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LEAN SERVICE APPROACH TO THE MAINTENANCE PROCESS OF CONSUMER PACKING MACHINE AT PT. BFM

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ABSTRACT

PT.BFM is a leading wheat mill in Indonesia and is also the first and largest producer wheat flour producer in Indonesia. This factory is very concerned about the quality of its products so the engineer must provide services by maintaining the machine to meet customer demand and maintain product quality well. To maintain customer confidence on the part of the engineer certainly must pay attention to the process of maintaining the machine itself, because the machine used must have waste. This study aims to identify waste and provide recommendations for improvement that aim to reduce the waste that occurs. By using the Lean Concept approach which is more dominant towards Lean Manufacturing and Six Sigma, so that this research can combine waste reduction with quality control using the DMAIC stage. That way the machine maintenance process can improve efficiency and improve quality. The study began by describing the Big Picture Mapping and weighting of waste values based on a questionnaire using VALSAT. Waste was also identified using FMEA to calculate the critical value of waste then a recommendation for improvement was carried out using 5W + 1H. Calculation results from processing data from data that has been collected, it was found that the total processing time which was previously 76,895 seconds to 57,342,497 seconds. The results of Value Added Activity are 85.233%, Non-Necessary Value Adding is 8.67% and Non-Value Added is 6.10%. FMEA analysis results obtained that critical waste that needs improvement is waste waiting with a score of 160.

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1. Introduction

Basic Concepts of Lean can be interpreted as an ongoing effort that aims to eliminate existing waste so that it can improve the quality of products in the form of goods or services and provide added value or value- added for the benefit and satisfaction of customers. The purpose of Lean itself is to continuously increase customer value by increasing the ratio between the added value of existing waste (the value to waste ratio). AccordingI to Vincentii GasperzIi (2007), the basic concept of leaniiiis one of the downsizing concepts. The concept was found to be applied by manufacturing companies or services because the concepts that apply efficiency will be targeted and always sought by companies. Lean thinking is a concept that was first formulated by Toyota.

Definition of Waste, Based on the Toyota ways of the word Waste in Japanese is called "Muda" meaning that the activities that do not provide added value in the process of transformation are input into output throughout the value stream mapping. Definition of Lean Service is a collection of tools and methods designed to eliminate that occurs, reduce waiting time, improving performance, and reducing production costs to create customer value according to Hines et al., (2004) in Setyaningsih (2013).

The Lean concept can be applied to the service sector, lean in service has the same principles as lean manufacturing, namely the concept of continuous improvement and eliminating activities that do not provide added value or waste. In implementing the Six Sigma strategy there are five major steps namely Define, Measure, Analyze, Improve, and Controle these five cycles will form a cycle that is related and provides quality improvement.

PT. BFM is a leading wheat mill in Indonesia and is also the largest producer of wheat flour for the first time in Indonesia. This factory is located on Jl. raya Cilincing, Tanjung Priok, Jakarta North, with an area of about 33 hectares of Iiectives can produce a maximum of 10,500 tons/day of flour. This wheat grinder factory in providing food raw materials in the form of quality wheat flour. This factory is very concerned about the quality of its products so the engineer has to provide services by maintaining the machine to meet customer demand and maintain product quality well.

To maintain customer confidence on the part of the engineer, of course, must pay attention to the process of maintaining the machine itself because the machine used must have waste. Waste referred to is the time required to exceed the set schedule so that it interferes with the process of packing 1 kg of flour products in the consumer packing division. Following are the details of the waste in the engine maintenance schedule in 2018 and 2019:

Table 1. Machine Maintenance Schedule in the 2018 consumer packing division

Month	Number of PM Process Activities	Percentage of PM Activity	Percentage of increase in PM Activity
Jan-18	26	11%	0%
Feb-18	19	8%	68%
Mar-18	13	5%	40%
Apr-18	9	4%	29%
May-18	22	9%	70%
June-18	12	5%	38%
July-18	50	20%	160%
Aug-18	29	12%	88%
Sep-18	19	8%	60%
Oct-18	15	6%	46%
Nov-18	13	5%	42%
Dec-18	18	7%	57%

