclusions of the research were issued, where the recommendations for future research on the subject were also expressed.

KEYWORDS: Cold Chain, CCQI Standard, Manzanillo Port, Refrigerated Perishable Merchandise, Reefer.

I. INTRODUCTION

At present, the logistics practices for the transportation and distribution of goods have become a factor of success for companies, which has guided them to perfect their supply chains, allowing them to compete in an increasingly complex market. The handling of perishable merchandise constitutes a key element to increase the competitiveness of the companies. However, there is little knowledge of the characteristics and logistics costs incurred by the clearance in the import and export of perishables refrigerated by the country's maritime customs, generating a notable absence of indicators to evaluate their performance.

The definition of strategies for the proper and efficient management of the cargo of perishable goods along agro-food logistics networks is one of the most pressing needs of the primary sector, which shows losses between 20% and 30% due to the effect of transport and cargo storage (FAO, 2010). The importance that this issue has acquired, in an increasingly globalized world, is due to the impact of factors such as logistics and transport on the price of the products sold, since they can represent between 10 and 15% of the final price and even in the case of developing countries up to more than 20% (Cipoletta, Pérez, & Sánchez, 2010)

The companies have projected great benefits when exporting and importing perishable products due to the large profit margins in this type of products, however, said profitability is closely linked to the logistics costs inherent to the dispatch of refrigerated products. Based on the above, the logistics actors that intervene in the refrigerated merchandise dispatch processes have been aligning

themselves to the needs required by the global environment, customs and port terminals in Mexico are increasingly trained in infrastructure, being a decisive factor in logistics.

The evaluation of merchandise dispatch strategies, especially refrigerated fruit, is the result of the study on the effects of the coordination of port agents, the configuration of the chain, the adoption of information and communication technologies (ICTs), as well as operational tactical aspects such as the use of intelligent reefers in the management of the controlled temperature, better packaging and packaging, the correct management of the deterioration of quality over time and the loading process in the means of transport and storage.

With the motivation of knowing the status of supply logistics in the cold chain through the use of reefers for the dispatch of refrigerated merchandise in the port of Manzanillo, this research project is aimed at evaluating the use of the CCQI standard by logistics actors in order to determine the level of adherence to international standards and based on this, prepare a report with possible proposals for improvements.

II. PURPOSES

Problem Statement

Commercial operations are a very lucrative business from a financial point of view, however, exporting and importing companies incur in numerous logistical operations that contemplate the hiring of land, sea and even air means of transport for the movement of their merchandise. International maritime dispatches require endless port and customs services that directly impact the profitability of this type of operation.

The commercialization of perishable merchandise, especially fresh fruit, is one of the most profitable activities in foreign trade, the figures for the global market for fresh fruits and vegetables are enormous. The business was valued in 2017 at US $ 247,000 million, while forecasts for 2030 estimate that it will be around US $ 400,000 million (Pizarro, 2018). The international commercialization of fruits requires a special operation that involves temperature control facilities and instruments for the conservation of the cold chain of the merchandise. These requirements transfer operating costs and risks that make it a very lucrative activity for both importers and exporters.

The logistical dynamism in the dispatch of refrigerated merchandise is directly linked to the development of the refrigerated market, which in recent decades has shown rapid growth, surpassing the market for dry containers. Whereas 15 years ago, the maritime reefer container market was roughly evenly divided between conventional reefer vessels and reefer containers, now more than 80% of reefer maritime trade is in reefers. This change is due to the growing demand for perishables around the world, and as a result of a change in cargo to other modes (conventional refrigerated ships or air freight) to refrigerate containers. (Castelain, Geerlings, & Van Duin, 2020)

Perishable merchandise is dispatched in the port of Manzanillo, highlighting fresh seasonal fruit, among the main products dispatched is the grape from the South American region (Chile and Peru), making the Port of Manzanillo the main maritime access point, In the period 2019-2020, 65,361 tons of table grapes were imported (SIAVI, 2021), oscillating on average to more than 32 thousand tons per year, which translates to more than 3.98 million boxes of grapes (8.2 kg) imported annually from this region, which were dispatched by reefers at the terminals of the Port of Manzanillo.

However, the dispatch of this type of merchandise through the Port of Manzanillo is immersed in technical and operational difficulties by some actors that intervene directly in the logistics chain, largely due to the special requirement in terms of cold preservation that demand this type of products or that the magnitude of their importance has simply not been dimensioned in their special treatment by maritime terminals, as they do not have the necessary infrastructure in terms of temperature control, such as the sufficient availability of electrical connections for the refrigerated containers that are unloaded in the port area.

