



Implementation of Lean Manufacturing using Kaizen in the Department of Preparation Stitching in Pt. Cli

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Abstract The national footwear or footwear industry showed considerable development in 2017 and has the potential to become one of the priority industry sectors in the Indonesian economy. The company to ensure that business activities are carried out effectively in the footwear or footwear industry. Initially carrying out its activities, companies can take a systematic approach to identify and eliminate waste or other activities that do not add value (non-value-added) so that all resources are used optimally. In an effort to identify waste and increase productivity, the method was used in this case is value stream mapping (VSM). Value Stream Mapping (VSM) as material and process flow information is an important step in lean processes. After analyzing the value added time and non value added time in the current state mapping that illustrates the entire process flow from upstream to downstream in the Alpha Bounce EM M shoe model, the waste that is known to influence is the waiting time that occurs in the heel lining sewing process. Furthermore, the increase in output that occurs in the preparation-stitching process by 25 pairs per hour, starting from 140 pairs to 165 pairs. From the results of the analysis and discussion obtained an increase in productivity by 11%, the overall goal of increasing productivity by the VSM method in the preparation-stitching process from the initial PPH of 1.11 to 1.23.

Keywords Effective, Footwear Industry, Kaizen, Non Value Added, Waste. 2-5 Keywords are required (10pt Times New Roman, Justified)

Introduction

Nowadays the footwear / footwear industry in Indonesia is getting a boost from the government to be more consistent in improving the efficiency and technology of the footwear / footwear industry in order to continue to compete in the global footwear industry. The decline in the performance of labor intensive industries such as shoes and garment, can force the factory to cut the number of workers which can ultimately cause a large social impact. The footwear / footwear manufacturing sector in Indonesia is an interesting discussion because of the characteristic characteristics of this industry, both from labor-intensive industries, production based on orders received and part of the raw materials that must be imported, to the production machinery used is a middle technology machine.

This is important for companies to ensure that activities in the company's business processes are carried out effectively. In carrying out its activities, companies can take a systematic approach to identifying and eliminating waste or other activities that do not have added value (non-value-added) so that all resources are optimally utilized. One of the global industrial factories in the footwear sector in Indonesia today is a factory located in the Tangerang area, which is a member of the 5th largest industrial group in Asia, currently has several factory branches located in the Tangerang area. As the main factory, this factory specializes in producing Adidas



Indonesia shoes with a production capacity of 17 million pairs a year and exports of 1 million pairs per month. This factory in Tangerang absorbs 8,956 people and local content reaches 90%.

The shoe / footwear manufacturing company where the research is conducted is a company that has a business partnership with a leading shoe trademark in the world. This is the main foundation for the company and immediately builds its competence with modern manufacturing technology. At present the footwear manufacturing company where the research was carried out has grown by having 31 high-tech production lines with more than 8,956 employees who have the skills to produce the highest quality shoes professionally for consumers throughout the world. Manufacturing output has grown steadily every year, and until 2017 has produced more than 16.6 million pairs of shoes to be marketed.

In selling their products, the company does not sell these products directly to consumers because the company has a production contract with certain shoe brands. The company only produces shoes without marketing or selling the products produced. Various models of shoes are produced with seasonal product cycles. Each shoe goes through several stages of development and commercialization stages before it is finally ready for mass production on the production line. The normal time cycle for the development and commercialization stage is around 6 months which is used for shoe sample making, subcontract selection, wear test, and four shoe making trials.

The ultimate goal of a company is to get the highest profit possible. High profit that will be obtained if the company can reduce company expenses and make efficiency, including reducing existing waste. One of the efficiency efforts is done by applying a concept that is often called lean manufacturing [6]. This concept emphasizes the importance of efficiency for reducing the use of resources so as to achieve the same results or at least reduce the long lead time waste. One form of waste is waiting, so long lead time is one of the crucial problems because it can affect flexibility and speed of response to consumers. This is the background of the need for efforts to shorten the lead time. [4] examines efforts to shorten lead times and focus on the flexibility of production lines, will result in higher productivity and quality, get a response to consumers faster, and more efficient use of equipment and space. If starting for improving productivity, the first step is to identify waste and then eliminate waste by applying the principle of lean, in the industrial world there is no better tool than value stream mapping (VSM). Visual Stream Mapping (VSM) can reduce to travel time, it means that the total distance travelled is small than the current method. In this case some of travelling non-value adding for customer, so this is should be taken off from process picking because it is a waste [7]. One tool that can be used for lean and green manufacturing is sustainable value strapping mapping (SVSM). SVSM covers various metrics to evaluate not only economic performance but also environmental and social sustainability [8].