(Source: Company Data, 2018)

Table 2. Machine Maintenance Schedule in the 2019 consumer packing division

Month	Number of PM Process Activities	Percentage of PM Activity	Percentage of increase in PM Activity
Jan-19	10	3%	0%
Feb-19	19	5%	68%
Mar-19	12	3%	37%
Apr-19	25	6%	82%
May-19	25	6%	78%
June-19	17	4%	54%
July-19	52	13%	166%
Aug-19	85	21%	269%
Sep-19	39	10%	121%
Octo-19	26	7%	80%
Nov-19	28	7%	91%
Dec-19	59	15%	187%

(Source: Company Data, 2019)

There are 9 months except those previously mentioned which exceed the percentage of activities, namely 5% of the predetermined schedule or it can be said that they are not well realized. This tolerance limit of 5%

becomes the standard in quality control so that the work process is controlled and can make a mapping in terms of quality of consumer packing machine maintenance that has been set in the consumer packing maintenance section.

Based on the above problems, the writer chooses to identify the waste problem, then the next step is to minimize waste from the machine maintenance process, especially in consumer packing. Because consumer packing is the last stage of all flour production processes that exist before distribution to consumers, at this stage the product is packed according to consumer demand, namely packing weighing 1 Kg.

According to Fijar Alpasa (2014), in his research the concept of lean service can be used in eliminating waste II (waste) in-service services to reduce waste, while according to Trismi Ristyowati (2017) the concept of lean manufacturing can increase output by reducing lead time and eliminating waste that occurs in a company. . So with a lean approach can occur efficiency in the production process which is useful for the progress of PT. ISM Tbk, Division Bogasari Flour Mills. The results will be obtained later, including the identification of waste and a proposal for reducing waste in the maintenance process of the consumer packing machine with the title "Analysis of Waste Reduction in the Maintenance Process of Consumer Packing Machines with a Lean Approach at PT. BFM ".

2. Research Methodology

In this research, methodologies are the steps or stages of conducting research. The following are the steps in getting the required data, namely: making observations at PT. BFM is part of consumer packing maintenance, conduct literature studies according to research, conduct field studies by interviewing technicians and workers in the consumer packing maintenance section, distributing questionnaires to respondents related to consumer packing machine maintenance.

This study takes historical data for 2 years, from January 2018 to December 2019. It is known that there are 3 shifts, 24 working hours (machines) with 6 working days, active working for 8 hours (labor) with resting time for 1 hour (labor). Data needed in this study include: CP machine maintenance process flow, the information flow of the CP engine maintenance process, Standard Operational Process (SOP) in maintenance/engineer, data on the number of operators per machine, CP machine maintenance schedule, SAP component ordering data needed, the distance of each machine, working hours, scores and weighting on the 7 waste questionnaire.

The research method consists of whatever steps the research takes place, starting from the introduction that contains a literature study in the form of a theory related to research and a field study in the form of interviews, direct observation, and documentation. Furthermore, the determination of the problem formulation of the problem to be studied is factual and clear. Then determine the purpose of research whether the results obtained from these studies can solve existing problems. Make a limitation of the problem to be studied so as not to widen. Then collect data about Lean's approach to the process of maintaining consumer packing machines. After data collection goes to the processing of data that will produce any waste that occurs and get a fix from the known waste problem. From these results analyzed whether the results can be said to solve the problem of waste that occurs or not, if not then it can return to the gathering/processing of data and if it has been concluded with a conclusion stating that the results can be said in accordance with the objectives that have been made.