However, the problem is not exclusive to the terminals, there are problems related to the reception of the cargo in the refrigerators, the mismanagement of controlled temperature conditions by the logistics service providers, there is also ambiguity in terms of Ocular verifications by different government bodies that open containers to the elements so that the merchandise is exposed to the high temperatures outside and is at risk of losing its cold chain.

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The loss of the cold chain in sensitive products such as fruit is considered a very serious problem for importers and exporters, due to temperature variations, products tend to deform in physical aspect (condensation, maturation or pigmentation) and this in turn is associated by the end customer as a product of questionable quality. A product affected by these physical characteristics related to the loss of the cold chain leads to the importer having to make concessions in the final price, the re-negotiation of sales contracts or simply the cancellation of an order due to non-compliance in the quality presented by customer. (Campos, 2020)

General Objective

Evaluate the application of the CCQI standard by the logistics actors involved in the dispatch of refrigerated merchandise through reefers in the port of Manzanillo using logistics indicators to determine the level of adherence to international standards in the model of the supply chain. cold.

Specific Objectives

- Monitor cold chain operations to identify Critical Control Points and Good Manufacturing Practices in accordance with the CCQI standard.
- Implement logistics indicators regarding the cold chain in shipping lines and TECs to contrast with the CCQI standard and determine the level of logistics actors.

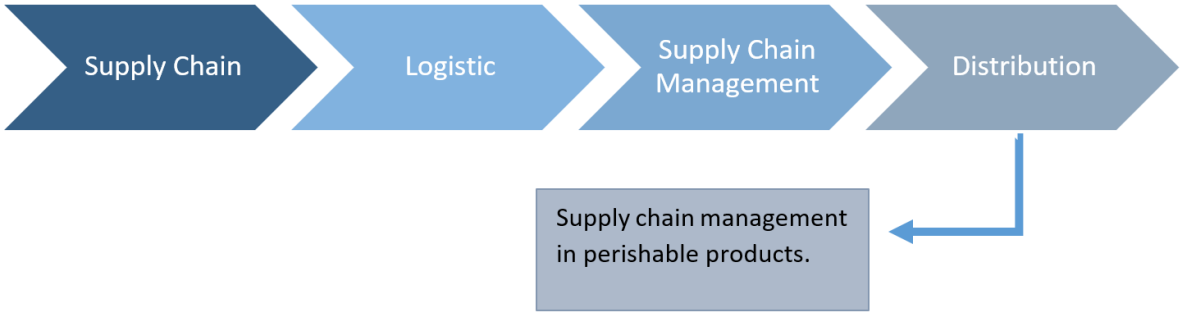
Hypothesis

In accordance with the above, the following hypothesis was formulated:
"The logistics actors that carry out the import clearance of refrigerated merchandise through reefers in the port of Manzanillo, operate with ignorance of the international standards and quality indicators of the CCQI standard in the handling, transportation and storage of the model of the Cold chain."
Independent Variable: CCQI Standard. Dependent Variable: Import dispatch of logistics actors.

III. LITERATURE REVIEW

The state of the art is presented in a deductive way, starting with the concepts of supply chain and logistics, continuing with the advances made in the administration of the supply chain, focusing on the strategies for coordinating agents and distribution; Likewise, a review of the supply chain for perishable products is carried out as shown in Figure 1.

Figure 1 State of the Art Methodology
Source: self-made



According to Ballou, the first textbook to suggest the benefits of coordinated logistics management appeared around 1961, in part explaining why a generally accepted definition of business logistics is still emerging. In 1991 the Council of Logistics Management, a professional organization of logistics managers, teachers and professionals, agreed to adopt the term logistics by:

> *"Logistics is the part of the supply chain process that plans, carries out and controls the flow, efficient and effective storage of goods and services, as well as related information, from the point of origin to the point of consumption., in order to satisfy the requirement of customers "* (Ballou, 2004)

On the other hand, the supply chain (CS) indicates that this is any combination of processes, functions, activities, relationships and paths along which products, services, information and financial transactions move within and between companies. It also implies any movement of these from the original producer to the consumer or end user. (Gattorna & Farrés, 2012)

There are several analytical and quantitative models developed for the characterization, management and evaluation of SC. To address them, different classification criteria have been established, which allow us to understand the nature of each one of them. Based on the contributions of (Estampe, Lamouri, Paris, & Brahim-Djelloul, 2013) who analyzed various models used to evaluate SC, highlighting their specific characteristics and their application in different contexts.

The logistics sector in Mexico is in constant growth since the entry into force of the North American Free Trade Agreement (NAFTA), however, there is little research applied to the study of logistics chains in the country, and the existing, the study of refrigerated perishable products is null. According to (Medina, 2009), a study by the International Refrigerated Warehouse Association, together with the World Food Logistics Organization, in Mexico there are two very different structures for the sale, conservation and transportation of perishable products.

