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IMPLEMENTATION OF LEAN MANUFACTURING TO IDENTIFY AND MINIMIZE WASTE IN UMKM CADO AGROFOOD SEMESTA

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ABSTRACT

The food processing industry, especially at the Micro, Small, and Medium Enterprises (MSMEs) scale, faces challenges in increasing production process efficiency due to limited resources and suboptimal work layout. This study aims to identify and minimize waste in the chocolate bar production process at the Cado Agrofood Semesta MSME using the Lean Manufacturing approach and Value Stream Mapping (VSM) analysis tool. The research method includes collecting cycle time data, calculating standard time, takt time, and analyzing value-added and non-value-added activities. The results show that the production process still contains several types of waste, especially in waiting activities and transportation between work stations. Through the application of the Kaizen concept and redesigning the process flow (Future State Mapping), the total production time (Manufacturing Lead Time) can be reduced significantly compared to the initial condition. Proposed improvements include rearranging the work layout and controlling work time according to takt time. The application of this concept has been proven to be able to increase production efficiency and productivity at the Cado Agrofood Semesta MSME.

Keywords : *Lean Manufacturing, Value Stream Mapping, Kanban, Takt Time, Production Efficiency, MSMEs*

I. INTRODUCTION

One approach that is widely applied to increase production efficiency is lean manufacturing, which focuses on reducing waste and increasing added value in every stage of the process.[1]However, the implementation of lean manufacturing in the food processing industry still faces various obstacles, including inefficient factory layouts, resistance to change, and limited resources, especially in small and medium-sized companies. Problems frequently encountered in this industry include high levels of operational waste, imbalances in production flow resulting in prolonged waiting times, and low levels of adequate lean technology adoption.[2].

After observation, it was found that Cado Agrofood Semesta faced a number of significant problems. The time required to produce the product is still inefficient, thus limiting production, chocolate bars per production are 300 pieces for 35 gram packaging, 150 pieces for 60 gram packaging, and 120 pieces for 70 gram packaging which makes product expansion hampered and in the processing process 1 KG of cocoa beans after roasting produces 800 grams of dry cocoa beans and only 600 grams can be used, resulting in large waste, this shows a significant need for MSMEs to implement a systematic approach method to identify and eliminate waste and optimize production flow.

This research aims to bridge the gap between lean manufacturing theory and real practice in the local food processing industry, especially in facing and finding solutions to the challenges of supply chain disruption and the pressure to increase increasingly tight profit margins. Unidentified waste can result in wasted raw materials, time, effort, and energy, which will increase production costs. Research on waste identification is very important for MSMEs to reduce costs. By reducing unnecessary activities and optimizing available resources.

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II. METHOD

A. DATA COLLECTION METHOD

To obtain various types of data needed in this research, researchers used various data collection techniques, namely:

1. Direct observation (observation)
   Conducting direct observation of the chocolate manufacturing process and the sequence of processes and identifying waste that occurs
2. Interview
   Conducting Q&A with Cado Agrofood Semesta during ongoing research regarding matters related to the research object.
3. Documentation
   To collect secondary data, this is done by recording data from the universal agrofood cado documentation related to the ongoing research.
4. Literature Study
   Literature study by reading books and journals related to lean manufacturing in identifying waste caused by employees and the formation of value stream mapping in minimizing waste.

B. LEAN MANUFACTURING METHOD

*Lean Manufacturing*It is a systematic approach to reducing waste in the production process, thereby increasing efficiency and productivity. This method is rooted in the philosophy of the Toyota Production System (TPS), which is the main foundation of the Lean Manufacturing concept.[3].

*Lean Manufacturing*is a viable approach to improving the efficiency of production systems and processes due to its capacity to systematically detect, measure, evaluate and address performance deficiencies in a holistic manner.[4].

[1] 7 Waste

a. *Overproduction*

*Overproduction*is a type of waste that usually occurs because there are production activities for a product that exceed customer demand.[5].

b. *Delay*

*Delay*is a type of waste that usually occurs due to the operator's idle time waiting for the product flow from the previous process or waiting to carry out the next process.

c. *Transportation*

*Transportation*is a type of waste related to an activity or movement around the production floor, both the movement of materials and products.[6].

d. *Process*

*Process*is a type of waste that results from a production process that does not comply with the procedures established by the Company.[7].

e. *Motion*

*Motion*is a type of waste caused by unnecessary movements and does not provide added value to a product or process so that it can extend lead time.

f. *Inventory*

*Inventory*is a type of waste that results from having too much inventory[8].

g. *Defect*

*Defect*is the definition of a product that is defective or does not comply with specifications[9].

