



## The Damage Management of Wood Pallets in The Food Industry in The State of TLAXCALA

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**Abstract.** Pallets are an essential part of any supply chain, as well as wooden pallets are also part of the main waste for recycling or reuse in activities other than logistical purposes. The purpose of this article is to identify the main damages produced in the wooden pallets, as well as to identify the repair costs for each damage to give the pallets the opportunity to continue in the logistics cycle without ending their useful life so abruptly and contribute to the food companies of the State of Tlaxcala in reducing costs and environmental impact. Through the observation and investigation technique, the most frequent damages to the wooden pallets of the food companies in the State of Tlaxcala were identified and quantified in the Pareto Diagram.

### To cite this article

[Sánchez, M. G., Gutiérrez, J. L. C. & Juarez, J. A. T. (2020). The Damage Management of Wood Pallets in The Food Industry in The State of TLAXCALA. *The Journal of Middle East and North Africa Sciences*, 6(07), 21-23]. (P-ISSN 2412-9763) - (e-ISSN 2412-8937). [www.jomenas.org](http://www.jomenas.org). 5

**Keywords:** Wood Pallets, Pareto Chart, Food Industry.

### 1. Introduction:

Since ancient times, wood has been used to transport different merchandise, helping to speed up loads and protect them. Over the years, supply chain management has improved thanks to the creation of smooth platforms called pallets, made of wood that They help to manipulate, transport, group and protect (Ballou, 2004) different products that will be distributed throughout commercial networks.

The pallets help to improve the management and fluidity of the warehouse, allowing a connection to the entire length and breadth of the supply chain, which includes retailers, distributors, manufacturers, producers, logistics service providers, etc., so that the product reaches end customers quickly and safely.

#### 1.1. Food industry in Mexico

According to PROMEXICO (2015), Mexico occupies the ninth place in the world for processed foods, with the first places being China, the USA and Brazil.

Mexico has had considerable growth in the processed food industry, thanks to the availability of raw materials, productivity, specialization of the workforce, and having a strategic geographic location which attracts foreign investment, achieving trade agreements with more from 40 countries Feroso (2017).

The food industry is made up of subsectors such as; grinding of grains and seeds, obtaining of oils and fats,

confectionery with and without cocoa, preservation of fruits, vegetables and prepared foods, dairy products, processing of meat of livestock and poultry, preparation and packaging of fish and seafood, bakery and tortillas and elaboration of animal feed.

The State of Tlaxcala has a total of 6,191 economic units, of which 98% belongs to small industries, while the remaining 2% is held by the food manufacturing industry in the State of Tlaxcala (DENUE, 2020).

### 2. Methodology:

For the purposes of this article, the information gathered from national official sources such as INEGI (National Institute of Statistics and Geography), PROMEXICO (Secretary of Economy), primary sources such as electronic journals and scientific articles was consolidated. Observation techniques were also used, research on the most frequent damage to pallets, another technique that was used was that of surveys of the operators and managers of said companies to know the causes of possible damage to pallets and the prices of the pallets they use, the data was collected from 8 food companies in the State of Tlaxcala, the damages are projected using a Pareto Diagram, for which the MINITAB version 17.1 program was used, said diagram will help to identify the main damages in pallets to establish strategies that help reduce them, likewise the costs of pallet repair are shown, in order for companies in this sector to use pallet repair as an option



to increase the useful life of pallets, achieving benefits economic and reducing environmental impacts.

**3. Results:**

The damages that were identified in visits to food companies in the State of Tlaxcala for 30 days, it should be noted that these wooden pallets fulfilled the logistical purpose and was material to dispose of, since the companies do not classify or separate the pallets, also do not have reuse programs, the recognized damages are shown in table No. 1 as well as the frequency of damages by wooden pallet.

Table 1: Damage identified in wooden pallets and frequency.

Damage identified in wooden pallets	
Damage Type	Frequency
exposed cloves	445
rotated block	426
damaged block	231
Fractured deck boards	4241
deck board spacing	290
splintered deck boards	123
damaged stringer	485
Missing staves	882

Source: own elaboration (2020)

The Pareto Diagram is a tool that helps to identify the main problems which is based on a bar graph whose specialty is categorical or qualitative data, this diagram helps to locate or identify the main problems Gutiérrez, & De la Vara (2009) helping to facilitate communication, cooperation and remembering in a timely manner which is the main failure, thus establishing the Pareto principle which establishes that 80% of the consequences stem from 20% of the causes (Kume, 2002).

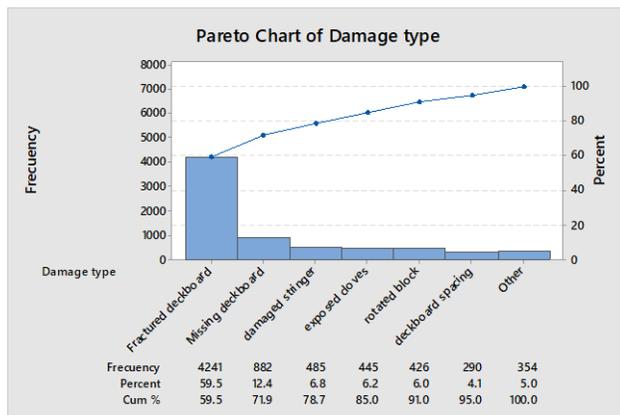


Figure 1. Pareto diagram of frequent damage to the pallets. Source: own elaboration (2020).