The production line consists of cutting, stitching and assembly processes. Before reaching the production line, shoes require certain treatments through a subcontractor process, both subcontractors conducted internally within the company or subcontractors at other companies or external subcontractors. For certain types of shoes that have quite difficult work complexity and high tier levels will have a longer process lead time, especially if the process needs to go through several subcontractors.

PT. CLI has a Preparation Stitching department that is used for stitching preparation. One of the processes in this department is sewing heel lining. In this case, waste or non value added are often found, therefore continuous improvement is needed to eliminate waste using the kaizen method.

Materials and Methods

The following are the steps in improving work methods using lean manufacturing with kaizen implementation [2]:

1. Identify workflows in the preparation stitching area

This process is a method used to determine the needs of a company for lean manufacturing. All workflows, especially those related to preparation activities, will be identified in advance whether they should be carried out lean or not.

2. Calculate added value in all preparation stitching activities.

Before companies consider using lean manufacturing, they need to look at the possibility of adding value to their preparation stitching activities or eliminating waste. After calculating the addition of value or not before the company can decide about the application of the concept.



3. Make a simulation of value added ratios

The company makes a ratio of added value to an item and identified waste. This simulation is done before the company decides about the application of lean manufacturing concepts.

4. Evaluation and implementation

After the process of identification, calculation and simulation, the company will carry out implementation and evaluation. With the evaluation and implementation, the company can make presentations to improve the previous implementation.

Results & Discussion

This research was conducted at a shoe company in Tangerang. The production line consists of cutting, stitching and assembly processes. Before reaching the production line, shoes require certain treatments through the process of subcontractor, both subcontractors which are carried out internally within the company or subcontractors at other companies or external subcontractors. For certain types of shoes that have quite difficult work complexity and high tier levels will have a longer process lead time, especially if the process has to go through several subcontractors.

In a previous study [5] at each work station the path balance was calculated by calculating the line efficiency, calculating line efficiency, idle time, balance delay, smoothness index and production capacity, after being calculated the pro-model simulation could be obtained by the work station ideal and utilization of working operators. This is related to research [5]. Understanding of productivity must be distinguished from understanding of production. Increased production shows an increase in the number of results achieved, while an increase in productivity implies an additional understanding of results and improvements in the way of production. Increased productivity is not always the result of increased production. Production can increase but productivity decreases. If a company will increase its level of productivity, then in starting a productivity improvement program, it starts for the first time by measuring productivity, after measurements are made then the next steps are finally made into a continuous cycle.

In this research focus on the process of preparation stitching, this was identified in the process of preparation stitching there is a process of sewing heel lining which has the longest total cycle time with a value of 106 seconds with a man power of 6 people. There are several processes including starting from screen heel lining, temple collar foam on heel lining, temple heel lining on pallet, and sewing foam collar on heel lining with computer stitching. The following elements are explained below.

Table 1: Existing Process Stitch *Heel Lining*

Proses	CT (Seconds)	TT (Seconds)	Man Power
Screen Heel Lining	16	22	1
Paste small collar foam & collar rein foam to heel lining	55		3
Stitching computer small collar foam to heel lining	35		2



Figure 1: Existing Process Stich Heel Lining

From this it is identified that there is non value added to the screen heel lining process. After trial and error by removing the screen, obtained good results and better quality. Then kaizen in this process is by removing the screen heel lining and improving the operator's working motion. The intended motion of work is to directly attach foam and rf collars to the heel lining so that it is far more effective and efficient without excluding quality. Following are the results of the improvement process that has been carried out.



Table 2: Improvement Proses Stitch Heel Lining

Proses	CT (Seconds)	TT (Seconds)	Man Power
Paste small collar foam & collar rein foam to heel lining	38	22	2
Stitch computer small collar foam to heel lining	35		2

*Figure 2: Improvement Proses Stitch Heel Lining*

As for identifying waste in detail, you can use the value stream mapping (VSM) method, this has been studied by [3] to reduce the waste that occurs using the lean manufacturing approach with the value stream method. mapping (VSM) for mapping the production flow and information flow to a product at the total production level, as well as the Failure Mode and Effects Analysis (FMEA) analysis to determine the causes of process failures that occur on the production line. Therefore, the kaizen method can be combined with VSM to reduce wastage at work stations in manufacturing companies.

Conclusion

After doing research at PT. CLI, especially for the preparation stitching area. Productivity can be optimized using the concept of lean manufacturing. Through this Kaizen approach a total cycle time of 106 seconds is generated with 6 man power. After analysis the heel lining sewing process, the screen heel process is found for marking collar foam, but this is a waste because actually after analysis it can be used directly on the pallet pattern so the cycle time is reduced and the efficiency for the operator is stated with a cycle time value of 73 seconds with 4 man power. So from this analysis the company is able to increase output and efficiency in man power. As for the suggestions in this subsequent research it is better to use the VSM (value stream mapping) method so that the identification of waste and its settlement can be done to the maximum.

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