In Mexico, there is a long way to go to have the capacity to transport all perishable products, since one part of the market does not use it, another is underdeveloped and the one with very advanced capacity does not supply the entire population. This situation is manifested when the refrigeration capacity per inhabitant of different countries is compared (see Table 1). Mexico lags far behind nations such as the Netherlands, the United States, Ireland, Spain or Canada, and its situation is similar to that of Latin American countries such as Chile or Argentina.

In the particular case of perishable products such as vegetables, (Viteri, 2003) establishes that they must be managed according to a Cross Docking system (distribution without storage). This method allows the products to arrive at the premises within a few hours of having been delivered by the supplier, with differentiated characteristics, freshness and quality in the merchandise. Table 1 shows the relevant stages for the cold chain analysis based on the analysis factors.

Table 1. Stages for the analysis of temperature in cold chains in perishables.

Author	Main stages	Factors analyzed
Jol, 2005	Food environment (product)	Acidity pH Water activity Presence of microbial growth inhibitors (preservatives)
	Preservation treatments before freezing.	Irradiation, Refrigeration Salinization and Acidification
	Packing material	Interaction time with the product during use and storage. Strength, flexibility, protection against light and air penetration.
	Microbial adaptation to temperatures.	Knowledge of microbial growth mechanisms for products
	Quality control systems	The maximum reference for the national chain is Canada considered a leader in quality assurance of food of agricultural origin, from primary producers, processors, distributors and marketers among others. ● Critical Control Points ● Good manufacturing practices
Giannakourou, Koutsoumanis, Nychas, and Taoukis (2001)	**Systematic temperature monitoring models**	Temperature monitoring technology at each stage of the cold chain to mathematically model the behavior of variables such as enzymatic activity.
Montanari, 2008	**Management systems of the Cold chain**	Mathematical models of parameterization of the product handling areas against temperature.

Source: Prepared based on Montanari, 2008; Jol, 2007; Cruz, 2009.

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The cooling process is a key method for preserving the flavor, texture and nutritional values of foods. However, its efficacy, effectiveness and efficiency depend on the selection of materials, previous treatments, freezing processes, packaging, storage conditions, control and monitoring system (Cruz, 2009).

The temperature (T) of fresh products for direct marketing to the end customer or for processing companies as an input, must be kept below 5 ° C to reduce product losses due to the proliferation of microorganisms and human pathogens. However, this is difficult to achieve since fresh products are normally exposed to temperatures between 8 and 12 ° C, according to the established logistics management and distribution (Giannakourou & Taoukis, 2003) cited by (Rediers, 2009).

The CCQI standard creates an auditable management system, which is based on risk assessment and system management. The purpose goes beyond focusing on care aimed at maintaining desirable cold conditions through Temperature Sensitive and Perishable Products (PTSP) throughout the entire cold chain. It is intended that this standard prevails as a professional control over temperature throughout the supply chain, using the appropriate means for handling, storage and transport (Germanischer Lloyd Certification, 2005). Quality indicators have been developed for the following cold chain operations.

- Transport by truck and Trailer
- Long term storage.
- Short term storage
- Air Transport
- Handling in Airports
- Container line
- Container ship
- Container terminal
- Refrigerated containers
- Refrigerated ship line
- Refrigerated ship
- Port terminal

Due to the very particular conditions of this research project, only the logistics indicators in terms of Warehouse, Handling and Transportation will be considered (except for air and airport indicators), because the use of the refrigerated container is present in these indicators. The classification and type of indicator is present in Table 2.

Table 2. Analysis of the indicators of cold chain and critical points in the structuring of logistics actors

Type of service	Logistics Actors	Cold Chain Indicators (CCQI) Manufacturing Critical Control Points (PCCM)
Transport	Motor transport	1. CCQI for truck and trailer transport
	Shipping Line	2. CCQI for reefer container line 3. Container Ship CCQI 4. CCQI for reefer containers
Driving	Container Terminal	5. CCQI for reefer container terminal 6. Use of Refrigerated Container Terminals
Storage	Refrigerated Enclosure	7. Refrigerated Container Assignment 8. PCCM Proper Management of Cold Storage

Source: self-made

IV. METHODOLOGY

The research was based on a descriptive, exploratory and correlational study, which allows to identify and define in detail the characteristics of the logistics chain for the perishables sector, very specifically in the fresh refrigerated fruit that is dispatched by the maritime terminals of the Port of Manzanillo via reefers.