2.1 Type of Data

2.1.1. Primary Data

Primary Data obtained from direct observation to the maintenance/engineer at PT. BFM to the manager to the operator. The following is the researcher conducting interviews with 5 informants, namely:

1. Mr. M. Zulkarnain as Manager of the Maintenance (Engineer) Department of Consumer Packing.
2. Mr. Hendra as Junior Manager of the Maintenance (Engineer) Department of Consumer Packing.
3. Mr. Didi Santoso as Section Head of the Maintenance (Engineer) Department of Consumer Packing.
4. Mr. Randek as Foreman 1 in the Maintenance (Engineer) Department of Consumer Packing.
5. Mr. Dimas as Foreman 2 in the Maintenance (Engineer) Department of Consumer Packing.

2.1.2. Secondary Data

Meanwhile, secondary data is obtained from historical data in the form of data for 2018 and 2019. The types of data obtained are in the form of Quantitative Data and Qualitative Data. Quantitative data obtained by data such as:

1. Data on the number of operators for each machine
2. CP machine maintenance schedule
3. SAP data ordering the required components
4. The distance each machine
5. Hours of work
6. Score and weighting on the 7 waste questionnaire

Qualitative data are in the form of data regarding:

1. CP machine maintenance process flow
2. The Flow of CP machine maintenance process information
3.Standard Operational Process (SOP) in maintenance/engineer

2.2. Data Processing and Analysis Data

2.2.1 Define Phase

Current Big Picture Mapping (BPM)

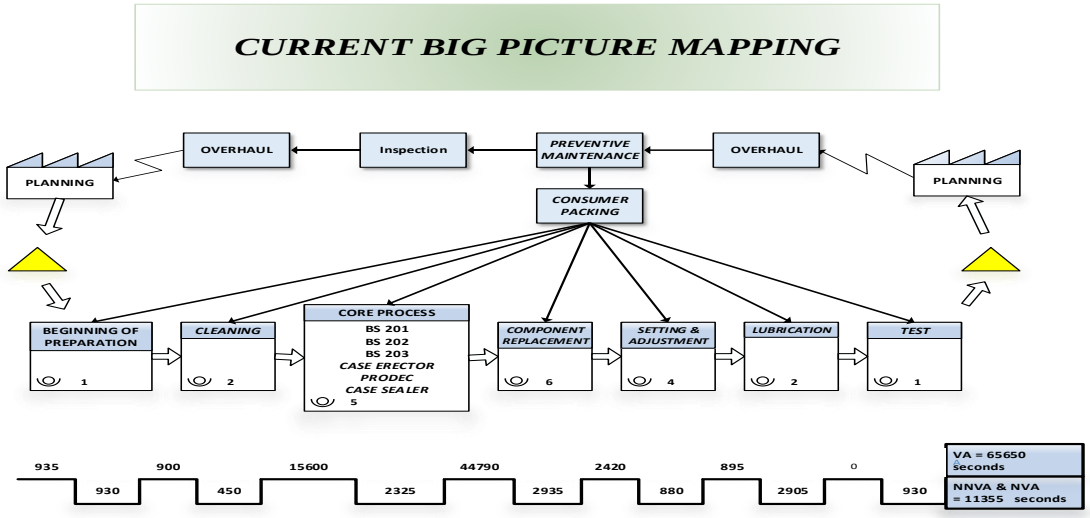

Figure 3. Current Big Picture Mapping (BPM)
(Source: Company Data, 2020)

From **figure 3**. above get a total treatment process time of 76895 seconds or 1281,583 minutes or 21,359 hours. With the acquisition of a total Value Added (VA) time of 65650 seconds, and the total time for Non-Value Added (NVA) and Necessary Non-Value Added (NNVA) is 11365 seconds.

2.2.2 Measure Phase

Highest Score and Sequence of Waste Ranking in **table 5**, it can be seen that the largest average value is in waste waiting (waiting time) with the acquisition of 3.2 and the smallest average value of 1 is waste overprocessing (unnecessary process).