[2] Rating Factor

Normal time is the average time required by a trained worker at a normal working speed to complete a task under certain working conditions.[10].

The rating factors can be seen in table 2.1 below:

Table 2.1 Skill Rating Factor Assessment

Skill		
Class	**Symbol**	**Adjustment**
Super skill	A1	+0.15
	A2	+0.13
Excellent	B1	+0.11
	B2	+0.08
Good	C1	+0.06

	C2	+0.03
Average	D	0.00

[3] Allowance

Normal time is the average time required by a trained worker at a normal working speed to complete a task under certain working conditions.[11]. The allowance value can be seen in table 2.2 below:

Table 2.2 Determination of Allowance

Factor Work Attitude	**Job Examples Load (Kg)**	**% Allowance man**	**Woman**
Can be ignored	Working at a desk without any burden	0-6	0-6
Very light	Working at a Standing Desk 0.00-2.25	6-7.5	6-7.5
Light	Light Shoveling 2.25-9.00	7.5-12	7.5-16
currently	Hoeing 9.00-18.00	12-19	16-30
Heavy	Swinging objects 18.00-27.00	19-30	
Very heavy	Carrying the Load 27.00-50.00	30-50	
Extraordinarily Heavy	Lifting Goods above 50	50	
Sit	Working sitting down	0-1	0-1
Standing on two feet	Upright body supported by two feet	1-2.5	1-2.5
Standing on one leg	One foot works the control tool	2.5-4	2.5-4
Lie down	On the front and back of the body	2.5-4	2.5-4
Bend down	The condition of the body being bent over, resting on both legs.	4-10	4-10
Eye Fatigue		**Lighting Good**	**Lighting Bad**
Disjointed view	Reading measuring instruments	0	1
Almost continuous viewing	Meticulous work	2	2
Continuous gaze with changing focus	Inspection	1	5
The view changes with a fixed focus	Very thorough inspection	4	8
Workplace temperature	**^{0}c**	**Normal Excess**	**Excessive**
Frozen	Below 0	Above 10	Above 12
Low	0-13	10-0	12-5
Currently	13-22	5-0	8-0
Normal	22-28	0-5	0-8
Tall	28-38	5-40	8-100
Very high	Above 38	Over 40	Above 100
Environmental conditions	**Example of a situation**	**Mark**	
Good	Ventilated room	0	
Enough	Poor ventilation	0-5	
Not good	There is a lot of dust	5-10	
bad	There is a dangerous smell	10-20	

Source: Sari and Nurkertamanda, 2025

[4] Kanban

The function of a kanban is to regulate the movement of materials within a production system to ensure timely delivery. The purpose of a kanban is to identify raw material requirements and ensure that goods or raw materials are produced on time to support subsequent production processes.[12].

[5] Value stream mapping

*value stream mapping*is the process of making finished goods, including raw material suppliers, manufacturing and assembly of goods, and distribution networks to the users of those goods. In recognizing waste that occurs and identifying the causes of waste, the starting point is using the Value Stream Mapping tool, which means that in solving problems, we start with the big picture and not just the processes.[13].

[6] Stages of Creating Value Stream Mapping

a. Determining the Product

This step in determining the product aims to clarify the boundaries of the value stream to be mapped, allowing for a more in-depth and focused analysis. By selecting the right product, value stream mapping can visually depict all the steps the product goes through, from raw material procurement to the finished product that reaches the customer.[14].

b. Creating a Current State Map)

*Current state*The VSM is a base map of the entire existing process from which all improvement suggestions can emerge. The current state map allows researchers to truly understand the process flow and materials of a specified product.[15].

c. Creating a Future State Map

*Future state value stream mapping*This is a mapping of the future state of material flow and information on the rope production process. Future state value stream mapping data is obtained from data from Table 5 of process activity mapping improvements, which is used to identify processes that can be reduced so that future conditions can be mapped.[16].

