

**IDENTIFICATION AND MINIMIZATION OF WASTE TO IMPROVE THE PRODUCTION
PROCESS OF JAMU CAPE COFFEE USING A LEAN MANUFACTURING APPROACH**

(Case Study CV. Nurul Jannah)

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Abstract

The herbal chili plant (*Piper retrofractum* Vahl) is a type of plant that is widely used in Indonesia and grows on vines. This plant contains many natural ingredients that are beneficial for health. a type of medicinal plant that is widely used in Indonesia which grows climbing. In Indonesia, herbal chilies are often found in Java, Sumatra, Bali, Nusa Tenggara and Kalimantan. CV. Nurul Jannah is an agroindustry which processes garden products such as jabe jamu, moringa, coffee, etc. On CV. Nurul Jannah, the herbal chili coffee production process is a product that many people are interested in. In making herbal chili coffee, CV. Nurul Jannah gets the raw materials for coffee from Jember Regency, while the herbal chilies are obtained from the area around the company, and other supporting materials are obtained from Sumenep. For processing itself, use manual methods. That's why it reaps a lot of waste. activities that do not add value or contribute to the product which can cause customer satisfaction and decreased production. To reduce waste, use the lean manufacturing concept. Lean manufacturing itself is a systematic approach to identifying and eliminating waste through a series of improvement activities. Lean manufacturing itself is a method for minimizing waste in the production process. In PCE production before repairs it was 30.1%, this occurred due to waste such as waiting time, defects, excess processing, motion and transportation. After the process was carried out the improvement was 36.7%. This value increased significantly.

Keywords: herbal chili coffee, waste, production

INTRODUCTION

The herbal chili plant (*Piper retrofractum* Vahl) is a type of plant that is widely used in Indonesia and grows on vines. This plant contains many natural ingredients that are beneficial for health. a type of medicinal plant that is widely used in Indonesia which grows climbing. In Indonesia, herbal chilies are often found in Java, Sumatra, Bali, Nusa Tenggara and Kalimantan. The main production center for herbal chilies is on the island of Madura and is spread widely throughout the island of Madur(Sudarmaji et al., 2019).

CV. Nurul Jannah is an agroindustry which processes garden products such as jabe jamu, moringa, coffee, etc. On CV. Nurul Jannah, the herbal chili coffee production process is a product that many people are interested in. In making herbal chili coffee, CV. Nurul Jannah gets the raw materials for coffee from Jember Regency, while the herbal chilies are obtained from the area around the company, and other supporting materials are obtained from Sumenep. For processing itself, use manual methods. That's why it reaps a lot of waste. There are seven wastes that often occur, namely transportation, waiting, excess production, defective products, inventory, movement, and excessive processing. of the seven wastes, the most prominent on CV.

Nurul Jannah is overproduction, defective products, and less necessary waiting, transportation, and movement.

Waste in the Lean Manufacturing concept is an activity that does not add value or contribute to the product which can cause customer satisfaction and decreased production.(Ristyowati et al., 2017). Waste in the production process can be reduced with a lean manufacturing approach. Lean manufacturing itself is a systematic approach to identifying and eliminating waste through a series of improvement activities. Lean manufacturing itself is a method for minimizing waste in the production process(Lestari & Susandi, 2019), By taking a lean manufacturing approach then using value stream mapping to map the production process. Identifying waste in the production process is Value Stream Mapping (VSM). Value Stream Mapping (VSM) is a concept from lean manufacturing that shows an image of all activities carried out by a company. VSM includes raw material suppliers, product manufacturing and assembly, as well as distribution networks to users of these goods. Value Stream mapping has the advantages of being quick and easy to create, does not require using special computer software, is easy to understand and increases understanding of the current production system and provides an overview of the flow of production information commands(Maulana, 2019).

RESEARCH METHODS

RESEARCH SITE

This research was carried out by conducting research which is located at CV. Nurul Jannah, Bluto sub-district, Sumenep.

RESEARCH DESIGN

This research was carried out in two ways, namely the initial research stage and the data collection stage. In the initial stages of the research, the research was carried out by determining the research object. The object itself was the herbal chili coffee production process at CV. Nurul Jannah is located in Bluto District, Sumenep Regency. This research refers to the application of lean manufacturing to improve the herbal chili coffee production process, then data collection at the location can be done by analysis, interviews, etc. And the last is the creation of scientific work.