While waste overproduction does not occur because in this division only carries out consumer packing machines and there is no production process.

Table 3. Average and *waste ranking*

No.	Waste	Respondent					Average	Ranking
		Section Head	Fore man	Fore man	Tech-nician	Tech-nician		
1	Waiting	3	3	4	2	4	3.2	**1**
2	Unnecessary Motions (Unnecessary movement)	2	3	4	2	3	2.8	**2**
3	Defects (Defective)	1	3	3	3	3	2.6	**3**
4	Transportation (Over transportation)	3	2	4	2	2	2.6	**4**
5	Unnecessary Inventories (Unnecessary supplies)	2	3	3	1	2	2.2	**5**
6	Overprocessing (Excess process)	1	1	1	1	1	1	**6**
7	Overproduction (Over production)	0	0	0	0	0	0	7

2.2.2.1 Value Stream Analysis Tools (VALSAT)

In **table 3.** below it is known that the largest total value obtained by the Process Activity Mapping (PAM) tool with a weight of 102.2 is ranked 1. Based on the results of previous VALSAT calculations it can be determined that the tools used in identifying value streams are Process Activity Mapping (PAM), the tool was chosen because it has the greatest value compared to other tools.

Table 4. VALSAT Calculation

Pemborosan (Waste)	Rata-rata	Process Activity Mapping	Supply Chain Response Matrix	Production Variety Funnel	Quality Filter Mapping	Demand Amplification Mapping	Decision Point Analysis	Physical Structure
Defects	2.6	2.6	-	-	-	-	-	-
Overproduction	0	0	0	-	0	0	0	-
Waiting	3.2	28.8	28.8	3.2	-	19.2	19.2	-
Transportation	2.6	23.4	-	-	-	-	-	2.6
Unnecessary Inventories	2.2	13.2	19.8	13.2	-	19.8	13.2	2.2
Unnecessary Motions	2.8	25.2	2.8	-	25.2	-	-	-
Overprocessing	1	9	-	6	1	-	1	-
Total		102.2	51.4	22.4	26.2	39	33.4	4.8

2.2.2.2 Process Activity Mapping (PAM)

There are several factors in consideration in making PAM, namely the type of activity, the time required, the distance of movement, and the number of workers involved in the activity. Activities are grouped into 5 categories, namely Operations, Transportation, Inspection, Storage, and Delay (waiting). The following is a table grouping each activity by calculating the percentage of each category:

Table 5. Grouping work activities

Aktivitas	Jumlah Aktivitas	Waktu (Detik)	Presentase (%)	Value Stream
Operation	68	72810	94.687%	VA/NNVA/NVA
Transportation	13	1400	1.821%	NNVA
Inspection	8	985	1.281%	VA/NNVA
Storage	2	230	0.299%	NVA
Delay	6	1470	1.912%	NVA
Total	**97**	**76895**	**100%**	

After the activities that occur are grouped in the appropriate type of value stream, the next calculation is to calculate the percentage to find out which type of activity is the most dominant.

Table 6. Precentage of activities in the value stream

Value Stream	Jumlah Aktivitas	Waktu (Detik)	Presentase
VA	40	65650	85.233%
NNVA	25	6665	8.668%
NVA	32	4690	6.099%
Total	**97**	**76895**	**100%**

In **table 6.** above is the result of calculating the percentage of value streams. Based on these results that the time required for the entire process of consumer packing machine maintenance is 76895 seconds with a total of 97 activities. Of all the activities consisting of 39 value-added activities (VA) as many as 38 operating activities, and 1 inspection activity.

As many as 25 activities that have no added value but are still needed in the processor cannot be eliminated (NNVA) consisting of 10 operating activities, 8 transportation activities, and 7 inspection activities.

