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# Comparison Of Lean Warehouse Implementation In Several Companies In Indonesia

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## **ABSTRACT**

When implementing the lean philosophy in the warehouse, there are environment issues or aspects to be considered. This study use literature research review by reviewing journals which specifically research on the implementation of lean warehousing in companies in Indonesia. Identification of waste and its investigation to find the causes is important to have the right recommendation for improvement can be compared between companies. Ideas for improvement such as using labels to segregate used and unused materials or tools is an example of sorting. Arranging lay out, racks and bins, and materials to become neat and tidy, easy to find, and clean is a must have properties for a warehouse. Updated policies and procedures are required for standardization of work. To sustain the implementation result, it is important to have training, knowledge sharing or other similar and creative events. Leadership, measuring, and the driving of improvements are key roles for the success of implementation.

**Keywords:** lean warehouse, implementation, 5S

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## **1. INTRODUCTION**

The expression "amateurs talk strategy and professionals talk logistics" is found in the discussion of the history of Alexander the Great and the Macedonian army. Alexander's army achieved remarkable success because it managed its supply chain so well. The army had a logistical structure that was fundamentally different from other armies of the period. They implement strategies and tactics which must be closely linked to supply chain capabilities and run a lean and efficient organization. The Macedonian army during the time of Alexander was known as the fastest, lightest and most mobile army, Hugo (2003).

According to Anggraini & Putri (2020), the lean production method at Toyota in practice gives authority to employees on the front lines to improve quality and productivity to the point of giving them the authority to stop the production line. By the 2000s lean production (also known as the Toyota Production System) had spread from the auto industry to the healthcare industry to government and other industries. Boeing has a program similar to lean production where engineers look for process improvements and this is a hallmark of quality and cost effectiveness.

Lean warehousing, similar to the lean production strategy, focuses on reducing waste and costs which then increases the value expected by customers on continual basis, Anđelković, A., Radosavljević, M., & Panić, D. S. (2016). Several studies have verified the positive impact of lean techniques on performance indicators in production environments. However, the implementation of lean principles in the warehouse is relatively new in the field of logistics. Studies performed on warehouse environments have only partially confirmed the positive impact of lean techniques. Up until now, there has been more evidence supporting the positive impact in production environments compare to warehouse environments, Cooper, H.M. (2010) and Prasetyawan Y., Ibrahim N. G., (2020).

## **2. LITERATUR REVIEW**

Lean, which can be interpreted as slim or thin, can also mean activities that operate without waste so than all activities carried out are only that provide added value seen from the consumer's point of view (Liker, 2006). Lean was first introduced in the Toyota Motor Corporation, the car manufacturing industry which aims to shorten the time from when a customer order is placed until the delivery of goods. This lean approach initially focused solely on eliminating waste and excess flow at Toyota. Lean manufacturing is a long-term philosophy that unites all elements into a management system that aims to eliminate waste as a whole. According to Womack and Jones (2002), the lean manufacturing process involves everyone in the entire organization working together to eliminate waste. Lean is not only reflected in eliminating waste and loss,

but also in striving for continuous improvement. The warehousing process as one of the many processes in the company is also part of achieving this strategy.

Bowersox et al. (2013) in Tahboub (2019) concluded that lean contributes the the following competitive edge for warehousing operations:

1. On-time delivery and low cost service to its customers through improved efficiency and productivity, together with high quality and accuracy in preparing orders.
2. Improved stock integrity and better control over services by preventing picking disruptions, lack of material availability and loss of sales opportunities.
3. Accurate levels of information flow and traceability between the warehouse and other legs of the supply chain.
4. Management of the ever changing customer requirements and market complexities by adapting to demand changes and remaining flexible to meet seasonal and new customer demands.

As cited by Dedahri (2013), Gudehus and Kotzab (2012) stated that the function of a warehouse in a logistics network is to transfer and store goods. Bartholdi and Hackman (2011), ten Hompel et al. (2007), Arnold et al. (2008) provide functionally similar definitions. Bartholdi and Hackman (2011) said that the warehouse performs a synchronization function in the supply chain. Hompel et al (2007) added that the definition with a change in the status of goods. Arnold et al (2008) look at warehouses from a wider angle. They assert that the real function of the warehouse is to disrupt the supply chain. The European standard EN 14943 (2005) defines the function of a warehouse as a space designed to receive, store and distribute goods.