DATA COLLECTION AND PROCESSING PROCESS

Data collection was carried out using three events, namely observation, interviews and literature study. Then for data processing, namely creating a Process Activity Mapping table, creating Current State Value Stream Mapping, calculating Process Cycle Efficiency, then identifying problems that cause waste, then making recommendations for improvements, then creating Future Process Activity Mapping and Future Current State Value Stream Mapping.

RESULTS AND DISCUSSION

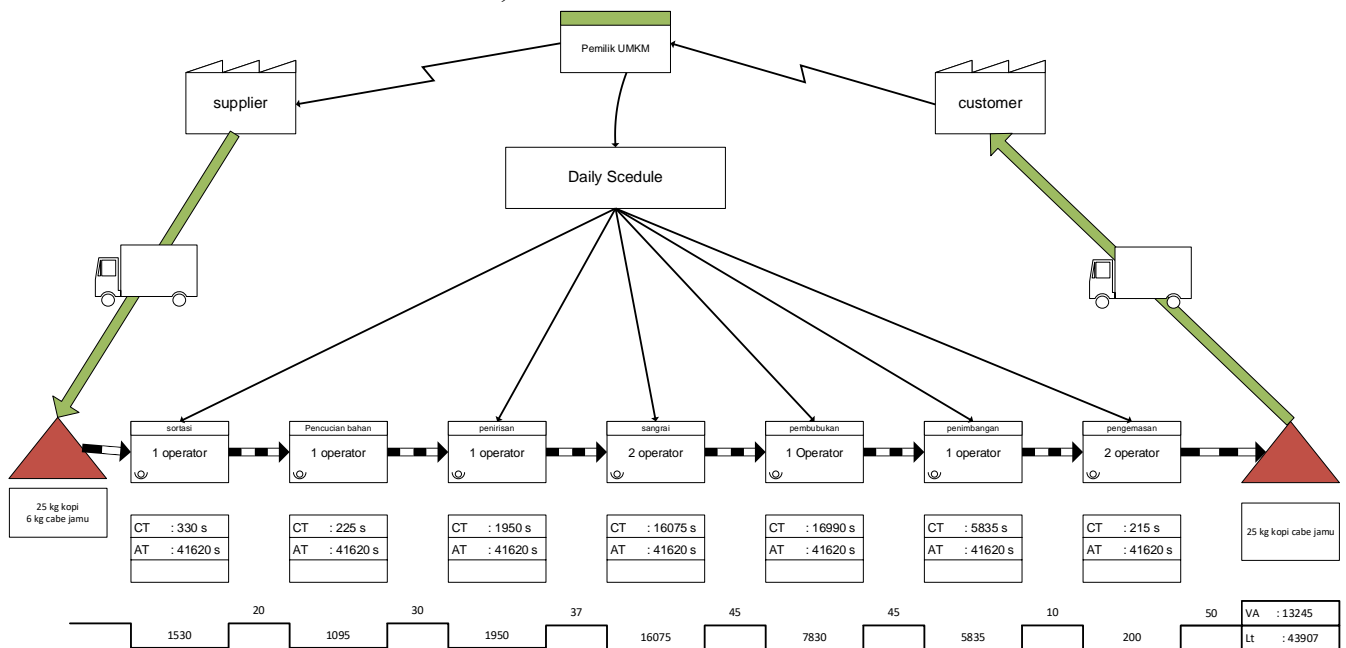
DATA PROCESSING

Processing this data is done by creating a PAM table obtained from observations at the Company as in the following table

Table1 Process Activity Mapping table

Activity	Amount	Total Time(s)	Percentage
operations	34	34495	78.56%
transportation	6	187	0.42%
inspection	5	3495	7.96%
storage	0	0	0%
delay	17	5730	13.05%
TOTAL	62	43907	100%
VA	7	13245	30.16%
N.V.A	11	3100	7.06%
NNVA	38	27562	62.77%
TOTAL	56	43907	100%

From the PAM table created above, then create a CVSM as below



Picture1 Current Value Stream Mapping

From the picture above, the value added value is 13245 seconds, and the lead time is 43907 seconds. Then the Process Cycle Efficiency calculation is carried out in the following way:

$$PCE = \frac{\text{Value Added}}{\text{Lead Time}} \times 100\%$$

$$= \frac{13245}{43907} \times 100\% = 30,1\%$$

Of the days obtained is 30%. So it can be concluded that the herbal chili coffee production process still has several shortcomings or there is still waste or wastage in the production line.