During the field work, efforts were focused to carry it out within the Specialized Container Terminals (TECs) which account for 100% of the refrigerated containers that are imported or exported by Manzanillo (Administración Portuaria Integral de Manzanillo, 2019),

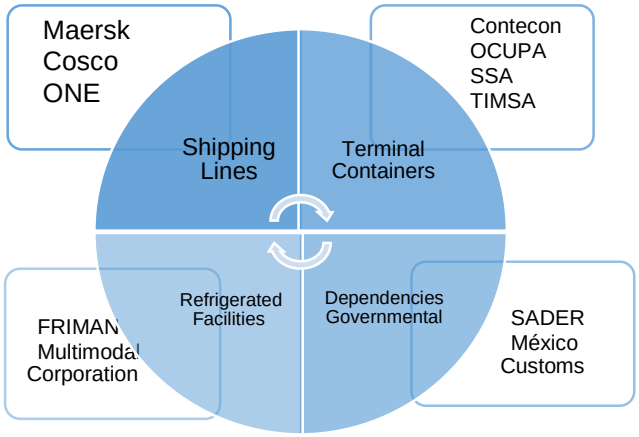
for this reason, the data comes from the information provided through the questionnaires applied and the interviews carried out with the four different logistics actors involved in the dispatch of fresh chilled fruit in the Port of Manzanillo. In the same way, scientific studies extracted from the bibliography referenced in the State of the Art.

A study was carried out in the refrigeration facilities inside the port area to identify good manufacturing practices, as well as the main critical control points that threaten the safety of perishable foods that are determined by federal authorities, so they will also be subject to study. From these observations in the processes, a flow chart was made, where the links that affect the cold logistics chain in the dispatch processes can be seen. Once this was done, strategies were proposed for best practices in the logistics structuring of the cold chain. In this case, it was also decided to build a flow chart with the alternatives and solutions that can minimize or eradicate the previously exposed threats and weaknesses.

Taking into account the physical composition of the Port of Manzanillo and the particular characteristics of the research project, it is only possible to consider the TECs and the refrigeration facilities because through the TECs the refrigerated containers that transport perishables are received and in the refrigerated areas they are performs the inspection of fresh fruit for what is considered a finite population.

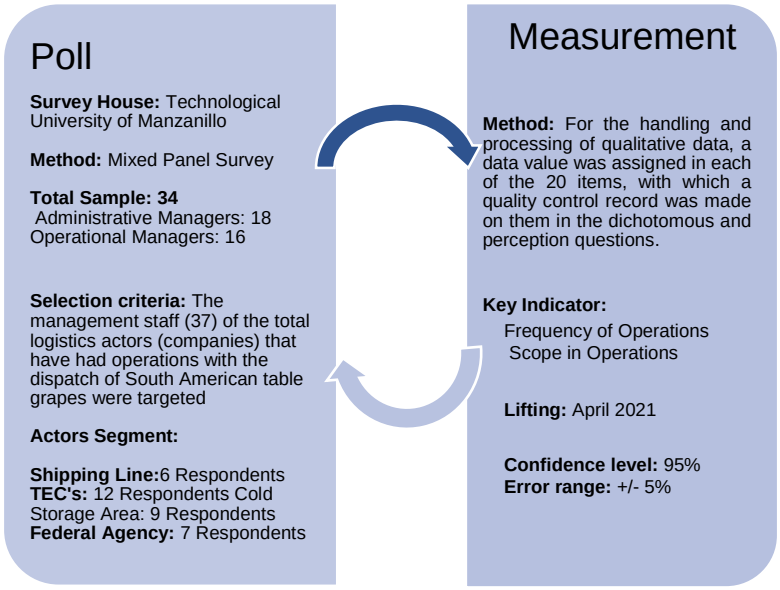
On the basis that the object of study are the actors involved in the cold chain of the importation of South American table grapes; It is pertinent to mention that the Refrigeration Facilities receive merchandise via reefer (refrigerated container) from some TEC, and in turn receives the reefers from the container ship which belongs to a shipping line.
As can be seen in figure 2, four non-probabilistic sampling classes will be carried out in the following categories; Maritime Terminals, Refrigeration Facilities, Shipping Lines and Government Dependencies. The number of samples will be the total number of actors in each of the categories; 4 container terminals that handle refrigerators, 2 refrigeration facilities that operate within the port, 3 shipping lines that transport table grapes from the South American region and 2 government entities.

Figure 2. Sampling
Source: self-made



A quantitative approach was chosen to be able to obtain information related to good manufacturing practices (temperature measurement and control) as well as information regarding the measurement in the CCQI indicators that are presented throughout the cold chain in the participation of the different logistics actors.

Figure 3. Survey Data Management



Surveys were applied to the managerial staff and directors of the eleven companies that act as logistics actors in the import process of South American table grapes through the Port of Manzanillo. The total population was estimated at 37 managerial positions in these companies, so applying a calculation to the sample size with a confidence level of 95% and a margin of error of 5% resulted in 34 surveys to be applied, of which; 13 were in person, 2 by telephone and 19 were answered online. Subsequently, the results were emptied into the program Statistical Package for the Social Sciences (SPSS) version 25.