As shown in figure No. 1, 59.6% of the damages are due to “fractured deck board” and 12.4% are due to

damages classified as “missing deck board”. The accumulated percentage of fracture deck board and missing deck board is 71.9%. Therefore, the greatest improvement to the entire process could be achieved by solving the problems caused by fractures and missing deck board.

Likewise, a survey was carried out to identify the possible causes that cause the main damages to the wooden pallets of the food sector in the State of Tlaxcala. The result is reflected in figure No. 2, which says that 50% of the damages They are due to the poor composition of the material and that they use recycled pallets, 25% of the damage corresponds to an inadequate load on the pallet and the remaining 25% that causes damage to the pallets is due to improper handling of the forklift.

The strategies that are recommended based on the information obtained are the following:

- It is recommended that the wooden plank be verified with the supplier that the material with which they were made has a good composition of resistant wood.
- Train personnel on the weight and measurements of the finished product to carry out the correct stowage.
- Train personnel for the proper use of forklifts.

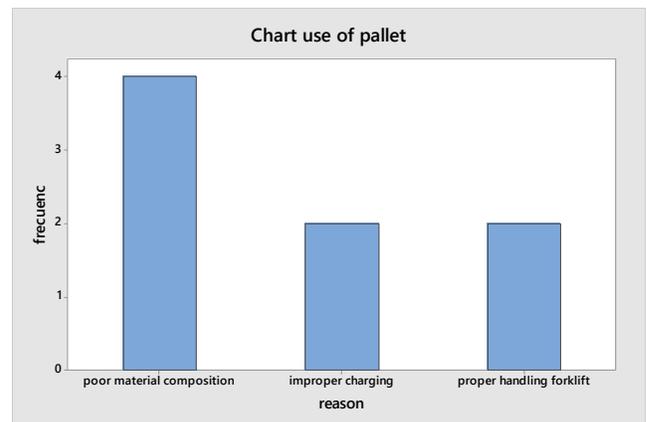


Figure 2. Pallet use graph. Source: own elaboration (2019).

Regarding the prices of the wooden pallets used by the food companies in the State of Tlaxcala, they are shown in table No. 2, regarding new pallets, they are those that have not had any use and the suppliers sell Directly to companies, recycled pallets are those that have had several uses behind and that intermediaries recover from other companies to store them, send them to recycling or, failing that, carry out some repairs, for their subsequent sale to companies, both new pallets. As recycled, they must have the safety and treatment seals of wooden packaging established by the official Mexican standard NOM-144-SEMARNAT-2012. Finally, the price of removal pallets is the price that food companies in the State of Tlaxcala pay to solid waste management service providers, it should be noted that these same suppliers re-sell the pallets that the companies discarded to different price.



Table 2: Platform Price.

Pallet Price	
Pallet	Average price per pallet
New pallet	\$121.87 pesos
Recycled pallet	\$307.50 pesos
pallet price for withdrawal	\$4.25 pesos

Source: Own elaboration (2019)

Table 3: Repair costs per platform.

Estimated cost per damage and per pallet		
Piece	Damage Type	Cost
1	Exposed Cloves	\$0.16
1	Rotated Block	\$0.99
1	Damaged Block	\$2.44
1	Fractured Deck board	\$6.61
1	Deck board Spacing	\$7.06
1	Splintered Deck board	\$15.17
1	Damaged Stringer	\$12.37
	Precio Total Por Daños	<b>\$44.80</b>

Source: own elaboration (2019).

Finally, the estimated costs (table No.3) on the damages identified in the pallets used in the food industry in the State of Tlaxcala are provided, the costs were obtained according to the minimum salary in force in 2019 in the State of Tlaxcala on which corresponds to \$ 118.47 and in the classification No. 7 "Carpenter in manufacture and repair of furniture" (DOF, 2018) also the prices of the material that are used for the repair of pallets were obtained based on the average price of economic units dedicated to the sale of tools and wood products located in the municipality of Huamantla, Tlaxcala.

#### 4. Conclusion:

It is recommended that the food companies of the State of Tlaxcala use an inverse logistics model so that they can recover the equivalent of the purchase volume and with this they can repair and reuse the pallets having better pallet management in order to obtain cost reduction logistics and help reduce environmental impacts.

It should be noted that any wooden pallet that is subjected to a very minimal repair is carried out and according to NOM-144-SEMARNAT-2012 these must be sent to treatment for the elimination of pests and their spread, within the procedures allowed for the exclusion of pests are treatment with methyl bromide (BP), heat

treatment (HT) and (DH) DH heat treatment by dielectric heating.

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