According to Dehdari (2013), like in the production environment, the leadership, measuring, and the driving of improvements in a systematic and analytic way are all important roles when implementing lean into the warehouse environment. Therefore, it is important to have the contribution of all employees and with the goal of gaining awareness of perfection in each corporate action. All aim to achieve permanent, systematic, analytical, continuous and measurable process improvement in the warehouse environment. Direct communication with the workers in the warehouse is much more restricted because the workers are spread all around. Another issue to consider is the processes are not usually synchronized and the workers change their work and their locations throughout the day. The worker may reports to two different leaders within one shift. These environmental aspects have to be taken into consideration when implementing the lean philosophy in the warehouse environment. [4]

As lean warehouse focuses on reducing waste and costs, it is therefore the key activities of the implementation is to understand what the waste are and where they occurred [9]. Table 1 explain types of waste and terminologies used by scholars. As cited from Liker (2006) by Kusnadi and Wahyudin (2018) there are 8 types of waste acknowledged by Toyota and according to Hines and Rich (1997) there are 7 commonly accepted. Tahboud and Salhieh shows different terminologies to provide better explanation. In applying to an industry, the waste type can be slightly different. Dzulkilfi and Ernawati for example, identify waste of searching time in a company.

**Table 1.** Types of Waste Terminologies by Scholars

No	Liker (2006) in Kusnadi & Wahyudin (2018)	Hines & Rich (1997)	Tahboub & Salhieh (2019)	Dzulkifli & Ernawati (2021)
1	Overproduction	Overproduction	The storage of excess inventory	
2	Waiting time	Waiting	Waiting time	Waiting
3	Unnecessary transport	Transport	Unnecessary travel	Transportation
4	Incorrect or Over processing	Inappropriate processing	Insufficient processing	Processing
5	Excessive Inventory	Unnecessary Inventory	Wrong or no Inventory	Inventory
6	Unnecessary movement	Unnecessary motion	Motion	Motion
7	Defect	Defect	Defects and Damages	Defect
8	Untapped creativity			
9				Searching time

Many years ago, there are several tools and techniques were introduced by Toyota on how to eliminate waste in a process such as Value Stream Mapping, 5S Technique, Just-In-Time Production, Continuous Improvement Programs, Kanban Systems, Continuous Flow Production and Quick Changeover

Methods. According to Kusnadi and Wahyudin (2018) the approach of Lean warehouse follows steps of Value stream mapping, Fishbone diagram, 5S + Safety and Layout improvement. According to Dzulkifli & Ernawati (2021) a company may use approach by Value Stream Mapping, Process Activity Mapping and followed by 5S. They also cited from Wahyudi (2017) that 5S is one of most adopted technique as 5S is utilizing the workplace to train the habits of workers in an effort to improve work discipline.

The 5S itself stands for Seiri (Sort), Seiton (Straighten), Seiso (Shine), Seiketsu (Standardize), dan Shitsuke (Sustain). Sort is a step that aims to remove the unused material or return it back. Straighten is a step that aims to arrange items in such a way that they are neat and easy to find. Shine is periodic cleaning of things that have not been categorized as clean. Standardize is a stage of work where the company must establish work standards. Sustain means maintain something that already implemented in the right way as it becomes a habit.

### 3. RESEARCH METHOD

The method used in this research is literature analysis using several journals as reference which are related to lean warehousing. The discussion process conducted by comparing 4 (four) journals in order to identify types of waste and improvement steps taken by respective companies.

Library research or literature analysis (literature review, literature research) is a study conducted by critically reviewing or analyzing the knowledge, ideas, or finding which contained in the body of the literature for academic orientation (academic-orientation literature) and formulate the theoretical contribution and methodology for certain topic, Cooper, H.M. (2010).

### 4. RESULTS AND ANALYSIS

The authors found 4 journals regarding lean warehouse conducted in 4 different companies from several types of industries. It is interested to review the types of waste which could be identified and steps for improvement obtained using the 5S method. The 4 companies are as follows:

- a. P.T. Surabaya Industrial Estate Rungkut (SIER)
- b. P.T. Pos Logistik Indonesia
- c. P.T. Nichirin Indonesia
- d. P.T. TXL

SIER is a state-owned company founded on 1974 in Surabaya to support and develop industrial estates in Indonesia, especially in East Java. P.T. Pos Logistik Indonesia is a subsidiary of state-owned company P.T. Pos Indonesia (Persero) which is specifically engaged in the logistics business which was originally a strategic business unit in 2007 and then stood as a subsidiary of PT Pos Indonesia (Persero) in 2012. PT Nichirin Indonesia is an automotive parts manufacturer which was founded in 2011, with OEM company customers for two-wheeled vehicles such as Honda, Yamaha, Suzuki and Kawasaki and four-wheeled vehicles such as Suzuki, Honda and Nissan. PT TXL is a company engaged in the warehousing sector with a distribution area in Eastern Indonesia. The performance of TXL is measured using KPI with several indicators such as productivity and quality.

It is understood that the waste type in a company is not always applicable for others. However for comparison purpose, the type of wastes to be used as reference is selected from one only i.e. SIER. The comparison of waste types are shown in table 1.

