

Continuous improvement in production logistics to minimize waste

Mejora continua en la logística de producción para minimizar desperdicios

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Abstract

Organizations of the new millennium, require consolidate its position in an increasingly volatile market, globalization requires companies to optimize their processes to generate differentiation strategies that give competitive advantages. An integrated logistics system, applied within and outside the organization to adequately manage the movement of materials and products, streamlining the supply chain from suppliers to customers. This document describes 10 steps taken in a method of work to develop a proposal for continuous production logistics route assortment of materials improves, which aims to reduce by 50% two of the waste generated in described plant: material handling and movement of unnecessary personnel.

Resumen

Las organizaciones del nuevo milenio, requieren consolidar su posición en un mercado cada vez más volátil, la globalización requiere que las empresas optimicen sus procesos para generar estrategias de diferenciación que le den ventajas competitivas. Un sistema logístico integral, aplicado dentro y fuera de la organización que administre adecuadamente los movimientos de materiales y productos, agiliza la cadena de suministro desde proveedores hasta clientes. En este documento se describen 10 pasos llevados en un método de trabajo para elaborar una propuesta de mejora continua a la logística de producción en la ruta de surtido de materiales, que tiene como meta disminuir en un 50% dos de los desperdicios que se generan en la planta: manejo de material y movimiento de personal innecesario. Se pretende mejorar la logística de producción identificando la condición actual de surtido que realizan los materialistas en el área de producción, ya que identificando las acciones que se llevan a cabo actualmente en el abastecimiento y manejo de material, se obtiene un conocimiento más profundo de las actividades, actores y factores que intervienen en dicho proceso clave, este conocimiento permitirá desarrollar una propuesta para planear acciones que lleven a un mejoramiento del sistema.

Integrated logistics, Production logistics, Continuous improvement, Waste, Route selection

Logística integral, Logística de producción, Mejora continua, Desperdicio, ruta de surtido

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Introduction

One of the challenges faced by companies in this millennium is to navigate in a global society, this leads them to develop a competitive character that allows them to remain current in the market. Factors such as quality, price and speed of response are today essential elements for organizations, this means that companies are constantly reviewing their processes to improve them and consequently offer a quality product or service. The application of continuous improvement methodologies through the use of quality and lean manufacturing tools help the various functional areas of organizations add value to their processes. This article proposes a continuous improvement plan for integral logistics,

Only necessary movements and displacements, a fundamental part of logistics

The waste of labor, unnecessary movements and inadequate handling of materials in the industry are problems that can constantly be seen in the supply process in the production areas. The situation presented as a case study in this document describes the circumstance that exists in the material assortment area of a manufacturing company in Ciudad Juárez, Chihuahua, where the diagnosis under the scenario of the first observation shows materialistic that incur in dead time, unused personnel that carry out activities that do not correspond to their work but that are assigned by their coordinators.

In fulfillment of the production goal due to delays in the supply of the required material and some other scenarios that are familiar in industries that underestimate the value of logistics in the organization.

In order to demonstrate the benefits that can be generated by the fusion of quality tools, lean manufacturing techniques and, above all, the purpose of production logistics, the objective of this study is based on identifying the current condition of assortment that materialists perform in the production area in a manufacturing company in Ciudad Juárez, Chihuahua and develop a proposal for an improvement plan for production logistics.

By identifying the actions that are currently carried out in the supply and handling of material in the production area in the company in question, a deeper knowledge of the activities, actors and factors that intervene in said key process is obtained, this knowledge It will allow to develop a proposal to plan actions that lead to an improvement of the system.

This article begins with the approach of the challenges faced by the organizations of this millennium and the need to link terms such as logistics, quality and lean manufacturing, to generate value propositions starting from a theoretical framework and subsequently describe the methodology used in the investigation that generated this text, the exposition of the results and the preliminary conclusions.

Literary review

LProduction logistics and industrial engineering converge when a company sets the goal of generating strategies that minimize waste in unnecessary movements and an adequate use of material handling and finished products, this is due to the challenges of a new competitive reality of manufacturing organizations. this millennium, where the joust takes place in a dynamic and provocative battlefield, in which it is not enough to produce a good or service with quality, but rather it must present a flexible process with high levels of productivity, as well as having the maximum speed of arrival to the market in response to customer requirements.

Thes tools and methodologies used in engineering to generate improvements in the processes and products of organizations, are aimed at adding value to the product or service, the waste that occurs in companies is therefore the contrast of these plans of improvement.

Cantú (2010) mentions that a "monitoring of the performance of key processes" should be established, under the methodology known as daily operation management, which consists of: "a set of activities carried out every day by each area or function of the organization to achieve its purpose, and involves activities aimed at maintaining and improving the current state of the area" (p. 141).

