

## Analysis of production flow process with lean manufacturing approach

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**Abstract.** This research was conducted on the company engaged in the production of Fast Moving Consumer Goods (FMCG). The production process in the company are still exists several activities that cause waste. Non value added activity (NVA) in the implementation is still widely found, so the cycle time generated to make the product will be longer. A form of improvement on the production line is by applying lean manufacturing method to identify waste along the value stream to find non value added activities. Non value added activity can be eliminated and reduced by utilizing value stream mapping and identifying it with activity mapping process. According to the results obtained that there are 26% of value-added activities and 74% non value added activity. The results obtained through the current state map of the production process of process lead time value of 678.11 minutes and processing time of 173.94 minutes. While the results obtained from the research proposal is the percentage of value added time of 41% of production process activities while non value added time of the production process of 59%. While the results obtained through the future state map of the production process of process lead time value of 426.69 minutes and processing time of 173.89 minutes.

### 1. Introduction

Product quality and short lead time are the keys to success in winning the competition. Companies should always try to focus on waste minimization that occurs in the entire production process. Forms of improvement on the production line with the application of lean manufacturing method are used to identify waste along the value stream and to find non value added activities. Lean manufacturing itself, has its weaknesses and strengths, as stated in previous research, the study stated that small and medium enterprises (SMEs) have different characteristics for lean manufacturing [1]. Through previous research also mentioned that with lean manufacturing can simulate lean index model for manufacturing case [2]. Lean manufacturing can also to increase productivity that has been done in companies engaged in producing sheet metal [3]. Some even use lean manufacturing to analyze production runs that has been done in Malaysian companies [4].

In addition, other studies in technological developments have conducted research to explore and evaluate previous work that focuses on the relationship between Lean and manufacturing production [5]. Prior research also related to lean manufacturing discusses detailed implementation of management care and lean manufacturing techniques in maintenance workshops to eliminate losses from damage. And to improve employee productivity and motivation in dairy-producing companies, it is clear from this research that lean



manufacturing is not only for increased productivity but also for maintenance management [6]. Some even say lean manufacturing is a miracle methods, this is because it can reduce waste that occurs in the company [7]. In addition, lean manufacturing can also be collaborated with ergonomics, this has been done in previous research, in the study explained that the improvement can be done continuously both from production and ergonomics that involve operators in work [8].

This research was conducted on the company engaged in the production of Fast Moving Consumer Goods (FMCG). Problems faced by the company are often there are activities that cause waste and non value added activity. From the observation result, which becomes non value added activity one of them is the activity of moving the dough from the mixing station to the stamping station. This removal activity is more than 10 meters away resulting in a lot of time needed to produce the product. The waste that occurs in the production process can be seen in Table 1 below.

**Table 1.** Waste occurred in the production process

No.	Work Center	Cause of Waste	Impact
1.	Mixing	Waiting for materials and mixing machine for repair.	Resulting in longer production process time.
2.	Stamping	Fixed the less dough on the crusher machine and the number of unnecessary activities.	Adds inputs and extends production leadtime.
3.	Drying (Oven)	There is a coil that undergoes work in process.	Company inventory increases.
4.	Wrapping	There is a damaged coil and plastic film.	The company output is not maximal.
5.	Packaging	Transporting the product to the finished material warehouse.	The production lead time becomes long.

Based on the above facts, it is necessary to research that can reduce non value added activity to increase the value added (product added) product, and shorten the lead time, so that impact on the increase of company productivity, and with lean manufacturing approach is expected to find the right solution to know the type And the root cause of non-value-added activities on the company's production floor, so that waste can be reduced.

## **2. Research Methods**

### *2.1 Research Location*

This research was conducted at PT. ABC is engaged in the production of Fast Moving Consumer Goods (FMCG). The company is located Medan Star Industrial Estate, Tj. Morawa, Deli Serdang, North Sumatra.

### *2.2 Types and Research Objects*

Type of research conducted is action research (action research) is a study conducted to obtain practical findings for operational purposes (Sinulingga, 2013). This study aims to obtain a solution that will be used on the company as a form of improvement from the original system. The object of research observed is the production process that occurs in the production.

### *2.3 Research Design*

Sources of data used in the study are primary data and secondary data. Primary data obtained

by observation or direct measurement. Data belonging to this category is:

- a) Production time data.
- b) Rating factor.
- c) Allowance.