[6] Diagramflow

The flow diagram of this research can be seen in Figure 2.1 below;

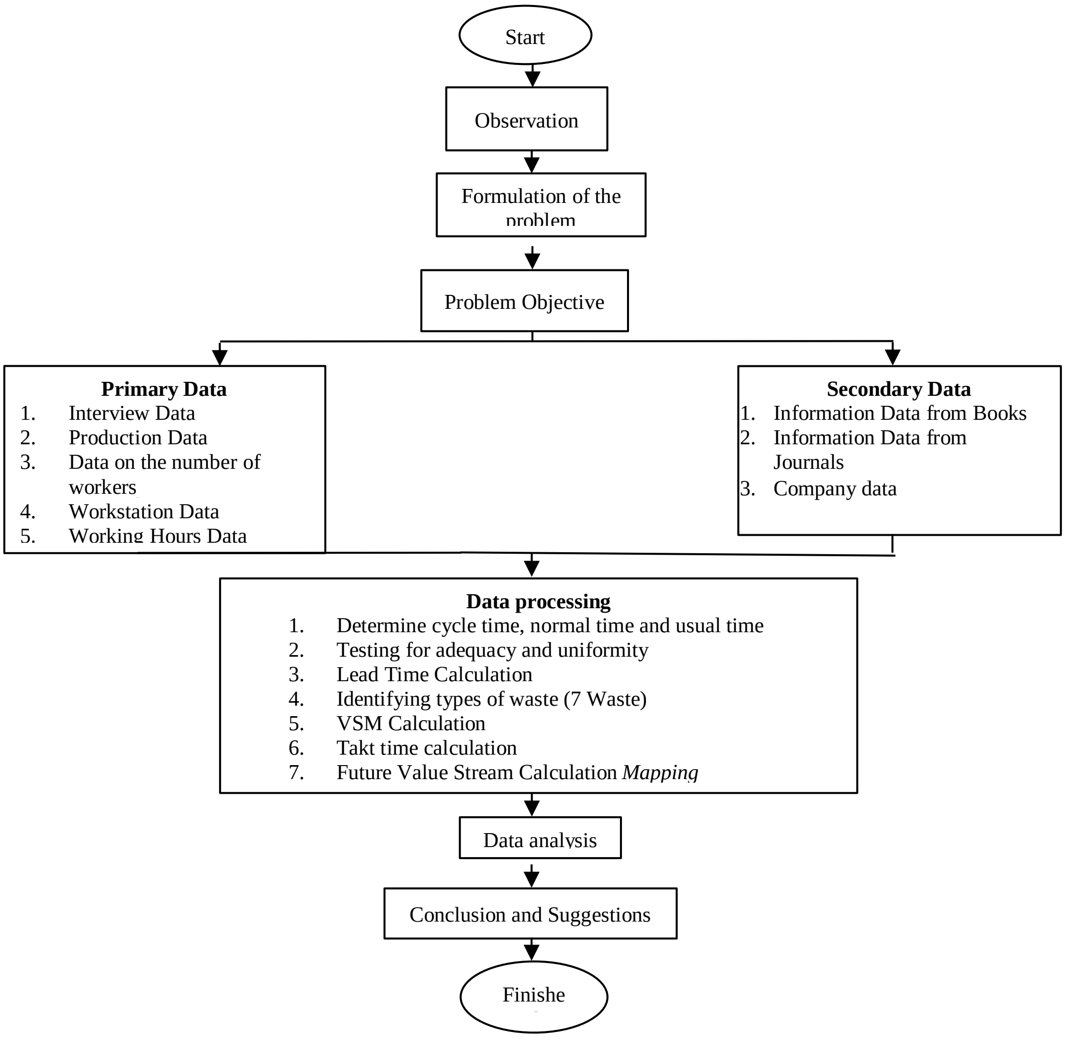

Figure 2.1 Flowchart

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III.RESULTS AND DISCUSSION

Data collection was conducted at the Cado Agrofood Semesta UMKM on Jl. KKA-Bener Meriah, Ulee Nyeu, North Aceh. Observations and interviews with the UMKM owner and production operators were conducted.