**Table 2.** Comparison of Waste between 4 Companies

Company	Waste Type						
	Defect	Processing	Waiting	Searching Time	Transportation	Motion	Inventory
<b>SIER</b>	1. Improper storage of product 2. Poor warehouse condition 3. Not implementing FIFO	1. Lack of implementation of procedure by employee 2. Improper material moving	1. Additional activity which causing delay to subsequent activities. 2. Lack of coordination	1. Insufficient data input for <i>inbound &amp; outbound</i> goods which causing difficulties to find the	1. Forklift operators are less reliable 2. Long distance between the unloading location	1. Excessive movement due to lack of ergonomics. 2. Inadequate equipment,	1. Carry out storage for items that really do not need to be stored. 2. There is no sorting of

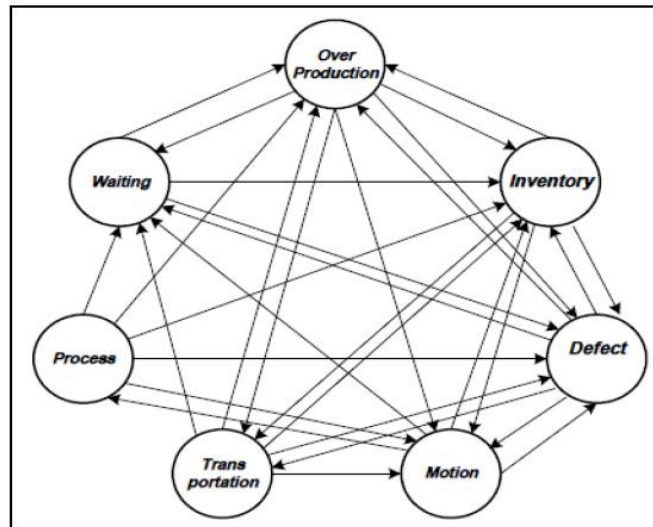
	(first in first out) method	which causing additional process such as repacking 3. Repacking due to damaged product 4. Inappropriate tools	between employees due to improper procedure 3. Several activities are performed manually which causing delay in subsequent activities.	product. 2. Lack of method for product data search 3. Insufficient layout drawing for product storage	and warehouse.	for example lifting at a height without proper equipment/tools.	incoming goods. 3. Ignorance and inaccuracy during transferring product activities
<b>Pos Logistik Indonesia</b>	1. Lack of ability and knowledge of employees in handling materials 2. Employee negligence in material handling 3. The production machine shutdown unexpectedly. 4. Low quality of materials. 5. SOP is not clear.	1. Error in inputting the order quantity. 2. Production activities are not aligned with production schedules 3. Fallacy in production management	Not applicable	Not applicable	Not applicable	1. The process of taking the material takes a long time 2. Employees do not follow procedures 3. Low quality of material handling. 4. Forklift capabilities that cannot meet the needs	1. Lack of employee ability to carry out inventory checks. 2. Inadequate storage space. 3. The layout of the VAS (value added service) division is not good. 4. Unused material that has accumulated. 5. Poor inventory planning. 6. Storage racks are not in accordance with the FIFO method.
<b>Nichirin Indonesia</b>	1. Materials are easily damaged by being crushed or stacked due to non-standard packing.	1. The operator must rearrange item by item and arrange them. Difficulty in	1. There is no delivery schedule by the supplier. 2. There is no good control over inventory data which causes an	1. Warehouse layout arrangement causing long searching times to find spare parts	1, Lack of storage media	1. Moving goods takes a long time. 2. The arrangement of goods is not neat.	1. Moving goods to storage takes a long time and causes the stock to be out of balance. 2. There is

		compiling because of the volume and weight of the item itself. 2. Many materials are not neatly arranged and must be unboxed.	imbalance between goods and needs	inventory in the warehouse. 2. Lack of regularity in storing materials and lack of storage racks causing long searching time. 3. Not all of stored materials have labels and sometimes material placement is not according to the label so it's confusing when searching			no control form for the arrival of new items. 3. There is no delivery schedule by the supplier. 4. Poor inventory system
<b>TXL</b>	Not concluded	1. The personnel in the picking and packing sections do not memorize or understand motif, so the motifs are wrong. The biggest selection error is in the picking process and then in the sorting process.	1. The goods are not available when picked up because the goods are still in the receiving area 2. The goods in the delivery area is not properly arranged.	1. The goods in the dispatch area is not properly arranged so that search process takes a long time to find suitable items.	1. Long distance between the packing area and the dispatch area	1. Every day, personnel pick up fast moving goods between bins with long distances. 2. The number of communication tools that are not balanced between sections.	1. Picking of goods with the quantity that does not tally with SO due to lack of concentration, lack of thoroughness, and/or lack of understanding of motifs.

As described in table 1, there are same or similar causes between waste type and also between companies. However, there are also type of waste found in a company but either not found or not applicable or not significant in other companies.

