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ANALYSIS OF THE PRODUCTION PROCESS AT PT TBA. ALAM SUTERA USING THE VALUE STREAM MAPPING METHOD

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Abstract

Each Production Process must have a shortage that may not have very short-term effects but in the long run waste can disrupt the effectiveness of the resources in the company. Minimizing waste in the production process is one of the goals of a company. Value stream mapping is one of the lean methods that can minimize waste in the production process. In this study, the method used to reduce production time at PT. TBA. is a fishbone and Value Stream Mapping (VSM). VSM is used to see the condition of production time in the company. To look for waste in the use of fishbone and to reduce it using line balancing. Found 2 line balancing that is unnecessary motion and unnecessary inventory. With this method we know the total cycle time of 69.06 minutes and the company can reduce 43.4% or 30 minutes of lead time from the total cycle time.

***Keywords**: Lean, Value Stream Mapping, line balancing, unnecessary motion, unnecessary inventory*

INTRODUCTION

The agricultural sector has an important and strategic role in national development. These roles include increasing national income, providing employment, gaining added value and competitiveness, meeting domestic consumption needs, domestic industrial raw materials and optimizing sustainable management of natural resources. This is indicated by the large contribution of the agricultural sector to Gross Domestic Product (GDP), especially during the economic crisis experienced by Indonesia, the only sector that saved the Indonesian economy in 1997-1998 was the agribusiness sector, where agribusiness has positive growth. comparison of the percentage of support in the world countries for the development of their agriculture sector in 1995-1997 and 2012-2014. Support for the development of agriculture in Indonesia in the last decade has increased considerably compared to many other countries in the world. In 1995-1997 there was only less than 1% support for the development of agriculture in Indonesia.Then, in 2012-2014, almost a decade later, that number jumped to 4%. Just like Indonesia, the Republic of China also experienced a similar increase in the country's support for the development of their agricultural profits. Brazil also experienced an increase in percentage, although it was not so significant. On the other hand, many of the countries listed in the graph above have experienced a significant decrease in the percentage representing state support in developing the agriculture sector of these countries. Based on data from 1995-1997, Korea has the highest percentage of state support for agricultural development. Neither

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is Turkey, which is not far below Korea. However, the percentage of figures from these two countries has fallen significantly in 2012-2014.

The United States and Russia also experienced a very significant decrease from the percentage figures recorded in 1995 - 1997 and 2012 - 2014. The increase and decrease of the percentage figures which would be very significant in some countries could be due to differences in production focus in each country which is always evolving and developing all the time. Indonesia is known to be a country that is very rich in agricultural products and many other resources that cannot be found in many other countries in the world, but also with the development of urban farming where farmers/communities can do suitable planting rather than large areas. however narrow and its broad potential as a business area. So it is only natural that the support provided by the government and society increases rapidly because Indonesia's agriculture is one of the factors that has a major contribution to the economic development of the Indonesian state and also as the largest supplier of agricultural products to other countries in the world. Because of the increasing state support for the growth of the agricultural sector, many business profits have sprung up that support and accommodate farmers in Indonesia.This makes it easy for the agricultural sector's agricultural sector, both for trade and local consumption and export. Based on data obtained by researchers on production and Purchase orders by consumers PT TBA, the amount of company production is not comparable to the average PO they get. Meeting the weekly production target is carried out from the next day to cover the POs that have not been sent every day. This causes that the company can send POs not according to the day needed or ordered (Fig 1).

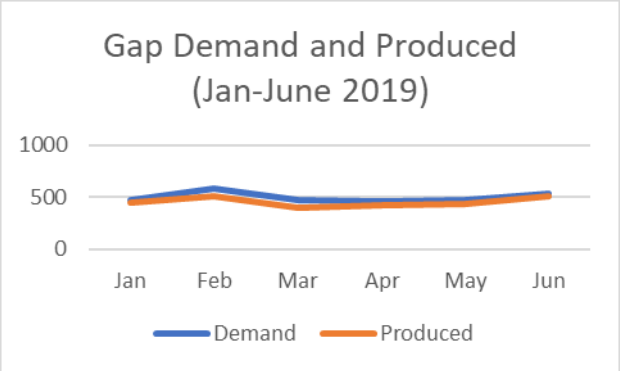

Figure 1. Demand and Produced PT TBA

From the background written, the research questions are: 1) What is the potential saving in minimizing the difference of goods entering and leaving inventory? 2)How to reduce waste at the time of production? The research results in improving production process that will minimize inventory cost and improving overall PT TBA business performance.

