

LEAN WAREHOUSE: AN ANALYSIS OF THE BENEFITS IN THE WAREHOUSE AREA

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Abstract: The search for better ways to optimize storage activities has been the keynote of organizations' warehouses. In this context, there is a need to expose practices that the lean warehouse underlies them. The objective of this work is to analyze the benefits of applying practices that follow the lean philosophy in the area of product storage in companies. The method used to prepare this article was through a literature review. The results found indicate that practices such as 5S culture, the ABC curve, layout change, picking, kanban and others generate several benefits. The conclusion of this article is that lean generates benefits, for example: it increases productivity, improves the service level, increases the useful area and reduces waiting time, among others.

Keywords: Lean Warehouse; Lean Tools; Warehouse Activities.

LEAN WAREHOUSE: UMA ANÁLISE DOS BENEFÍCIOS NA ÁREA DE ARMAZENAGEM

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Resumo: A busca por melhores formas de otimização das atividades de armazenagem tem sido a tônica dos armazéns das organizações. Nesse contexto, há necessidade de se expor práticas que o *lean warehouse* as fundamentam. O objetivo deste trabalho é analisar os benefícios da aplicação de práticas que seguem a filosofia *lean* na área de armazenamento de produtos nas empresas. O método utilizado para a elaboração deste artigo foi através de revisão da literatura. Os resultados encontrados indicam que práticas como cultura 5S, a curva ABC, mudança de layout, *picking*, kanban e outros geram diversos benefícios. A conclusão deste artigo é que o *lean* gera benefícios na área de armazenagem, exemplo: aumenta a produtividade, melhora o nível de serviço, aumenta a área útil e reduz tempo de espera, entre outros.

Palavras-chave: *Lean Warehouse*; Ferramentas do *Lean*; Armazenagem.

1. INTRODUCTION

The search for improvements highlights the importance of lean manufacturing in practice, as it helps to identify the elimination of waste as a way of optimizing production performance, in order to achieve the lean operation process. This evidence is the need that customers need to receive with quality, particularity and requirements that value a product or service. The use of lean as a practice to avoid waste, such as transport, stock, overproduction and movement, among others. Several segments can implement lean production theory. The object of study of this work is the storage area. In this case, it is about the lean warehouse.

Within this scenario, with increasing competition, companies need to seek alternatives that keep them at the top of the production chain. In this sense, internal operational issues have become even more important, such as handling and storage [1], which allows for a significant gain in productivity and quality. Tools based on lean manufacturing philosophy can improve the efficiency of these operations.

In the face of market repulsions, one factor that remains in confirmation is the importance of understanding the need for what the lack of lean warehouse in a company's storage management could cause. Therefore, we sought to gather information in order to justify this problem. Thus, this article aims to analyze the benefits of applying practices that follow the lean philosophy in the area of product storage in companies. For this, it is necessary to understand the concepts and brief history of lean, list the lean tools and the elimination of waste in the activities of the storage area, and analyze the benefits of using lean tools in the warehouse activities.

1.1.1. THEORETICAL FOUNDATION

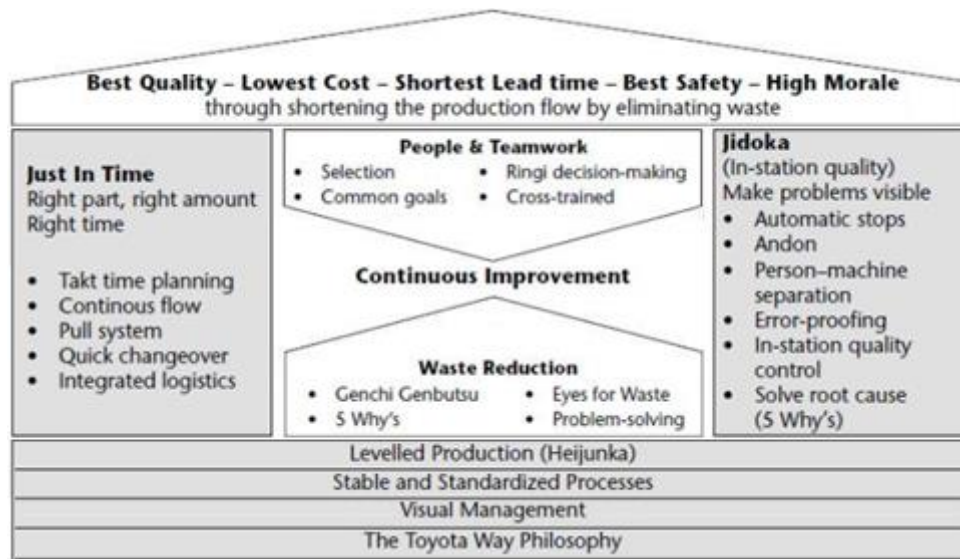
This article introduces lean concepts and a brief history; lean tools and waste elimination; the activities of the warehousing area and the benefits of using lean tools in warehouse activities.