Secondary data is obtained based on company documentation data. Data belonging to this category is:

- a) Data of production amount per month.
- b) The order of production process.
- c) Number of production operators.
- d) Clock and work shift data.
- e) The number of machines from each work station.

Observation and measurement of production process time is done by using stopwatch time study method. In addition, the method of data collection is done by conducting interviews or question and answer with the responsible of the production department on matters relating to research and collect secondary data taken from company documents related to research.

#### *2.4 Formation of Current State Mapping*

The steps to form the current state mapping are as follow:

- a) Determination of Value Stream Manager.  
Value Stream Manager is someone who is responsible for the condition of the factory and understanding the system and production process in the factory. Through Value Stream Manager could be known all the information and secondary data company. Value stream managers are selected based on the following aspects: have aspects of individual personality; Having knowledge and experience or expert in lean engineering for all departments in the company; have responsibility for the flow of materials and the flow of information that takes place in the production process.
- b) Formation of SIPOC Diagram  
SIPOC diagram illustrates the information about Supplier, Input, Process, Output and Customer involved in the production process.
- c) Standard time calculation
- d) Mapmaking for each process category
- e) Making a whole map flow
- f) Identification of waste (non value added activity) on Current State Map with PAM (Process Activity Mapping)

#### *2.5 Current State Map Analysis*

An analysis of the improvement of the current state map is done by identifying any waste that exists along the value stream of current state. Then will be searched the root of the problem and how to overcome it. Some steps are done ie:

- a) Breakdown of value added and non value added activities.
- b) Time cycle analysis
- c) PAM (Process Activity Mapping) analysis with 5W1H.

#### *2.6 Future State Map Establishment*

Future state map is a picture of the situation to be achieved by the company going forward. Some steps that need to be done are:

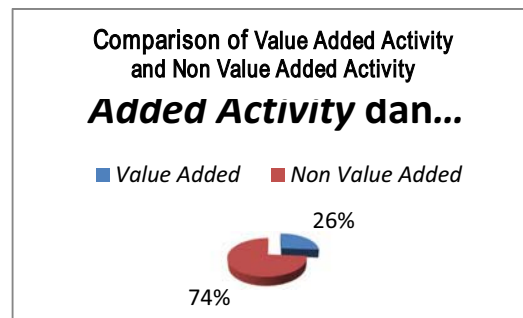
- a) Preparation of corrective action based on analysis
- b) Making PAM (Process Activity Mapping) proposal.