V. RESULTS

A descriptive statistical analysis was carried out on the results obtained in the questionnaires that were the main instrument for obtaining information. The analysis was structured in order to classify the total response items into four categories of analysis

Table 3. Classification of Analysis Categories

CCQI Standard Analysis Category	Items
Evaluation of cold chain management in logistics actors	2 - 8
Good Manufacturing Practices in the logistics chain	10 - 23
Critical Control Points in the cold chain model	9, 25 - 40
Logistics structuring in the actors that dispatch the cold chain	41 - 59

Source: self made

Regarding this section, it was expected that the instrument would provide accurate information on the current performance that logistics actors are presenting in the dispatch of refrigerated products. In item no. 2 "Overall rating for the performance of the logistics actors that dispatch table grapes", it could be seen that there is a positive appreciation percentage with 94.2% of the respondents (taking the rating from 3 to 5) this is a very significant parameter Because it can be seen that only 2 (5.8%) of 34 total respondents consider that the performance was negative (taking the rating from 1 to 2).

It is important to mention that the same logistics actors evaluate themselves and issue an evaluation of the performance of other logistics actors, so there is an evaluation of the experience in dispatch operations with which they were involved among the same actors who issue their qualification.

In table 4, item No.8 can be observed in this category "Knowledge of the CCQI Standard by the Logistics Actor" which is a variable that is present in the hypothesis and it was determined in its frequency table that 53% of those surveyed consider them in a variation from

Totally Disagree to Indifferent, Therefore, the majority of respondents who do not fully apply the CCQI Standards in the handling, transportation and storage of refrigerated cargo stands out.

Table 4. Cross table Knowledge of the CCQI Standard by the Logistics Actor

			Knowledge of the CCQI Standard by the Logistics Actor					Total
			Strongly Disagree	In disagreement	Indifferent	Agree	Totally agree	
Logistics Actor	Shipping Line	Count	0	1	0	2	3	6
		% within Knowledge of the CCQI Standard	0.00%	11.10%	0.00%	18.20 %	75.00%	17.60%
	Terminal Specialized in Containers	Count	1	3	3	3	2	12
		% within Knowledge of the CCQI Standard	50.00%	42.90%	33.30%	27.30 %	40.00%	35.30%
	Refrigerated Enclosure	Count	0	0	3	6	0	9
		% within Knowledge of the CCQI Standard	0.00%	0.00%	33.30%	54.50 %	0.00%	26.50%
	Government agency	Count	1	3	2	0	0	7
		% within Knowledge of the CCQI Standard	50.00%	42.90%	33.30%	0.00%	0.00%	20.60%
Total		Count	2	7	9	eleven	5	3. 4
		% within Knowledge of the CCQI Standard	100%	100%	100%	100%	100%	100.%

Source: self made

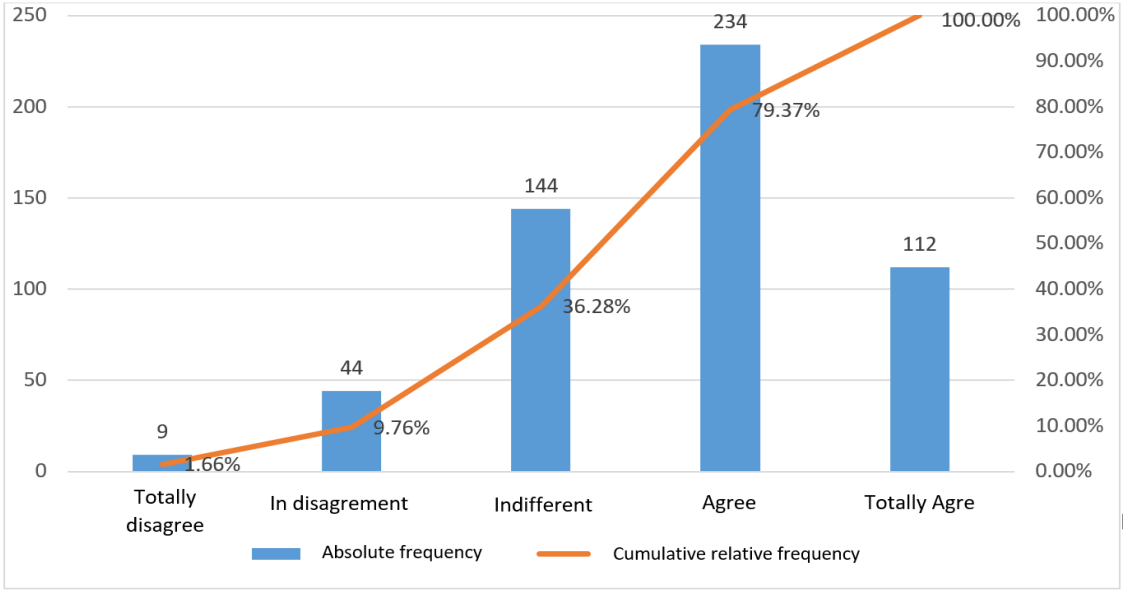
Due to the extensive number of items to be analyzed, it was decided to apply a funnel diagram to be able to show the behavior of each one of them through the rating given by each surveyed logistics actor. In said graph that is presented below, it is possible to observe that among the elements best evaluated by the respondents is the “maintenance of the refrigerated infrastructure” and the “operation of the reefer connections”, this is a positive indicator that was present in the bulk of the participants.