1.1.1.1. Lean concepts and brief history

Lean warehouse is a set of practices that apply to logistics. A management technique that allows you to focus on eliminating the waste caused, unlike mass production, which brings great waste and losses, lean brings an economic alternative, occupying an important position in the area of logistics and warehouse.

In the book "The Toyota Model: 14 Management Principles of the World's Largest Manufacturer" by [2] he talks about the elimination of process waste, bringing principles of a "lean process", which is the STP, which can be represented through the figure of the STP (Figure 1).

Figure 1 – Toyota Production System House



Source: Adapted from LIKER (2005:51)

The STP house brings together concepts that consolidate the entire Toyota Production System, bringing the necessary balance of production in volume and variety, standardizing the processes carried out so that there is more efficiency in the process.

1.1.1.1.2. Lean tools and waste elimination

Studying lean is to understand the management that seeks to reduce waste, increasing productivity and quality of the entire process, that is, it eliminates all activities that do not add value.

1.1.1.1.2.1 Wastes

The figure 2 presents the wastes for manufacturing. The wastes are defect, overproduction, waiting, non-utilized resources, excess processing, motion, inventory and transportation.

Figure 2 – Wastes



Source: Adapted from KELSEY (2021)

1.1.1.1.2.2 Lean Tools

In fact, the market changes perennially, since to better meet the demands of the consumer to be competitive in the scenario; companies' organizations need to deal well with these changes. Organizational change occurs when a company changes its internal processes to achieve certain goals and should be part of the business routine, as it improves results and gains a competitive advantage.

1.1.1.1.2.2.1 Kaizen

It means continuous improvement, as well as all activities that somehow have an advance in some function, which can make the business more efficient. Generally, the kaizen method involves five main steps, which are: a) Analysis of the current situation; b) Identification of the problem area; c) Development of tactics; d) Implementation of improvements; and e) Analysis of results and presentation to senior management. Thus, we can conclude that kaizen aims to improve standardized processes to eliminate waste, correct activity flow problems and thus solve business problems.

1.1.1.1.2.2.2 5S

Its objective is that everything is clear and visible between people and the work environment and that any abnormal situation can be resolved soon. It is an easy-to-understand technique, but its application may not be so simple, as it implies changes in attitudes, requiring everyone's involvement.

The meaning of the 5S are Seiri, Seiton, Seisu, Seiketsu and Shitsuke. Seiri: in your application, it is necessary to define which equipment, tools, materials, information and data are necessary or unnecessary. Seiton: has the function of defining the most appropriate place to store, store and dispose of materials. Seisu: considers that data and information must remain updated and stored to ensure the right decision. Seiketsu: seeks to ensure a favorable environment, create adequate conditions for physical and mental health, ensure hygiene and take care of clear and objective information and data. Shitsuke: develops the habit of preserving the improvements made, always with a view to new challenges.

1.1.1.1.2.2.3 Kanban

It is a signaling system between customer and supplier, constituting a simple method of visually controlling processes. It organizes work defining what, when, how much, how to produce, how to transport and where to deliver. In other words, it aims to control and balance production, eliminating losses, prioritizing production, controlling the flow, and providing information on products and processes. With the application of this technique, the limit and control of the material in process is the number of cards in circulation. Examples of advantages of this are: eliminate inventory waste, ending excess production.

1.1.1.1.3. Storage area activities

The main activities of the warehousing area are packaging, receiving, warehousing, inventory, dispatching and order picking.