2.2.2.3 Six Sigma calculations

In **table 7** it can be seen that the consumer packing machine has damaged components in 2019 and which becomes CTQ of 6. Of the 6 CTQs are in February, March, April, May, September, October. For this reason, it is necessary to supervise the engine maintenance process, because it exceeds the tolerance limit of 5%.

Table 7. CTQ Check sheet Damage components

No	Month	Examined Unit	Damaged Unit	Percentage (%)	CTQ
1	January	59	44	4.255%	
2	February	312	293	28.337%	√
3	March	179	166	16.054%	√
4	April	112	91	8.801%	√
5	May	79	52	5.029%	√
6	June	34	17	1.644%	
7	July	69	20	1.934%	
8	August	96	13	1.257%	
9	September	181	140	13.540%	√
10	October	194	166	16.054%	√
11	November	35	4	0.387%	
12	December	88	28	2.708%	
	Total	**1438**	**1034**	**100%**	

Table 8. Result of Measurement of Sigma and DPMO values

No	Month	Examined Unit	Damaged Unit	Percentage (%)	DPU	DPMO	Sigma Value
1	January	59	44	4,255%	0,12429379	124.294	2,66
2	**February**	312	293	28,337%	0,15651709	156.517	2,51
3	**March**	179	166	16,054%	0,15456238	154.562	2,52
4	**April**	112	91	8,801%	0,13541667	135.417	2,61
5	**May**	79	52	5,029%	0,10970464	109.705	2,73
6	June	34	17	1,644%	0,08333333	83.333	2,89
7	July	69	20	1,934%	0,04830918	48.309	3,17
8	August	96	13	1,257%	0,02256944	22.569	3,51
9	**September**	181	140	13,540%	0,12891344	128.913	2,64
10	**October**	194	166	16,054%	0,14261168	142.612	2,57
11	November	35	4	0,387%	0,01904762	19.048	3,58
12	December	88	28	2,708%	0,0530303	53.030	3,12
	Total	1438	1034	100%	1,17830958	1.178.310	34,51
	Average	**119,8333**	**86,166667**		**0,09819246**	**98.192**	**2,88**

(Source: Data Processing, 2020)

From the calculation results in **table 8** above, in the process of maintaining consumer packing machines at PT. BFM has an average sigma value of 2.88, indicating that the average sigma value is still far from the expected value of

6-sigma. While the DPMO value is 98,192 in one million opportunities, the value indicates that the value is quite far from the expected value of 3.4 DPMO. With a sigma value of 2.88, it is still far below the world-class industry standards, meaning that in the process of maintaining consumer packaging machines at PT. BFM needs improvement from the quality of maintenance and maintenance carried out.

2.2.3 Analyze Phase

The analysis phase is the third operational step of the six sigma cycle. At this stage, identifying the types of waste that occur and analyzing which types of waste have the dominant overall contribution.

Analyze VALSAT with the PAM Tool. After calculating using VALSAT, the results show that using the best tool to identify value streams in this study is using Process Activity Mapping (PAM) with the highest score from other tools. The use of PAM to find out the lead time (process) in detail in identifying the types of activities that need improvement.

Based on **table 9** below, there is a comparison of the time and percentage of the total time from the initial PAM and the final PAM after the proposed improvement is determined:

Table 9. Comparison of current PAM and future PAM based on activity

Activity	Amount of Activity		Presentage (%)		Time (Seconds)		Presentage (%)	
	Current PAM	Future PAM	Current PAM	Future PAM	Current PAM	Future PAM	Current PAM	Future PAM
Operation	68	50	70.103%	75.758%	72810	55906.805	94.687%	97.496%
Transportation	13	8	13.402%	12.121%	1400	625.692	1.821%	1.092%
Inspection	8	8	8.247%	12.121%	985	810	1.281%	1.412%
Storage	2	0	2.062%	0%	230	0	0.299%	0%
Delay	6	0	6.186%	0%	1470	0	1.912%	0%
Total	**97**	**66**	**100%**	**100%**	**76895**	**57342.497**	**100%**	**100%**

In the table above it can be seen that there is a decrease in processing time for Operation activities from 72810 seconds to 55906.805 seconds. This reduction indicates that the proposed application can be said to be effective because it can reduce the total work time that occurs in these activities.