Based on figure 4 and in the interview carried out with the different professionals in the area, the problem of “the capacity of electrical connections within the container terminals” was identified as a very recurrent case that affected the dispatch. Again this element resurfaces as an aspect evaluated negatively in the applied survey.

Regarding the maritime transport of refrigerated containers, the CCQI standard is used for the evaluation of the organizational aspects of a container line. The transport of refrigerated containers can be carried out with our own vessels or those of other operators.

(Germanischer Lloyd Certification, 2005). As well explained above, this indicator shows what a shipping line in question offers to refrigerated containers, whether owned or leased long-term.

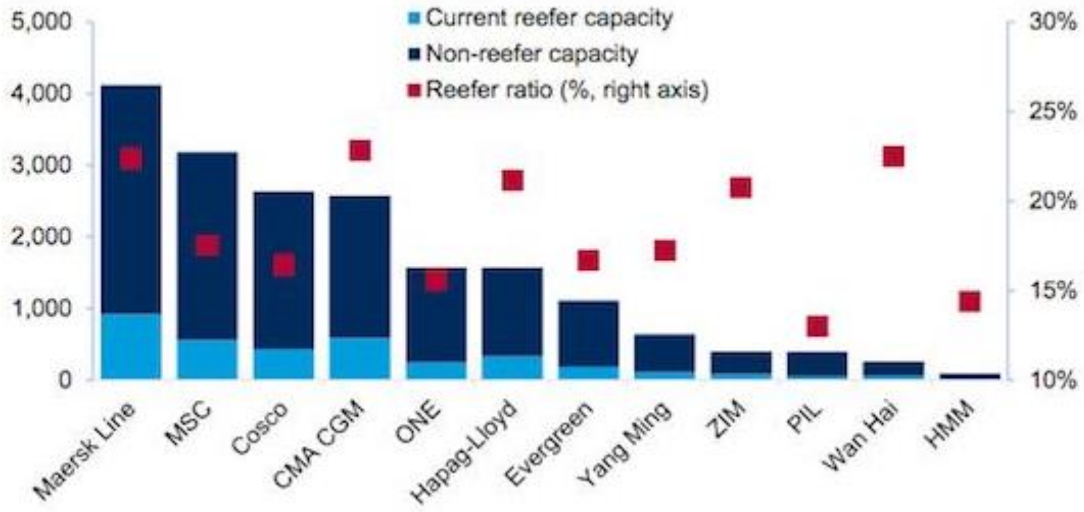
Figure 4. Evaluation of the items of Critical Control Points in the Logistics Actors
Source: self-made



Based on Figure 5, it is possible to identify that the three shipping lines in question are positioned among the 6 shipping companies with the largest number of reefer containers in the world, with Maersk standing out with a capacity close to one million TEUs - a unit of measure equivalent to twenty cubic feet of cargo- the methodology used in the study does not establish the "number of refrigerated containers per shipping company" but rather the refrigerated cargo capacity that it houses in its infrastructure.

Considering the above information, it is based on the idea that the number of container ships does not prevail, but rather their capacity to transport containers (dry and refrigerated) based on this fact, it was determined that Maersk has the highest transport capacity of TEUs. refrigerated (also dry) in its fleet of container ships with 986 thousand TEUs, Cosco for its part is weighted with the third place in the world with an offer of 521 thousand TEUs and finally ONE with 247 thousand refrigerated TEUs.

Figure 5. Worldwide Refrigerated Container Capacity (thousands of TEUs)
Source: Drewry consulted (Transport CEO, 2018)



Finally, in table 5, it was assigned a score based on what is indicated in the CCQI standard, highlighting the Maersk shipping line with 98 points, which positions it well above its closest competitor -Cosco- by standing with 65 points. The ONE group holds the third place in the comparison with 37 points.