By determining a comprehensive logistics system, a holistic view of the movement that occurs in materials from their procurement, storage, processing and distribution is favored, this leads to a change in the paradigm that frequently occurs when considering that logistics is only the distribution and transportation of the finished product, since its relationship with the administration of the flow of goods and services is perceived, from the acquisition of raw materials and supplies at their point of origin, to the delivery of the finished product at the point of consumption.

According to this, a comprehensive logistics system, by synchronizing its component functions, achieves an agile flow to quickly respond to a changing and increasingly demanding demand presented by customers; This system can be better understood when its subsystems are addressed: Supply Logistics, Plant Logistics and Distribution Logistics.

Supply logistics, groups the functions of purchases, reception, storage and inventory management, includes activities related to the search, selection, registration and monitoring of suppliers. Plant Logistics covers maintenance activities and plant services (water supplies, electricity, fuel, materials, etc.), industrial safety and care for the environment. Distribution Logistics includes the activities of shipping and distributing finished products to the different markets, constituting a link between the production and marketing functions. The Supply and Plant Services subsystems are grouped under the name of Production Logistics. (Monterroso, E., 2000).

Grove, cited by Pau and Navascués, (2001) establishes that "The production process (or transformation in systems theory) creates wealth, that is, it adds value to the components acquired by the company. That is why it is said that the material is more valuable as it progresses through the process and its capacity to satisfy human needs increases, this gives relevance to good material management within the company.

Returning to Cantú (2010), keeping an eye on the processes that are developed in Production Logistics as "key processes" to add value to the product, would avoid wastage, waste or "muda" as the Japanese call it.

Muda is —specifically all that human activity that absorbs resources but does not create value: failures that need rectification, production of items that nobody wants and the consequent piling up of stock and leftover products, steps in the process that are not really necessary, movements of employees and transportation of products from one place to another for no purpose, groups of people in a downstream activity waiting because an upstream activity has not been delivered on time, and goods and services that do not meet customer needs. (Womack, J., Jones, D., 2012).

For Production Logistics, the reduction of unnecessary movements of materials and people is fundamental, identifying a lot of handling and movement of parts, long distances traveled or excessive displacement of the operators leads to directing the efforts to design proposals that lead to the improvement of the processes.

The application of a Lean program both for the reduction of waste and for the improvement of the quality of the processes is explained by paying attention to the lean principles through the breakdown of its tools such as the 5's, SMED, TPM, Jidoka, Heijunka, Kanban, Visual control, Quality techniques, Staff participation systems, among others, according to Juárez, Y., Rojas, J., Medina, J. & Pérez, A. (2011) —one is dedicated to a particular aspect of waste elimination in each part of the process.

The problems, whether sporadic that occur every day, or chronic with which an organization gets used to living through basic quality tools, can be identified, classified, analyzed and measured, and it can be considered that for each previous action there is a basic quality tool or technique that can be used.

Be Linches (2008) lists —the 7 tools for problem solving (p. 65):

- Verification list.
- Histogram.
- Management charts.
- Control charts.
- Pareto chart.

- Cause/effect diagram.
- Distribution or dispersion diagram.

The application of the continuous improvement methodology, quality tools or one or several lean techniques help reduce waste in organizations, added to this, logistics must be recognized as one of the key functions of the company. that allows to optimize the processes and that, if applied in the organization, leads to speeding up the flow of materials and information.

Based on the literature, thinking about developing continuous improvement projects applied to production logistics leads us to consider the possibilities of minimizing waste in the organization, considering this as the starting point for the research presented in this article.

The research methodology narrates the activities carried out by the materialists at the time of supplying the stations in the production area in the organization under study, this, through a qualitative approach with a descriptive scope, delimiting from a broader context.

The manufacturing industry in Ciudad Juárez.

The industrial sector is a very important component for the growth and economic development of a country, in Ciudad Juárez the manufacturing sector is experiencing great dynamism that is reflected in the growth of manufacturing exports and the income of the establishments belonging to the program of the Manufacturing, Maquiladora and Export Services Industry (IMMEX) who, through job positions and manufacturing orders, present a relevant indicator to demonstrate that the decisions made in this sector are correct.

It can be considered that from the signing of the North American Free Trade Agreement (NAFTA) that entered into force in 1991, manufacturing and therefore the IMMEX companies emerged as a source of foreign exchange for the country, without excluding the number of jobs it has generated in this border strip of the municipality of Juárez.

But this dynamic is due to the growing demand from foreign markets and the results of the domestic economic policy that has created favorable conditions for exports through a fiscal, customs and administrative program that supports said activity; allowing Mexico to have a technological development and a growing participation in international markets,

For Mexico, and in this case specifically for Ciudad Juárez, international subcontracting operations have allowed the products manufactured in their companies to compete in national and international markets, which is why it is important to design strategies that manage to improve processes at all times. industries that take place in them.