c) Overall map flow map of proposal

### 3. Results and Discussion

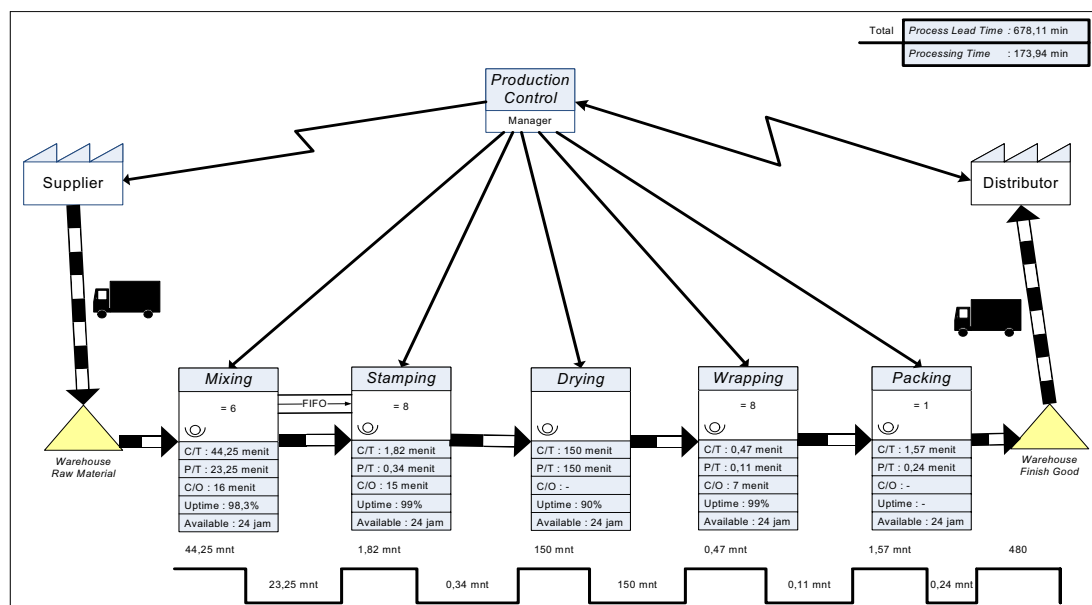
#### 3.1. Current State Mapping Results

At this stage, each process along the value stream is combined with material flow and information flow so that it becomes a single flow in the factory. The results obtained through the current state map of the production process of process lead time value of 678.11 minutes and processing time of 173.94 minutes. Comparison between value added and non value added activity can be seen in Figure 1.

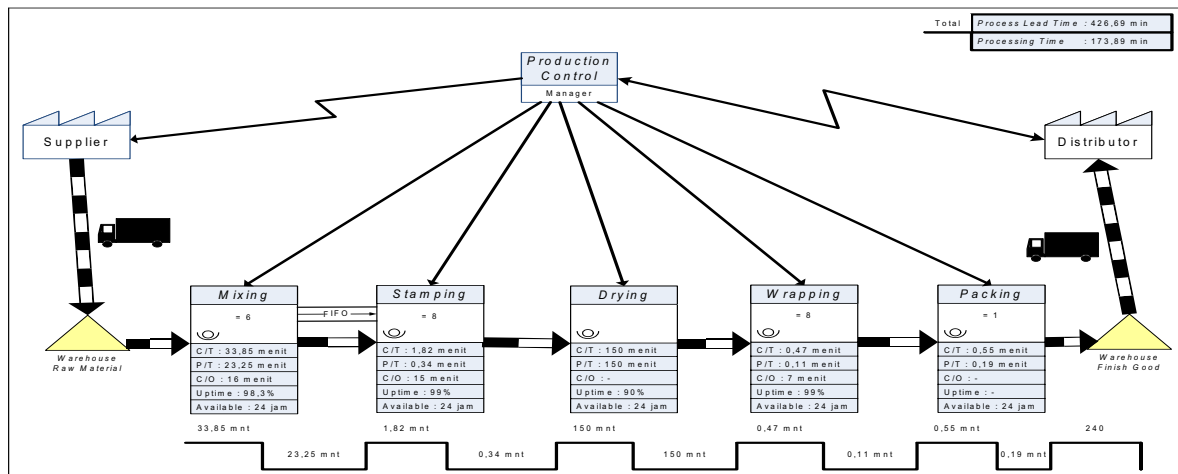


**Figure 1.** Value Added Activity and Non Value Added Activity Pie Chart

Based on pie chart above can be seen that the percentage of value added time equal to 26% from activity of production process while non value added time from production process equal to 74%. The Current State Mapping result is shown in Figure 2.



**Figure 2.** Production Process Current State Map



**Figure 3.** Production Process Future State Map

Based on Figure 2 above can be seen that there is a high process lead time that is equal to 78.11 minutes and *processing* time of 173.94 minutes. Process lead time is the time generated from the entire production process starting from raw material until the product is produced. Figure 2 described the current production process on a map. Based on that, shown that the manufacturing have 5 workstations; consist of mixing, stamping, drying, wrapping, and packing.

### 3.2. Future State Mapping Result

The portfolio of future state maps based on the results of the proposed improvements made earlier. The result obtained through the future state map of the production process is the process lead time value of 173.89 minutes. Future State Map can be seen in Figure 3 above. Figure 3 is based on the simulation of the future mapping based on the current state mapping shown in figure 2. Based on Figure 3 above can be seen that the results obtained through the future state map of the production process of process lead time value of 426.69 minutes and processing time of 173.89 minutes. Process lead time can be reduced by 251.42 minutes. From this situation conclude that the future map shown the better progress compare on before.

## 4. Conclusion

The problem faced by the company is the amount of non value added activity or waste in the production process so as to extend the production time. Based on activity mapping process and current state map, non value added activity is much higher than value added activity. The proposed improvement plan on the future state map is expected to decrease the lead time of the company's production process. Proposed improvements to existing future state maps have not covered all the waste that may exist in the company. Therefore the company needs to make continuous improvement by creating a new current state map and making new proposals.

## 5. References

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