A. RESEARCH DATA

Data on the number of stations and work operators were obtained based on field observations. Data on the stations and work operators at Cado Agrofood Semesta can be seen in Table 3.1 below:

Table 3.1 Activity Data and Production Time

No	Activity	Observation (minute)					Average
		1	2	3	4	5	
1	Take cocoa in inventory	1.27	1.34	1.29	1.40	1.31	1.32
2	Putting cocoa into the roasting machine	2.11	2.24	2.16	3.49	2.13	2.42
3	Roasting Process	14	14	14	14	14	14
4	Collecting cocoa	3.58	4.00	3.53	3.31	4.09	3.70
5	Bringing cocoa beans to the bean grinder	1.22	1.35	1.28	1.24	1.31	1.28
6	Seed Cracking Process	5.06	6.00	5.53	5.00	5.03	5.32
7	Separation of seeds from skin (nib)	6.28	7.00	7.05	6.49	7.18	6.80
8	Collecting Nibs	2.06	2.00	2.12	2.05	2.08	2.06
9	Bringing the nib to the grinding machine	2.32	2.47	2.44	2.39	2.44	2.41
10	Inserting the nib into the grinding machine	1.24	1.18	1.16	1.29	1.13	1.20
11	Nib milling process	120	120	120	120	120	120
12	Collecting coarse paste	7.14	7.11	7.20	7.15	7.14	7.14
13	Addition of other ingredients	0.46	0.67	0.41	0.58	0.44	0.51
14	Put the cocoa paste into the fine grinder	2.33	2.42	2.29	2.31	2.40	2.35
15	Cocoa paste refinement process	1440	1440	1440	1440	1440	1440
16	Collecting fine paste	5.54	5.46	5.58	5.58	5.53	5.53
17	Bringing a smooth paste	2.22	2.16	2.36	2.27	2.35	2.27
18	Heater ready	5.00	5.00	5.00	5.00	5.00	5.00
19	Put the smooth paste into the heater	2.44	3.13	2.55	2.51	3.26	2.77
20	Heating process	1080	1,080	1,080	1,080	1,080	1,080
21	Bringing liquid paste to the printing station	3.41	3.38	3.40	3.41	3.40	3.40
22	Pour the mixture into the mold	30	31.08	31.05	31.12	30.47	30.74
23	Mold cooling	1,440	1,440	1,440	1,440	1,440	1,440
24	Checking	8.32	8.26	8.28	8.23	8.33	8.28
25	packaging	44.06	45.49	44.31	44.37	45.20	44.68

B. EVALUATION*RATING FACTOR*

1. Roasting Station

The rating factor values can be seen in table 3.2 below:

Table 4.3 Rating Factor Values of Cocoa Roasting Station Workers

No	Factor	Class	Symbol	Mark
1	Skills	*Excellent*	B2	+0.08
2	Business	*Good*	C1	+0.05
3	Working conditions	*Excellent*	B	+0.04
4	consistent	*Good*	C	+0.01
	TOTAL			**+0.18**

2. Cocoa Bean Skin Separation Station

The rating factor values can be seen in table 3.3 below:

Table 3.3 Rating Factor Values of Workers at the Seed Skin Separation Station

No	Factor	Class	Symbol	Mark
1	Skills	*Excellent*	B1	+0.11
2	Business	*Excessive*	A1	+0.13
3	Working conditions	*Good*	C	+0.02
4	consistent	*Excellent*	B	+0.03
	TOTAL			**+0.29**

3. Coarse Pasta Processing Station

The rating factor values can be seen in table 3.4 below:

Table 3.4 Rating Factor Values of Workers at the Seed Skin Separation Station

No	Factor	Class	Symbol	Mark
1	Skills	*Excellent*	B1	+0.11

2	Business	*Excellent*	B1	+0.10
3	Working conditions	*Good*	C	+0.02
4	consistent	*Good*	C	+0.01
	TOTAL			**+0.24**

4. *Fine Pasta Processing Station*

The rating factor values can be seen in table 3.5 below:

Table 3.5 Rating Factor Values of Fine Pasta Processing Station Workers

No	Factor	Class	Symbol	Mark
1	Skills	*Excellent*	B1	+0.11
2	Business	*Excellent*	B1	+0.10
3	Working conditions	*Excellent*	B	+0.04
4	consistent	*Excellent*	B	+0.03
	TOTAL			**+0.28**

5. *Heating Station*

The rating factor values can be seen in table 3.6 below.