Of the value above, 30.1% is due to waste in the production process which makes the value low. The waste or extravagance includes delays caused by waste waiting time, overproduction, defects and motion. Then for the waste mentioned above, we will explain why it occurs in the following point.

WASTE IDENTIFICATION

Table2Waiting Time Waste Table

Types of Waste		source of waste (Where)	Responsible Person (Who)	Occurrence Time (When)	Reason for Happening (Why)	Improvement Suggestions (How)
<i>What</i>						
Waiting	Information					
There is a delay	waiting time	sorting	Sorting section operator	during the washing and sorting process	1. Wait for your turn for ingredients	1. add operators
					2. Direct the water flow to the material	1. Make the water flow patent so all you have to do is regulate the water flow
		roast	roasting section operator	during the roasting process	1. Wait for the frying pan to get hot	1. managing/maintaining tools to carry out the process
					2. process overload	1. Add tools for the roasting process
pulverization	Powdering section operator	during the powdering process	1. disassemble the fabric for the powder container	1. Replace the fabric with a longer length and leave the ends unstitched to allow the material to exit so as not to disassemble the fabric		

Table3Overproduction Waste Table

Types of Waste		source of waste (Where)	Responsible Person (Who)	Occurrence Time (When)	Reason for Happening (Why)	Improvement Suggestions (How)
<i>What</i>						
Overproduction	Information					
There is Overproduction		sorting	Sorting section operator	during the washing and sorting process	1. There is no master production schedule	1. coordinate with the head of the Company

Table4defect wastage table

Types of Waste		source of waste (Where)	Responsible Person (Who)	Occurrence Time (When)	Reason for Happening (Why)	Improvement Suggestions (How)
<i>What</i>						
DEFECTS	Information					
There is a defect	there is a defective/damaged product	roast	roasting section operator	during the roasting process	1. The ingredients burn because they haven't been stirred for too long	1. Manage your time so that it is right during the roasting process
					1. Lack of care during the packaging process resulting in the packaging tearing	1. You should make enough movement to carry out packing
		packaging	Packaging department operator	during the packaging process		

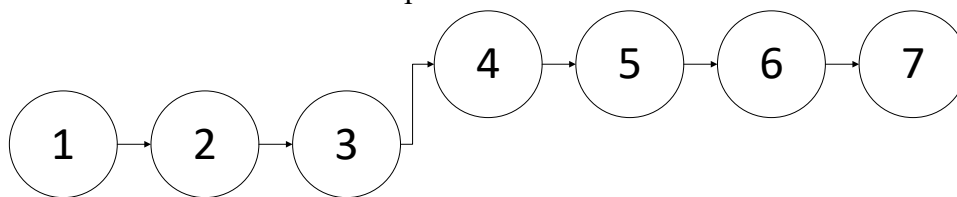
Table5motion wastage table

Types of Waste		source of waste (Where)	Responsible Person (Who)	Occurrence Time (When)	Reason for Happening (Why)	Improvement Suggestions (How)
<i>What</i>						
Motion	Information					
There is Motion	unnecessary or excessive movement	sorting	Sorting section operator	during the washing and sorting process	1. moving the container too much	1. Use a container that can carry out the sorting and washing process
					2. Direct the water flow to the material	1. Make the water flow patent so all you have to do is regulate the water flow
		roast	roasting section operator	during the roasting process	1. take sugar from a distant place	1. managing the layout so that it makes it easier to collect materials and tools
		pulverization	Powdering section operator	during the powdering process	1. disassemble the fabric for the powder container	1. Replace the fabric with a longer length and leave the ends unstitched to allow the material to exit so as not to disassemble the fabric

PROPOSED IMPROVEMENTS

A. Proposed improvements to minimize waste of waiting time

To improve waste of waiting time, use the killbridge killing waster method. The aim of using this method is to reduce as much time as possible.