The methodology for this research was simplistic since a manufacturing company from Ciudad Juárez, Chihuahua, was considered as a case study, observing a non-experimental cross-sectional design since variables were not manipulated and the data were taken in a single moment, of a descriptive type. narrating the events witnessed. Observation, anecdotal records and document review were used as data collection instruments. (Hernández, R., Fernández, C., Baptista, P., 2014)

Specific context

The company in which the study is carried out is located in Ciudad Juárez, Chihuahua, considered one of the main suppliers of wipers for the automotive industry, with important clients such as Nissan, Volkswagen and Ford, and also produces parts for spare parts that can be locate at convenience stores like Wal-Mart and Auto Zone. The material assortment process in the production area was considered as the specific area to carry out the case under study in this investigation. Of all the processes carried out by the company, one was located in which quality tools for diagnosis and lean tools could be used to design a proposal to improve the production logistics system.

The universe to be considered were the 80 materialists who work in the production area in the three shifts, the estimated sample for the study is not probabilistic for convenience since, as its name indicates, it was considered for the convenience of the study. (Hernández, R. et al, 2014).

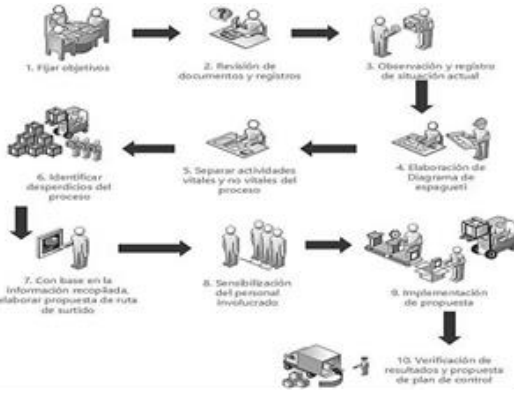


Figure 1 Research methodology

Results

1. The following objectives were reached:

- Identify elements, subjects and circumstances that arise in the selection process of the case study.
- Propose an assortment route.

2. Review of documents and records.

- The document review was carried out: 80 people were detected moving the material, which are presented in Table 1, this staff is divided into three shifts.
- Met goals were also identified.

Tur no	1	2	3	4	5	6	7	8
1	11	4	5	2	2	2	2	2
2	5	4	4	3	3	2	2	1
3	4	2	-	2	-	-	-	-
Back ups	3	3	2	2	2	2	2	2
Total	23	13	11	9	7	6	6	5

Table 1 Number of personnel for the assortment of materials by shift and station

3. Observation and recording of the activities that are currently being carried out, detecting the following:

- Inexistant assortment routes defined.
- InexStrong material change indicator.
- The runner must get pallets out of the plant.

- The necessary equipment is not available to supply the number of components that the area requires, so the materialist must do the same operation over and over again.
- Repetitive movements.
- Disorder in the area.
- Unnecessary displacement of material that accumulates for undefined periods in temporary spaces.
- The material is on the floor.
- Improper handling of material
- The materialist performs non-vital activities.
- 4. Elaboration of the spaghetti diagram, to identify and confirm movements of materialists.

This black lines in Fig. 2, represent the route made by the materialist, after observing the diagram, the points of the location of internal suppliers and the need for the proposed route to have a continuous flow and to control the waste of movements, in addition, the need for a 5'S project was considered to minimize the disorder of the area.



Figure 2 Spaghetti diagram

5. Identification of vital and non-vital activities of the process. Records were made with the collected data and the activities that were vital for the material supply process were determined in such a way that the machines were kept operating without stoppages due to lack of material, identifying the standard time that must be handled on the route.

6. Waste identification

The waste identified through the registration tools was the following:

- Transportation: Unnecessary movement of materials and people.
- Movements: Unnecessary movement of Geent and materials within the process.
- Waiting: wasted time of people.
- Inventory: Failure to meet delivery deadlines.

Once the data was recorded and organized, it was analyzed to generate ideas that allowed the design of a proposal to improve production logistics, specifically in the material assortment process.

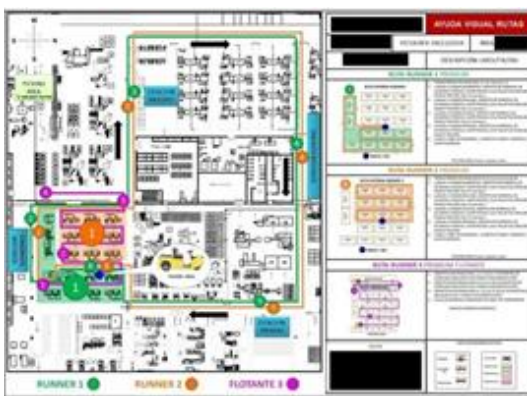


Figure 3 Passortment route proposal

Since the mapping was carried out, it was considered necessary to start with a 5'S program since the disorder of the area, in addition to giving a bad appearance, was non-functional, the implementation of a kamaban system and the assortment route proposal were also considered.