Table 3.6 Rating Factor Values of Heating Station Workers

No	Factor	Class	Symbol	Mark
1	Skills	*Excellent*	B1	+0.11
2	Business	*Excessive*	A1	+0.13
3	Working conditions	*Excellent*	B	+0.04
4	consistent	*Excellent*	B	+0.03
	TOTAL			**+0.31**

6. *Printing Station*

The rating factor values can be seen in table 3.7 below.

Table 3.7 Rating Factor Values of Printing Station Workers

No	Factor	Class	Symbol	Mark
1	Skills	*Excellent*	B1	+0.11
2	Business	*Excellent*	B1	+0.10
3	Working conditions	*Excellent*	B	+0.04
4	consistent	*Excellent*	B	+0.03
	TOTAL			**+0.28**

7. *Packing Station*

The rating factor values can be seen in table 3.7 below.

Table 3.7 Rating Factor Values of Printing Station Workers

No	Factor	Class	Symbol	Mark
1	Skills	*Super Skill*	A2	+0.12
2	Business	*Excellent*	B1	+0.10
3	Working conditions	*Excellent*	B	+0.04
4	consistent	*Perfect*	A	+0.04
	TOTAL			**+0.30**

C. ALLOWANCE ASSESSMENT

The recapitulation of allowance assessment can be seen in table 3.8 below:

Table 3.8 Summary of Allowance Values

No	Work Station	Allowance Value
1	Cocoa Roasting	17%
2	Seed Coat Separation (NIB)	13%
3	Coarse Pasta Processing	18%
4	Fine Pasta Processing	14%
5	Heating chocolate	19%
6	Printing	17%
7	Packaging	20%

Table 3.8 summarizes the allowance values at various work stations in the chocolate-making process. These allowance values reflect the percentage of time allocated to address fatigue, individual needs, and uncertainty at each station. The table shows that the packaging station has the highest allowance value, at 20%, indicating the need for additional time in the final stages of chocolate production. The table also shows that the chocolate heating station also has a relatively high allowance value, at 19%, considering that this process is susceptible to variations in heating times and material handling. Conversely, the lowest allowance value is found at the cocoa nib separation (NIB) station, at only 13%, indicating that this process is more stable and consistent. Overall, the variation in allowance values at each station reflects the different characteristics and complexities of work in chocolate production, which must be considered for optimal work time planning and production scheduling. The

results of the allowance determination can be crucial because it provides an objective basis for planning realistic work times that can be adapted to actual conditions in the field.

D. DATA PROCESSING

[1] Actual data processing

- Data sufficiency test

  Data adequacy test Data adequacy test is carried out to ensure that the data obtained from the research is sufficient to be used as data.

  $$N'=2\left[\frac{2/0{,}1\sqrt{5\,(31495{,}32)-396{,}6^2}}{396}\right]$$

  N'= 0.69

- Data Uniformity Test

  Data homogeneity testing is a crucial step in statistical analysis, ensuring that the data used in the study are similar or homogeneous. Data consistency is essential for reliable, relevant, and disseminated analysis results.

  $$\sigma x = \sqrt{\frac{0{,}025}{5}} = 0.05$$

  BKA = 1.32 + = 1.412 (0,05)

  BKB = 1.32 - = 1.232 (0,05

- Normal Time Calculation

  The results of the calculation of normal and standard time for the first activity are:

  Wn = Ws (1+RF)
  = 1.32 (1+ 0.16)
  = 1.53

  $$Wb = Wn + \frac{100\%}{100\% - Allowance}$$

  $$= 1.53 + = 2.74 \frac{100\%}{100\% - 17\%}$$

- Lead time calculation and current activity mapping

  The manufacturing lead time can be seen in table 3.9 below:

Table 3.9 Manufacturing Lead Time

Activities	Standard Time (Minutes)
1	2.74
2	4.02
3	17.44
4	5.50
5	2.74
6	7.75
7	9.58
8	3.70
9	3.17
10	1.67
11	148.98
12	9.05
13	0.79
14	3.15
15	1843.34
16	7.23
17	4.21
18	7.78
19	4.88
20	1416.03
21	4.42
22	38.60
23	1800.17
24	10.52
25	54.27
Total	**5411.73**

Source: Data Processing

From Table 3.9 above, it is known that the total standard time required to complete all of these production activities is 5411.73 minutes. This amount of time reflects the length of waiting time in the overall manufacturing process, which serves as one of the main indicators in production time management and capacity planning.