Picture2workstation diagram

Table6 Results According to the Killbridge-Wester Method for Operations

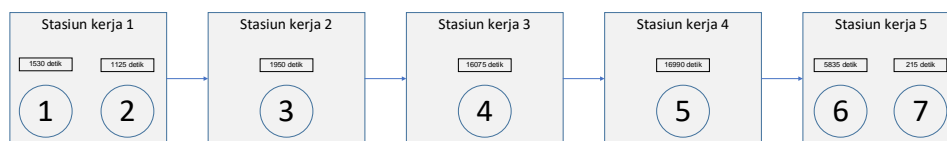
Station	Time(s)	Cycle Time(s)	Idle Time(s)
1	1530	1756.28	226.28
2	1125	1756.28	631.28
3	1950	1756.28	-193.72
4	16075	1756.28	-14319
5	16990	1756.28	-15234
6	5835	1756.28	-4078.7
7	215	1756.28	1541.28

Based on the calculations above, a statement is made to explain the calculations. This method will save time by combining several stations to reduce idle time and increase station efficiency levels as shown in the table below:

Table 7 Results According to the Killbridge-Wester Method for New Stations

station	combined operations	operating speed	cycle time(s)	idle time(s)
1	1,2	2655	1756.28	-898.72
2	3	1950	1756.28	-193.72
3	4	16075	1756.28	-14319
4	5	16990	1756.28	-15234
5	6,7	6050	1756.28	-4293.7

Judging from the table above, the first station is a combination of the first and second stations, then the second station is the third station, the third station is the fourth station, the fourth station is the fifth station and the fifth station is the sixth and seventh stations. From the table above, it can be concluded that there is a downsizing of work stations due to the merger of work stations. The following is a Precedence Diagram from the results of previous calculations.



Picture 3 new workstation diagram precedence

Based on the work station improvements in the diagram above, results were obtained that increased track efficiency, and these improvements were significant enough to increase productivity at the work station.

B. Proposed improvements to minimize overproduction waste

In overproduction, waste occurs because there is no master schedule which results in the production of too much material. Proposed improvement for wasteful overproduction by creating a master production schedule so that the production process is more structured and minimizes overproduction.

C. Proposed improvements to minimize defect waste

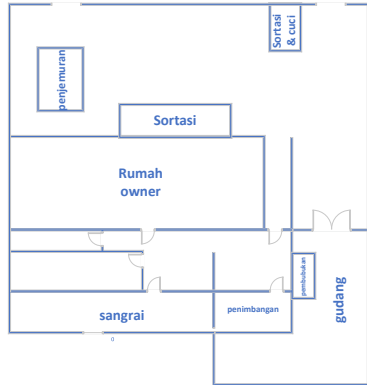
Defects occur due to lack of accuracy and caution when roasting and packaging. If it continues like that it will cause more and more overproduction. So that improvements are proposed by carrying out periodic checks and carrying out work on point.

D. Proposed improvements to minimize excess processing waste

This waste occurs because work methods are less flexible which results in a long production process time, if this continues it will cause a waste of time and energy. The proposed improvement for this waste is to upgrade the grinding machine so that when grinding it does not go through three stages of grinding so that the coffee can reach powder. The upgrade referred to by the coffee grinding machine is the filter and teeth to grind the material to be ground. Then during the packaging process, where to add stickers, it is best to purchase packaging that already has a printout of the logo and identity of the company and product.

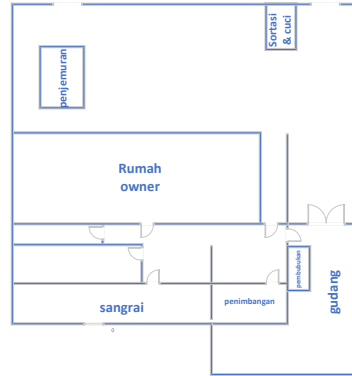
E. Proposed improvements to minimize transportation waste

This waste occurs because the production floor is not good so it will take time to move between stations. Repairs to this waste are carried out by rearranging the production floor as shown in the following picture