Table 5. CCQI for ocean transport of refrigerated containers

Indicator	Navy ship score		
	Maersk	Cosco	ONE
CCQI for Refrigerated Container Line	56	30	14
CCQI for Refrigerated Container Ships	42	35	2. 3
Total CCQI = Maersk (56 + 41) Cosco (30 + 36) ONE (14 + 24)	**98**	**65**	**37**

Source: Own elaboration based on (Drewry, 2018)

Derived from the application of the questionnaire to the operational managers of the four TECs of the port of Manzanillo, information was obtained regarding the infrastructure of each terminal, as well as the reported work team. Based on the results, a thorough analysis was carried out and it was determined to rule out infrastructure that was not directly related to the handling of refrigerated containers.

Based on Table 6, it is possible to establish an indicator for the TEC logistics actors that operate refrigerated containers in the Port of Manzanillo. The SSA company has more than 3 times the number of electrical connections than CONTECON, its closest competitor. However, the number of electrical connections is directly related to the flow in the movement of cooled TEUs. The CCQI standard mentions that there is a relationship between installed capacity and number of movements attended, so the lower the result in this factor means that there is a better installed capacity for the availability of care and coverage of this type of merchandise, favoring better conditions for the management and control of the cold chain.

Table 6. CCQI for Refrigerated Container Terminal

Refrigeration Infrastructure of Terminals	Reported Quantity			
	SSA	OCUPA	TIMSA	CONTECON
Number of Reefer TEUs Served in 2019	132,445	60,339	36,634	66,496
Electrical Connections for Refrigerated Cargo	1,064	140	120	360
Total CCQI = SSA (132,445 / 1,064) OCUPA (60,339 / 140) TIMSA (36,634 / 120) CONTECON (66,496 / 360)	**124.47**	**430.99**	**305.28**	**184.71**

Source: Own elaboration based on (Manzanillo Integral Port Administration, 2019)

Thanks to this indicator, it can be seen that SSA is the terminal with the best coverage conditions for reefer containers, the researcher noticed in the field visit that the OCUPA company, despite having the most unfavorable indicator, is maintaining a large number of refrigerated cargo operations due to the fact that its terminal redirects the cargo to its subsidiary company FRIMAN, which is a specialized refrigerated area for handling loose cargo at a controlled temperature.

Finally, the researcher decided to design a global indicator that would establish the Port of Manzanillo as the unit of measurement, combining the refrigerated operations of its four container terminals in order to determine the magnitude of the refrigerated cargo that the port has to provide infrastructure and equipment for this type of load.

It is intended that this indicator is obtained by dividing the number of refrigerated containers reported in 2018, by the total containers moved per year and multiplying by 100% considering the TEU as the main unit of measure, so the formula to be used would be the same as Following way:

$$Rr_p = \frac{R_p}{C_p} \times 100\%$$

Data:
Refrigerated Containers Moved throughout the Port [RP]
Total Containers Moved throughout the Port [CP]

Table 7. Indicator Use of Refrigerated Terminals of the Port of Manzanillo

Refrigerated Terminals Indicator	Reported Amount 2018				TOTAL
	SSA	OCUPA	TIMSA	CONTECON	Manzanillo Port
Chilled TEUs Moved	132,445	63,541	26,167	85,289	307,442
Total TEUs Moved	946,109	738,843	523,347	870,296	3,078,595
Indicator x Terminal / Port	**13.99**	**8.60**	**4.99**	**9.79**	**9.98**

Source: Own elaboration based on (Comprehensive Port Administration of Manzanillo, 2019)

Based on the information in Table 7, through the implementation of the Refrigerated Terminals Indicator of the Port of Manzanillo, it is possible to identify that the SSA terminal out of every 100 containers that 14 mobilizes are refrigerated containers, with TIMSA being the terminal that mobilizes the least reefer containers when representing the 5% of all its containerized cargo operations. This generates a clearer idea of how the business unit of each terminal is, how they determine efforts channeled in improvements and investment in the cold chain. Derived from the implementation of this indicator, it is feasible to establish that the predominant logistics actor in the handling of refrigerated units is the SSA terminal.

VI. CONCLUSIONS

Throughout this research project, different approaches were addressed in order to obtain answers regarding the use and application of the CCQI standard in the dispatch of refrigerated perishables in the port of Manzanillo. In the search for these answers, two specific objectives were raised, which will be addressed in a conclusion in this regard.