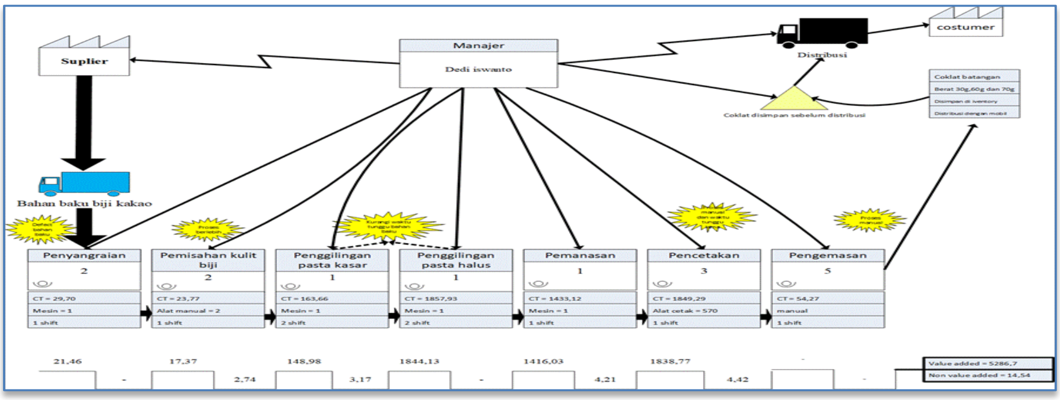
The current process activity mapping can be seen in table 3.10 below:

Table 3.10 Current Process Activity Mapping

Activities	VA (Minute)	NVA (Minute)	NVVA (Minute)
1	-	-	2.74
2	4.02	-	-
3	17.44	-	-
4	-		5.50
5	-	2.74	-
6	7.75	-	-
7	9.58	-	-
8	-	-	3.70
9	-	3.17	-
10	-	-	1.67
11	148.98	-	-
12	-	-	9.05
13	0.79	-	-
14	-	-	3.15
15	1843.34	-	-
16	-	-	7.23
17	-	4.21	-
18	-	-	7.78
19	-	-	4.88
20	1416.03	-	-
21	-	4.42	-
22	38.60	-	-
23	1800.17	-	-
24	-	-	10.52
25	-	-	54.27
Total	**5286.7**	**14.54**	**110.49**

Source: Data Processing

- **Creating Current Value Stream Mapping**



The first stage of production is roasting the cocoa beans using a special machine to enhance flavor and remove moisture. This process results in a cycle time (CT) of 29.70 minutes. Next, the roasted cocoa beans are separated from their skins using a special separator, with a cycle time (CT) of 23.77 minutes using two machines during one shift. After that, the cleaned cocoa beans are ground into a coarse paste by machine (CT 163.66 minutes, one machine, two shifts), then ground again to a fine paste in the next stage (CT 1857.93 minutes, one machine, two shifts).

The refined cocoa paste is then heated using a machine to achieve optimal consistency and flavor (CT 1433.12 minutes, one machine, one shift). The next stage is molding the hot paste into bars using a specialized molding machine with a capacity of 570 units per shift and a CT of 1849.29 minutes, making it one of the longest processes in the production process. After molding, the chocolate is cooled and packaged manually (CT 54.27 minutes per shift). Manual packaging can potentially lead to longer wait times.

The packaged chocolate bars are stored back in the warehouse before being distributed to the market using the available distribution fleet. Throughout the production process, several major issues were identified, including defects in raw materials, excessive processing, especially at stages with long lead times, and the dominance of manual activities in the final stages, which require more time and reduce distribution efficiency.

[2] Data Processing (Repair)

- ***Lead time calculation and future process activity mapping***

The Manufacturing lead time for repairs can be seen in table 3.11 below:

Table 3.11 Manufacturing Lead Time (Improvement)

Activities	Standard Time (Minutes)
1	2.74
2	4.02
3	9.32
4	5.50
5	7.75
6	9.58
7	3.70
8	1.67
9	74.58
10	9.05
11	0.78
12	3.14
13	921.74
14	7.22
15	7.77
16	4.86
17	1416.02
18	5.47
19	39.64
20	188.72
21	11.57
22	30.45
TOTAL	**2765.29**

Source; Data Processing

Based on Table 3.11 regarding the proposed improvements, it can be seen that the total standard duration for all production stages is now 2765.29 minutes. This reflects the results of implementing improvements at each stage of the production process with the aim of increasing efficiency and reducing waiting time between processes.