LITERATURE REVIEW

Value stream mapping

Define value streams as the process of creating, producing and delivering products (goods and/or services) to the market. For the process of making goods (good), the value stream includes suppliers of raw materials, manufacturing and assembling of goods, as well as distribution networks to users of the goods (Pandya, Kikani & Acharya, 2017).

Current Stream Mapping

Current State Map is a map of production from suppliers, processing to the product to the customer. The data entered is the flow of material, processing time, and information (Ghushe et al., 2017).

Future Stream Mapping

Future Stream Mapping is a map that is based on current stream mapping but has been improved to reduce lead time and waste (Ghushe et al., 2017).

Fishbone

Fishbone or Ishikawa is a tool is a diagram created by Ishikawa to look for cause and effect, this diagram is shaped like a fish bone, this fishbone diagram can be used when we

need to recognize the root cause of a problem or the underlying cause of a particular effect, problem, or condition (Coccia, 2017).

Cycle time

Cycle time is the time required in a part of the operation carried out from raw materials to finished products (Wavhal et al., 2017).

Leadtime

Leadtime is a pause or time interval from a process to the next process in an operation process. (Kader and Akter, 2014).

Line Balancing

Line Balancing is a tool to reduce bottlenecks on a production line by minimizing time and workload. (Parvez, Amin and Akter, 2017).

MATERIALS AND METHODS

Theory At this stage, the author understands the basic theory through reading journals and reading books about value stream mapping from lean manufacturing. Furthermore, the authors compile the basic theory to be a guide and support in this study. The theory discussed in this study includes the understanding of value stream mapping from lean manufacturing, the tools used in lean manufacturing.

The Method of Collecting Data

Data collection methods collected in this study are interview and observation. The interview contained in this study was conducted with a business development supervisor, Desi Simbolon, PT. TBA. for getting information about problems that occur on the production line, and what needs to be examined more deeply.

Observations made by researchers are direct observations where, researchers are not directly involved in the production line, but researchers collect information needed by observing and collecting information directly from the production line.

RESULTS AND DISCUSSIONS

Data from each process is collected by observing and calculating the actual time that occurred on the production.

1. Available Time:
   total available Work time = Working time – Breaktime
   = 9 Hours – 1 Hour = 8 Hours = 480 Min
   (Working time –Breaktime) X 60 Min/Hours
2. Change over time:
   From the operator to operate
3. Uptime:
   Uptime= (Available Time – change over time) X 100 %/Available Time
   Uptime (490 Min- 10 Min) x 100%/490 Min = 97.95%
4. Material delivery:
   Supplier every 2 months

Cycle Time

Cycle Time is the time needed to complete the production of one unit from beginning to end.

Table 1. *Table Time*

Process	Ct (min)	Co (min)	Available time	Uptime	Operator
Weighing	0.20	30	490	93.8%	1
Packaging	0.16	20	490	95.9%	1
Checking	0.5	10	490	97.9%	1
Packing	0.6	20	490	95.9%	1
Packaging	6.3	35	490	92.8%	1
Total	**7.76**	**115**			**5**

Process Activity Mapping

The activity mapping process is processed from the cycle time table, the transportation table, the inventory is known from the interview and unnecessary motion. These 4 activities help to analyze more waste. Total to all in a matter of minutes is 69.06 minutes.