In the Monitoring of cold chain operations, it was for the purpose of identifying CCPs and GMPs in the importation process of refrigerated perishables. Great indications were obtained to show that more than 60% of the logistics actors carried out the good practices, however, in the evaluation by themselves, poor results were obtained in terms of the CCQI standard in the management by the companies. container terminals. In this section, the researcher realized that refrigerated rooms are the actors most dedicated to preserving them, due to their close relationship with the merchandise. On the part of the PCC,

Regarding the implementation of the cold chain indicators, where shipping lines and TECs were evaluated, it can be argued with greater knowledge of the facts that the result is not very encouraging in terms of the cold chain. The logistical structuring of the actors involved in the dispatch of refrigerated products is crucial and it is imperative to identify it, private companies have had to invest economic resources in the acquisition of technology and infrastructure to operate it, so this activity is shared by very few suppliers to world level. However, in our country this need is not fully assimilated by the federal government, which operates through its representative bodies under unequal conditions (equipment and infrastructure),

Finally, the author can conclude in a general way that based on what is stated in the results of this research, there is the operational and technical capacity on the part of the logistics actors within the Port of Manzanillo to operate refrigerated merchandise, specifically fresh fruit such as Table grape, has been present for more than 20 years in port operations in Manzanillo, a path that has been forged

by the infrastructure investment of shipping agents and the gradual response of private maritime terminals to serve them. There have been individualized efforts throughout the chain, however, the Manzanillo Port Authority has made efforts to guarantee and prioritize the dispatch of this type of merchandise,

REFERENCES

1) Comprehensive Port Administration of Manzanillo. (2019). Communications. Obtained from the Historical Movement of Containerized Cargo 1992 - 2019: http://www.puertomanzanillo.com.mx/upl/sec/359b2c35cebbaaa2a8a86d2a853b1c6bc7eafd67.pdf
2) Comprehensive Port Administration of Manzanillo. (2019). Annual Report 2018. Mexico: Ministry of Communications and Transportation.
3) Ballou, R. (2004). Logistics: Supply chain management. Mexico: Pearson Education. Mexico: Pearson Education.
4) Campos, IV (October 23, 2020). The Chilean grape imported in Manzanillo. (HP Romero, Interviewer)
5) Castelain, B., Geerlings, H., & Van Duin, R. (2020). The reefer container market and academic research: A review study. Elsevier. Journal of Cleaner Production.
6) Cipoletta, G., Pérez, G., & Sánchez, R. (May 2010). Integrated policies for infrastructure, transport and logistics: international experiences and initial proposals". Natural Resources and Infrastructure (150).
7) Cruz, RM (2009). Effect of cold chain temperature abuses on the quality of frozen watercress. Journal of Food Engineering, 90-97.
8) Defee, C., Williams, B., Randall, W., & Thomas, R. (2010). An inventory of theory in logistics and SCM research. The International Journal of Logistics Management, 404-489.
9) Domínguez, M., & García, C. (2002). Temperature controlled distribution of perishable products in Europe. Food, 45.48.
10) Drewry. (August 08, 2018). Reefer container trade expansion to support freight rates. Retrieved March 2020, from https://www.drewry.co.uk/news/news/reefer-container-trade-expansion-to-support-freight-rates
11) Estampe, D., Lamouri, S., Paris, J.-L., & Brahim-Djelloul, S. (2013). A framework for analyzing supply chain performance evaluation models. International Journal of Production Economics, 247-258.
12) FAO. (2010). World Bank workshop on reducing post-harvest losses in grain supply chains in Africa. New York: The World Bank.
13) Gattorna, J., & Farrés, X. (2012). Dynamic supply chains (II). Dialnet, 24-29.
14) Germanischer Lloyd Certification. (October 02, 2005). Cold Chain Quality Indicators Standard (CCQI). The Concept of Quality of the Cold Chain. Germany: Cool Chain Association.
15) Giannakourou, MC, & Taoukis, PS (2003). "Application of a TTI-based distribution management system for quality optimization of frozen vegetables at the consumer end. Food Science, 201-209.
16) Hernández, Fernández, & Baptista. (1998). Investigation methodology. Mexico: Mc Graw Hill.
17) Medina, RS (2009). Cold chains and refrigerated transport in Mexico. Foreign Trade, 1010-1017.
18) Pizarro, R. (2018). Looking for fresh ideas. Agricultural Network.
19) Rediers, H. (2009). "Evaluation of the cold chain of fresh-cut endive from farmer to plate. Postharvest Biology and Technology, 257-262.
20) SIAVI. (2021). Tariff Information System Via Internet. Mexico: Ministry of Economy.
21) Transport CEO. (September 14, 2018). Transport CEO. Obtained from European lines are the reefer kings.: http://www.transportceo.com/noticias.php/European-lines-are-the-reefer-kings.-tags.-drewry,-reefer/99624
22) Viteri, ML (2003). Logistics in the fresh fruit and vegetables chain. IDIA XXI Journal of Information on Agricultural Research and Development, 176-180.