The proposed improvements will cover the entire process, from roasting, separating beans from the husk, grinding into a coarse and fine paste, heating, to printing and packaging. Each step has a standard time that has been adjusted based on observations and re-measurements of working conditions after improvements in methods and workplace arrangements have been made, resulting in a positive impact on increasing production line efficiency, reducing wasted time, and supporting overall productivity and production capacity.

The future process activity mapping can be seen in table 3.12 below:

3.12 Future Process Activity Mapping

Activity	VA (Minute)	NNVA (Minute)
Take cocoa in inventory	-	2.74
Putting cocoa into the roasting machine	4.02	-
Roasting Process	9.32	-
Collecting cocoa	-	5.50
Seed cracking	7.75	-
Separation of seeds from skin (nib)	9.58	-
Collecting Nibs	-	3.70
Inserting the nib into the grinding machine	1.67	
Nib grinding process	74.58	

Collecting coarse paste	-	9.05
Addition of other ingredients	0.78	-
Put the cocoa paste into the fine grinder	3.14	-
The process of refining cocoa paste	921.74	-

3.12 Future Process Activity Mapping (Continued)

Activity	VA (Minute)	NNVA (Minute)
Collecting fine paste	-	7.22
heater ready	-	7.77
Put the smooth paste into the heater	4.86	-
Heating process	1416.02	-
Bringing liquid paste to the printing station	-	5.47
Pour the mixture into the mold	39.64	-
Mold cooling	188.72	-
Checking	-	11.57
packaging	-	30.45
Total	**2681.82**	**83.47**

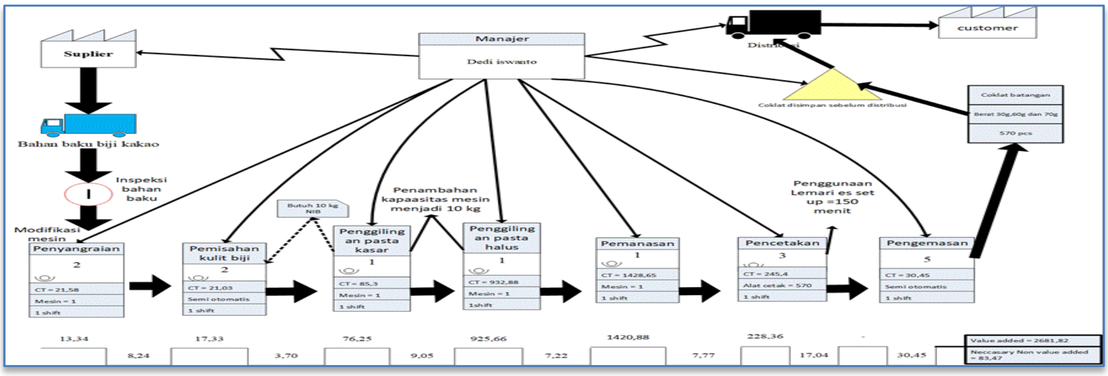
Source: Data Processing

For future activity mapping, elimination of activities that do not add value and minimization of time in several activities have been carried out.

The activities that are eliminated are carrying the nib to the coarse grinding machine, carrying the coarse paste to the fine paste mill and carrying the dough to the printing place.

The activity that minimized the process time was the mold cooling to 150 minutes using a refrigerator, this time is shorter than in the current activity mapping process time of 1440 minutes because it uses room temperature and minimization was also carried out on the packaging activity by using a semi-automatic machine for 25 minutes instead of manually for 44.68 minutes.

- ***Creating Future Value Stream Mapping***



From the value stream mapping, improvements in machine capacity have been seen, with raw material processing capacity increased to 10kg per batch, reducing cycle time in several key stages. The use of a refrigerator for a set-up process of 150 minutes, in contrast to the previous 1440 minutes at room temperature, is also a step to strengthen quality control after the molding process, to ensure product stability and quality before the chocolate is distributed to consumers.