Table 2. *Process Activity Mapping*

No	Activity	Time (min)
1	Process	7.76 min
2	Transportation	16.3 min
3	Inventory and Checking	30 min
4	Unnecessary motion	15 min
	Total	**69.06 min**

Waste Identification

Table 3. *Waste Reduction*

Waste type	Waste identification	Reason and handling
Unnecessary inventory	There is waste Inventory check in raw material checking 30 minutes from overall Cycle Time 69.06 min	Making proposed stream mapping
Unnecessary motion	Unnecessary motion 15 minutes from overall Cycle Time 69.06 minutes	Didn't have tools to transport Making fishbone diagram

Fishbone

Fishbone or Ishikawa is a tool is a diagram created by Ishikawa to look for cause and effect, this diagram is shaped like a fishbone, This fishbone diagram can be used when we need to recognize the root cause of a problem or the underlying cause of a particular effect, problem, or condition.

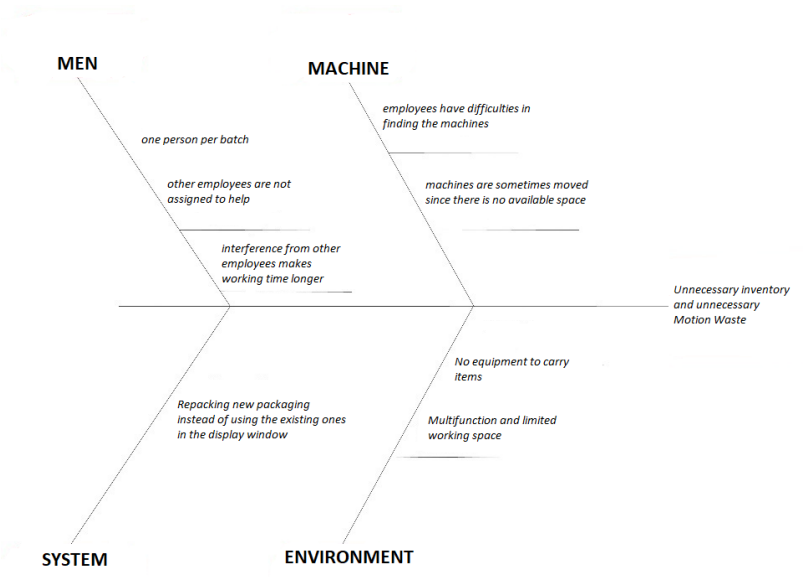

Figure 2. Root cause analysis using Fishbone

Waste Unnecessary Inventory

Every day there are 1 person in the field consultant position to check goods (fertilizer, seeds and so on) for 30 minutes before starting the packaging process. From the unnecessary inventory waste has a contribution to the total Lead Time with the following calculation:

Current lead time: 69.08 min
Inventory check/total Lead Time x 100%: contributionin total LeadTime
30 min/69.08 min x 100%: 43,4%
Inventory check with one field consultant

If 1 of 2 helper helps Inventory to do check the shipment, production can save 15 minutes of total Lead Time with the following calculation:

Current lead time: 69.08 min
Inventory check/total Lead Time x 100%: contributionin total LeadTime
15 min/69.08 min x 100%: 21.7%

Waste Unnecessary Motion

Every day the most unnecessary motion is generated from the movement of moving goods to be sent, which is as much as 15 minutes. From the unnecessary motion waste that has contributed to the total Lead Time with the following calculation:
Line balancing Waste waiting process:

Current Lead Time: 69.08 Minutes
Waiting time/Lead Time X 100%: contribution total Lead Time
15 min / 69.08 min x 100%: 21.7 %
Proposed Lead Time with one extra cart

Comparison Current and Proposed Value Stream Mapping

Table 4. Difference *proposed total lead time reduction*

No	Measurement	Current mapping	Proposed mapping
1	Unnecessary Inventory	30 minutes	15 minutes
2	Unnecessary motion	15 minutes	0 minute
3	Operator	1-person inventory check	2-person inventory check
4	Addition	0 trolly	1 trolly