The relationship between wastes is quite complex as each type can have influence on the other type, directly or indirectly. Rawabdeh (2005) in Anggraini & Putri (2020) developed a framework for assessing the

level of influence of waste based on its effect on other waste. Directions for the relationship between the seven wastes can be seen in Figure 1.



**Figure 1.** The Influence Relationship between 7 Types of Waste  
(source: Rawabdeh (2005) in Anggraini & Putri (2020))

With reference to table 2, there are recommendation for improvement to reduce and eliminate the causes of waste detailed in table 3. The recommendation offer interesting ideas and they are possibly applicable to similar companies with similar waste type. As there are relationship between waste types, one recommendation may have positive effect for more than one waste type.

**Table 3.** Comparison of Recommendation on Improvement

Company	Recommendation of Improvement
<b>SIER</b>	<ol style="list-style-type: none"> <li>Sort: The use of labels or labeling to be used for goods and equipment to reduce waste of defect, processing, waiting, searching time and inventory caused by defective product, inadequate tools, reduce activities like product search, and storing excessive product</li> <li>Straighten: The grouping of finished products to be carried out according to the group of shipment to make easier transportation.</li> <li>Shine: Carry out daily cleaning, inspection of cleanliness and maintenance of cleanliness, Perform maintenance to the warehouse space.</li> <li>Standardize: Make picket/duty schedules, ensuring the understanding on procedures, establish 5S checklists.</li> <li>Sustain: Establish 5S standardization and provide 5S training. Perform knowledge sharing and FGD (forum group discussion). Implement FIFO (first in first out).</li> </ol>
<b>Pos Logistik Indonesia</b>	<ol style="list-style-type: none"> <li>Provide additional material handling facilities, indoor fans and supporting racks for products awaiting placement into the warehouse.</li> <li>Conduct employee training regarding product treatment and handling.</li> <li>Implementation of 5S</li> <li>Establish SOP for production planning, production balancing, and storage limits as well as minimum and maximum of production.</li> </ol>
<b>Nichirin Indonesia</b>	<ol style="list-style-type: none"> <li>Sort: Materials in the box that are not easily broken/crushed can be removed out from the box.</li> <li>Straighten: Raw Materials should be consistently arranged according to classification of material type.</li> <li>Shine: Material should be immediately stored neatly in the storage rack.</li> <li>Standardize: Implement the ROP and safety stock system in ordering materials.</li> <li>Sustain: Warehouse workers should be consistently maintaining the cleanliness and tidiness</li> </ol>

	of their work environment.
<b>TXL</b>	<ol style="list-style-type: none"> <li>1. Extra processing: <ol style="list-style-type: none"> <li>a. Making samples of goods in the bin, carrying out sorting process activities in picking and packing,</li> <li>b. Revise procedures, work instructions, carry out personnel rotation, regular training on product knowledge.</li> <li>c. Provide a sample book of fast moving products in the packaging area and see product motifs on the website.</li> </ol> </li> <li>2. Motions: <ol style="list-style-type: none"> <li>a. Carry out bin transfers based on fast moving and slow moving goods.</li> <li>b. Using communication tools, re-layout the packing area to the dispatch area.</li> <li>c. Arrangement of goods in the dispatch area with a "U" pattern.</li> </ol> </li> <li>3. Overproduction: <ol style="list-style-type: none"> <li>a. Provide a sample of the product motif in the bin.</li> <li>b. Provide a barcode in each bin.</li> <li>c. Conduct training on accuracy.</li> </ol> </li> <li>4. Waiting: <ol style="list-style-type: none"> <li>a. Changing the working hours of the goods receiving department, so as to maintain a balance of capacity at each stage of the process.</li> <li>b. Arrange goods in the delivery area based on the customer's name and according to the delivery schedule</li> </ol> </li> </ol>

## 5. CONCLUSION

When implementing the lean philosophy in the warehouse environment, there are issues or aspects to be considered. Direct communication with the workers is much more restricted because the workers are spread all around. Another issue to consider is the processes are not usually synchronized and the workers change their work and their locations throughout the day. The worker may reports to two different leaders within one shift.

In identifying waste, it is important to perform investigation to find the causes. The mentioned above 4 journals provide typical process for waste identification and practical recommendation for improvement. Using labels to segregate used and unused materials or tools is an example of sorting. Arranging lay out, racks and bins, and materials to become neat and tidy, easy to find, and clean is a must have properties for a warehouse. Updated policies and procedures are required for standardization of work. To sustain the implementation result, it is important to have training, knowledge sharing or other similar and creative events. The implementation have to have leadership, measuring, and the driving of improvements.

It is expected that this study will become a reference for companies particularly warehousing functions which will carry out lean implementation. Hopefully this study can also be useful for reference in further research.

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