Analysis of the process time shows that the total value added time is significantly higher (2681.82minutes) compared to necessary non-value added (83.47 minutes), which is an indication of efforts to reduce delay time, stock buildup, or activities that do not directly increase the value of the final product. The emphasis on semi-automation processes in the printing stage with the use of 5

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printing tools accelerated output to 570 pcs per shift and 4.83 minutes/pcs, as well as adjustments to product weight to 35g, 60g, and 70g to meet market needs.

- ***Takt Time***

The results of the takt time calculation for repair are as follows:

$$Takt\ time = \frac{Available\ working\ time}{Demand}$$

$$Takt\ time = \frac{2765{,}29}{570} = 4.85 \text{ minutes/piece}$$

The Takt Time calculation after implementing the improvement suggestions yielded a value of 4.85 <9.49 minutes, a lower Takt Time than the previous condition. This indicates that the production system after the improvements can produce goods more quickly and is more responsive to customer needs.

[3] recommendations for improvements

Improvements to production flow are carried out to minimize waste of time, materials and costs so that it becomes more efficient than the old production flow.

As forThe proposed improvements to the production flow at Cado Agrofood Semesta can be seen in table 3.13 below:

Table 3.13 Proposed Improvements

No	Station	Types of Waste	Repair
1	Roasting	*Transportationi*, process and defect	Rearrange the machine layout so that the distance between the warehouse and the station is not too far. Modifications were made to the passageway between the funnel and the heating area so that the cocoa beans would get stuck less often. Conduct inspections of raw materials from suppliers before further processing
2	Separation of cocoa bean skin	Process	The process uses a semi-automatic machine so that the time and results meet standards.
3	Coarse grinding	*Delay*and motion	The layout between stations was rearranged and the machine capacity was increased to 10 kg so that there would be no raw materials waiting to be processed.
4	Fine Grinding	*Delay*	Machine capacity increased to 10 kg capacity
5	Warming up	*Transportation*	Adjustment of distance between stations
6	Printing	*Delay*	Use of refrigerator to cool chocolate.
7	Packaging	*Delay*	Use of semi-automatic machines to reduce time

Source: Data processing

With this improvement in the production line, it is hoped that product distribution will increase and be timely so that expansion to new locations can be carried out without any further obstacles.

VI. CONCLUSION

The types of waste that occur at Cado Agrofood Semesta are motion (excessive movement), transportation (long movement of raw materials), defects (damaged raw materials), processes (manual) and delays (piling up of raw materials).

Process stations that have waste include: Roasting where cocoa beans often get stuck during input because the aisle between the funnel and the heater is narrow and the results obtained are only 600 g / 1 kg of cocoa. Separation of the skin from the beans, namely the process results are still below standard because it uses manual tools. Coarse grinding of cocoa paste where the distance between stations and Nib Stacking due to capacity limitations. Fine grinding where the accumulation of coarse paste due to capacity limitations and the transfer of paste to the heating place which takes time. Chocolate printing where there is a waste of time for too long because it is cooled using room temperature and finally packaging where the process still uses manual labor which increases lead time.

Recommended improvements for Cado agrofood Semesta production line are Rearranging the machine layout so that the distance between the warehouse and the station is not far apart, Modifying the aisle between the funnel and the heating place so that the cocoa beans are minimally stuck and Inspecting raw materials from suppliers before further processing. The process uses a semi-automatic machine so that the time and results are according to standards. Rearranging the layout between stations and increasing the machine capacity to a capacity of 10 kg, there are no raw materials waiting to be processed and it is suitable for the heating capacity. Adjusting the distance between stations. Using a refrigerator to cool the chocolate to get a set up time of 150 minutes instead of using room temperature for a set up time of 1440 minutes and Using a semi-automatic machine rather than a manual one to reduce time.

With these improvement recommendations, lead time is obtained.2775.38 minutes < 5410.04 minutes actual and takt time is4.85 minutes < 9.49 minutes. This indicates an increase in efficiency in the Cado Agrofood Semesta production line, which is expected to resolve distribution issues that hinder expansion into new locations (new markets).

Suggestion

The suggestions from the research authors are as follows:

1. In implementing production line improvements, good planning is required so that the workflow is clear and does not add unnecessary lead time.
2. In this case, workers are given guidance on good and efficient working methods that comply with standards.

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