Picture4

Layout before repairs

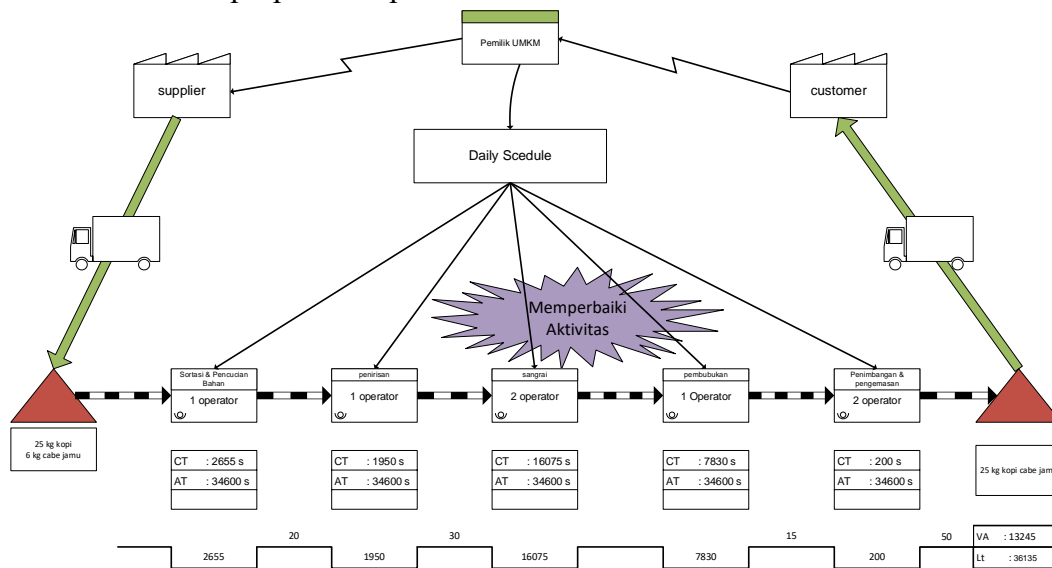


Picture5

Layout after repair

CREATION OF FUTURE VALUE STREAM MAPPING

With the improvements that have been proposed, below is the future state value stream mapping. This process is carried out after the proposed improvements. FSVM can be seen as shown in the following image:



Picture6Future State Value Stream Mapping

From the Future State value Stream Mapping image, the Lead time is 36135 seconds with an Added Value of 13245 seconds. So the Process Cycle Efficiency (PCE) is obtained as follows:

$$PCE = \frac{Value\ Added}{Lead\ Time} \times 100\%$$

$$= \frac{13245}{36135} \times 100\% = 36,7\%$$

From the results above which obtained a PCE value of 36.7% and this value is above 35% and greater than the previous value of 30.07%, it can be concluded that after improving the production process the PCE can

be increased significantly. However, the PCE value is less than 50%, this is because there are activities that are important but do not have added NNVA value, causing the PCE value to be less than 50%.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSION

From the results of the processing and analysis that have been carried out, it can be concluded as follows: CV Nurul Jannah is a company operating in the agro-industry sector where the company processes products such as coffee, herbal chilies and moringa. The company stocks materials from the surrounding environment and the market, then the production process is not good so there is some waste or waste, the biggest waste is waiting time, defects and excess processing. Then other waste also occurs but it occurs very little or rarely. This research aims to reduce waste. Reducing waste in waiting time is by creating new work stations or merging work stations. By merging work stations, idle time in a process is reduced. Then, defect waste in the roasting process can be reduced by conditioning the workforce by reducing less useful activities and carrying out regular checks. Meanwhile, to eliminate defects during the packaging process by organizing the packaging and packaging operators, be careful when opening, closing and placing the packaging. Value Added (VA) is an activity that is useful or gets added value in a production process, then the VA value before improving the production process gets a value of 30.07% then after improving the production process it becomes 38.28%. Which means it has increased significantly after improving the production process.

SUGGESTION

In this case, namely the production process carried out by CV Nurul Jannah, there are several activities that need to be paid attention to, where there is a lack of coordination between the head of the company and the head of the production department, so attention needs to be paid to ensure that there is no miscommunication which causes waste in the company.

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