Measurement
Value stream mapping current and proposed difference

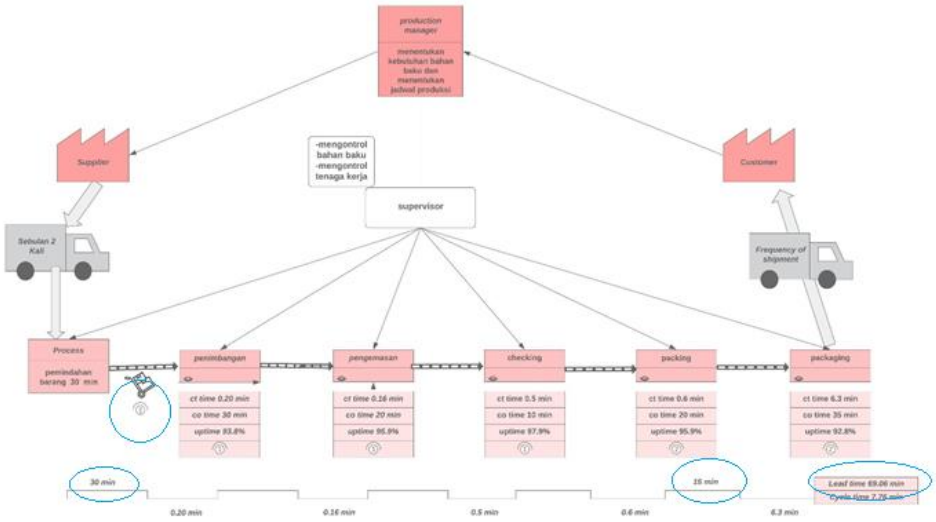

Figure 3. Current Value Stream Mapping (a)

Figure 4. Proposed Value Stream Mapping (b)

After comparing the current stream mapping to the proposed stream mapping waste in the unnecessary inventory and unnecessary motion sections, it is expected that there will be a reduction from 69.08 minutes to 39.08 minutes for Lead Time. 30 minutes is reduced by 43.4% with the addition of trolleys and operators in the company's operations business.

Research Result Implication

In the implementation theory, it is seen that Value Stream Mapping can help reduce lead time and cut waste. From previous research comparisons, the average result we get is a decrease in Lead Time, the results can be different due to different amounts of data. However, the results of this study indicate that the results achieved are reduced waiting and unnecessary motion.

Further Research

VSM can identify the waste that occurs on the production line so that the lead time on production can be minimized to be more effective. The concept of VSM to identify Waste Management researchers conducted further analysis using fishbone diagrams to find out the root causes of waste that make high lead time. Of the problems found were unnecessary movement and waiting, this was explained from the fishbone diagram of the lack of employees and the removal of goods that were still manual, so the researchers suggested adding personnel and trolleys to assist production processes. From an interview conducted by Agrophoria with Mrs. Desi as Business Development appear that the results provided can help PT TBA to overcome the waste problem that we found, namely unnecessary movement and waiting, according to him, the addition of employees will certainly lead to too long lead times. It also wants to be implemented by Agrophoria Alam Sutra to help the work of existing operators, for the idea of adding a trolley also feels good but is still considered first.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The conclusions can be described based on the results of data processing and analysis conducted by researchers. On the company's production line with VSM, it was found that the company has waste in unnecessary inventory and unnecessary motion in the checking of raw materials at the beginning of production and unnecessary motion in the process of transporting goods. The main cause of the waste in unnecessary motion is the lack of a means of transporting goods (trolleys) on moving goods. According to the interview (2020) the lack of a means of conveyance causes waste of motion by 15 minutes from the overall lead time of 69.08 minutes. Another factor that is identified is the existence of

unnecessary inventory, the existence of waste is because employees must check the shipment before entering the initial production process. Waste of unnecessary inventory that is encountered is 30 minutes from the total lead time of 69.08 minutes.

The proposed Value Stream Mapping, unnecessary Inventory waste dropped from 30 minutes to 15 minutes and unnecessary motion waste in the transportation process decreased from 15 minutes to 0.

Recommendations

The researchers proposed process improvement in the company production system using Value Stream Mapping approach. This VSM is required to be carried out on the company's production line due to significant waste in two places the company should employ additional equipment.

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