7. Proposal

If the proposal emanates from the work team, it has a greater probability of success, this is because people hardly accept changes that they consider taxes, but when they are made to participate in improvement projects, a brilliant idea is not expected from a single person. mind, but many ideas from great minds that will be able to add value to the process. With this in mind, an informational meeting was convened, and a brainstorm was held to propose solutions.

The proposal to improve production logistics covered the following points:

Prepare a 5'S plan, since it is considered necessary to maintain the work area to present it clean, organized and safe, since a disorganized and unclean environment impacts the morale and efficiency of the worker.

For the production logistics to be fulfilled, establishing a standard work in the route and times of the supply route allows to supply the machines without the risk of stoppage due to lack of material or that it is lying on the floor due to oversupply.

The handling of materials through the appropriate equipment is also a point to consider in a logistics project, but many times there is no budget to design or buy new equipment, so on some occasions what you have must be adapted to the needs. In this way, in the case study, the adaptation of a vehicle formed by a tugger and 3 wagons was suggested (Fig. 4).



Figure 4 Adapted transport equipment

8. Sensitization

The result of the investigation leads to the reflection of the fulfillment of an improvement that can be considered within a Lean culture since "it is not something that begins and ends, it is something that must be treated as a cultural transformation if it is to be lasting and sustainable. ¶, this because it is —a set of techniques focused on added value and people¶. (Hernández, J., Vizán, A. 2013).

Sensitizing the staff involved in the change is a fundamental part of it, since they must know the benefits that the new work system brings to everyone.

Something that is required when generating a change is to establish compliance rules and make themselves known to those who will have to apply them (Figure 5), as well as the need for them to implement the improvement. Much is said that the most valuable element of an organization is human capital and therefore in any improvement project the personnel who will implement the change must be made aware and trained.



Figure 5 Rules for the runners

9. Implementation

The first thing that was carried out in the implementation of the improvement project was the awareness of the key element: people. Professor Jeffrey Pfeffer quoted by Heizer & Render (2009) states that "It is possible to achieve sustained competitive advantage through the way people are managed". The Kaizen of man starts from the premise that man is the most important resource of the organization, and that the participation of all employees to achieve quality is a basic premise.

Building an environment of respect and mutual commitment, as well as taking advantage of the mental and physical capacities of the employees, allows us to avoid wasteful labor. Involving employees as much as possible, sensitizing them and training them offers an advantage in the implementation of any change.

The workers were explained how to operate the proposed route, the formats necessary to keep the records and the rules to follow in the new way of working. The improvement proposal was implemented with a continuous flow and with the purpose of controlling the waste of movements, in addition to minimizing the disorder of the area, since material that is not used cannot be handled on this route. To determine the times of each supply route, it was necessary to analyze the number of parts needed, taking into consideration the highest standard number that the machines produce per hour in order to keep them running; the start was taken into account so that the materialist did not present problems when beginning with the completion of his journey.

In the case of the study in question, situations as important as the fact that the production lines have enough spaces so that the material can withstand a little more than an hour without the need for restocking were detected through observation. that every hour the tour must be carried out so that the production lines do not suffer stoppages and are always supplied.

Due to the fact that in the analysis of the causes it was determined that many of the repetitive movements were due to the lack of adequate transport equipment and that the materialist could not carry the number of components required in the way that was done, we also worked with the proposal of the adaptation of a material transport equipment, to supply the components that are required.

10. Verification of results and proposal of control plan

The results obtained with the implementation of the improvement plan were clean and orderly areas, clear corridors, material handling and movement of people and materials minimized, efficient and effective use of labor, standardization of work, optimal use of transport equipment material, staff involvement.

After observing the results of the implementation, the design of a control system is proposed through the use of a verification sheet of the supply route and an internal audit program to follow up on the improvement.

Conclusions and recommendations

Continuous improvement projects make it possible to improve the working conditions of the employees involved and minimize waste. In the case study, the result was the minimization of movements and transfers of materials and people that were determined unnecessary. Greater control of the materialists was achieved by giving route schedules. The number of employees moving material was also reduced, as now only runners can handle it.

Reproducing this system in all areas of the plant would generate a standard job for all materialists and reduce the number of personnel to supply the areas.

Concluding, the analysis of the factors that occur in the initial situation of the case study, led to detect notorious waste in the process, the proposal that was made to establish the supply of materials to the work stations caused a reduction of 60%. of the materialists, for which it is concluded that analyzing the factors, subjects and actions that intervene in production logistics using quality tools allow generating proposals that can lead to a project that minimizes waste.

In the particular case, it is convenient to take this proposal to the entire plant, to ensure that production logistics are streamlined and lead to the achievement of the company's goals.

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