Packaging: the main objective of this process is to move the products without damage it, in a way that is accessible to the company [4] apud [5]. Packaging refers to the process of storing materials in boxes so transport them with safety. Furthermore, this is for the purpose to identify the items, to pack them and enter the data at this stage on the packaging: customers' names, origin, destination, and carrier [6].

Receiving is the first fundamental part of the storage process. Where it occurs, the unloading of the material in the warehouse, having as an important factor also the origin of the product. Checking (qualitative and quantitative): quantitative refers to the quantity of the requested or expected order and qualitative refers to the quality of product requested [6]. Another type of conference is documentary, which deals with maintaining the quality of items entering the warehouse, reducing documentation failures and non-conformities of the products [7].

Warehousing is the movement or transport of materials, with the main objective of storing and serving customers. It also concerns the storage of the material in a given space that is suitable. In addition, it must be well located and have a physical and strategic arrangement [8] and [9].

The inventory can be customers, rotating or by area. Being, according to the classification of the movement of the products [10]. However, the RFID system guides the shipment. Also managing shipments, carriers and vehicles. The dispatching is responsible for the correct output of the product to the necessary means [7]. Another warehousing activity is order picking. Three ways mentioned to separate orders: internal, external and combined. In the internal, the man goes to the material and in the external; the material goes to the man [11] apud [12].

1.1.1.1.4. Analysis of the benefits of using lean tools in warehouse activities

The application of lean tools generates several benefits in the storage area. This article cites value stream mapping, kaizen, 5s, and kanban examples.

1.1.1.1.4.1 Value Stream Mapping

Value Stream Mapping (VSM) as a tool for identifying specific activities that occur along the value stream for a process. The main objective of this tool is to evaluate each stage of the processes, whether or not it creates value and demonstrates which improvements points, so that the process is optimized [13] apud [14].

Therefore, there is a language established among the collaborators, subsequently starting an improvement project. Once you have defined which company product you want to map first, the design of the current state starts from the collection of information such as times, number of people involved in each process, etc. In distribution centers whose value stream mapping was a lean warehouse practice, generating these views in employees for storage activities as well [15].

1.1.1.1.4.2 Kaizen - continuous improvement

Continuous improvement is the process of always wanting. It contributes to the survival of a company and to boost an organization, allows you to assess yourself, cover actions and synchronize your business with organizational goals, promoting increased productivity and quality. In this way, we have established criteria that put us linearly in the improvement process. This tool helps in the understanding and motivation of those involved, which speeds up the dissemination of activities practices [1].

1.1.1.1.4.3 5S

5S is a quality technique whose methodology is to adapt to work areas and make them a favorable environment. The benefits of this storage tool are that it helps employees feel more valued at work and, in addition, improves their health [15].

1.1.1.1.4.4. Kanban

Kanban allows you to control the amount of work-in-process at each workstation without downtime due to lack of material or excess stock. Other benefits of kanban are it avoids over or under-production/delivery of parts; controls inventory; allows you to discover and resolve process weaknesses; enables the delivery of parts according to consumption; and identifies the pieces [12].

2. METHODOLOGY

The methodology used was a bibliographic survey. The references used were articles and dissertations between 2009 and 2021, as well as books.

3. RESULTS AND DISCUSSION

The article began by defining lean warehouse practices. Afterwards, he explained the context in which lean philosophy emerged and its definition; then lean waste and tools; then the activities of the storage area; and finally, the benefits of lean warehouse in the warehousing area.

The lean philosophy presented through the Toyota house in which just in time, jidoka and kaizen appear. Lean warehouse is the application of this philosophy in storage activities. The tools presented were kaizen, 5S and kanban. The activities of the storage area are packaging, receiving, inventory, dispatch and order picking.

Among the benefits of lean in the warehousing area, the mapping of the value stream helped to identify waste, and this was the cause for the implementation of improvement projects in these centers. In addition, the 5S culture increases the feeling of valuing employees and ensures everyone's safety; and kanban helps control inventory and identify parts.

4. CONCLUSION

The conclusion is through this work, the application of lean warehouse tools can produce benefits. Examples of these tools that can generate gains in activities in the product storage area are value stream mapping, use of performance indicators, kaizen, layout change, change in picking, and 5S, among others. These tools allow employees to see waste and whether the company is meeting its goals; employees feel more motivated and their health is also gaining; increase productivity, service level and floor space; reduce waiting time; between others.

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