Table 10. Comparison of current PAM and future PAM based on *Value Stream*

Value Stream	Amount of Activity		Presentage (%)		Time (Seconds)		Presentage (%)	
	Current PAM	Future PAM	Current PAM	Future PAM	Current PAM	Future PAM	Current PAM	Future PAM
VA	40	40	41.237%	60.606%	65650	51256.112	85.233%	89.386%
NNVA	25	20	25.773%	30.303%	6665	5419.442	8.668%	9.451%
NVA	32	6	32.990%	9.091%	4690	666.943	6.099%	1.163%
Total	**97**	**66**	**100%**	**100%**	**76895**	**57342.497**	**100%**	**100%**

In **table 10** above it is known that the value stream is also a decrease in time in value-added (VA) from 65,650 seconds to 51,256,112 seconds with a percentage of 85,233% or 85% to 89,386% or 89%. The increase in the value of the percentage is said to be effective in terms of decreasing processing time in the consumer packing machine maintenance process because it can eliminate the waste that occurs.

2.2.3.1 Fishbone Analysis Diagram

After obtaining the results of the identification of waste with a questionnaire and VALSAT, it will then identify the causes of waste that occur in the process of maintaining consumer packing machines at PT. BFM by using a Fishbone Diagram, making it easier to propose improvements. The causes of waste will be explained in the following causal diagram:

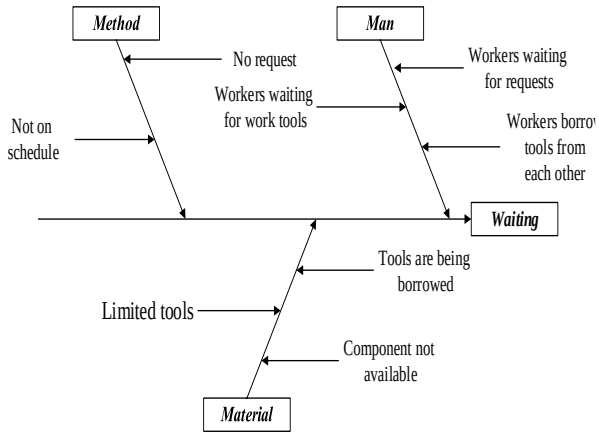

Figure 4. Fishbone Waiting Diagram
(Source: Data Processing, 2020)

2.2.3.2 Analysis of Failure Mode Effect and Analysis (FMEA)

From the results of the identification of waste with fishbone diagrams obtained the factors causing the occurrence of waste, then the use of

the FMEA method along with the causal factors are analyzed to determine the critical waste needed in the proposed improvement as soon as possible. This process of risk identification by creating a list or waste list which then goes to the stage of waste assessment. The following is a list of waste from failures that often occur in the process of maintenance of consumer packing machines obtained from observations and discussions that have been elaborated with a fishbone diagram, including:

Table 11. Waste identification risk list

No	Waste Category	Failure Mode	Cause Of Waste	Waste Effect
1	***Waiting***	• Waiting for request • Waiting for work tools • Waiting for components	• The maintenance process is sometimes not on the schedule • Limited working tools used • Required components are not yet available	• The consumer packing machine maintenance process takes longer • The maintenance process is disrupted • Harm the company and disappoint customers
2	***Unnecessary Motions*** (Unnecessary movement)	• Repetitive ways of working on taking Greas • Operators lack focus • Operators borrow equipment from each other during the maintenance process	• Greas tools that are not performing well • There is a rotation in the position in working on the maintenance process • Tools/components (work tools) are limited	• Workers become saturated in workmanship • Declining productivity • Interrupting the flow of the ongoing process
3	***Defects*** (Defective)	• Not yet have a flowchart provision in the work process • The components used are incorrect or inappropriate	• Not yet understand the making of flowchart provisions • Incorrect machine estimation Interrupts the work of operators who are working	• Interrupts the work of operators who are working • Components become damaged and overprocessing
4	***Transportation*** (Over transportation)	• Component orders must go through repeated licensing • The layout of the manager's office is quite far from the maintenance room	• It must follow the directions • Follow the existing layout	• How the work becomes longer
5	***Unnecessary Inventories*** (Unnecessary supplies)	• Excess components that have been ordered (incorrectly ordered) to stack up to reduce the quality of components • Difference between data warehouse and field requirements	• Inaccurate estimation • Miscommunication between operators and material warehouse workers	• Components that have been ordered incorrectly may be used uncertainly • Differences of opinion regarding the availability of goods
6	***Overprocessing*** (Excess process)	• The use of tools and components that are not appropriate • Lack of supervision from working operators	• Lack of focus on work processes • The operator is exhausted from a heavy workload.	• The equipment used will be damaged • Making work processes that are not appropriate or useless

2.2.4 Improve Phase

Proposed Corrective Action

The proposed improvement is following the results of interviews with informants about the maintenance process of PT. BFM. In overcoming waste waiting, the company pays more attention to the workings of the consumer packing machine maintenance operator and gives guidance on the best use of time by doing work that the operator can do to reduce waiting time. Conduct regular evaluations to find out the problems that occur and can handle them appropriately.

2.2.5 Control Phase

2.2.5.1 Future Big Picture Mapping (FBPM)

From the results of the calculation of the RPN, priorities for improvement are then made. The following explanation is in the table below :

Table 12. Proposed improvements with FMEA

Proritas ke-	Waste	S	O	D	RPN	Usulan Perbaikan
1	***Waiting***	8	5	4	160	• Planning a maintenance schedule for consumer packing machines carried out on an ongoing basis and must be following the production department • Adding several tools/work tools • Coordination more often between operators
2	***Unnecessary Motions*** (Unnecessary movement)	7	5	4	140	• Adding several tools/work tools • Add operators to support the consumer packing machine maintenance process • Consistency of regulations imposed on companies
3	***Defects*** (Defective)	5	4	4	80	• Making SOPs for the maintenance of consumer packing machines • Operators are more focused and conscientious at work • Improve training materials for operators in terms of training and certification
4	***Transportation*** (Over transportation)	4	3	4	48	• Assign new tasks and avoid monotonous and repetitive tasks • Adding transportation equipment for moving tools/components • Improve the layout of the machine in terms of sequencing the company's production process.
5	***Unnecessary Inventories*** (Unnecessary supplies)	6	3	2	36	• Making plans in terms of ordering tools and components so that there are no delays in the arrival of components. • Check inventory once a week • Communication between operators needs to be improved again.
6	***Overprocessing*** (Excess process)	8	1	3	24	• Conduct periodic inspection, maintenance, and prevention on every machine or tool used so that no damage can occur to the company. • Add operators to support the consumer packing machine maintenance process • Coordination is more frequent between operators

Based on table 12 above, it is known that the biggest waste and become the priority is waste waiting (waiting time) with the largest value of Risk Priority Number (RPN) 160. The Control phase is the last stage of the DMAIC method, at this control stage will measure performance after making improvements, in this case, will be known that what is done is following what is expected.

In Figure 5, Future Big Picture Mapping, the total treatment time is 57342,947 seconds or 955,716 minutes or 15,929 hours. With a total time, Value Added (VA) of 51256,112 seconds,

and the total time for Non-Value Added (NVA) and Necessary Non-Value Added (NNVA) is 6086,385 seconds. FBPM can reduce processing time and reduce waste that occurs from the maintenance of consumer packing machines.

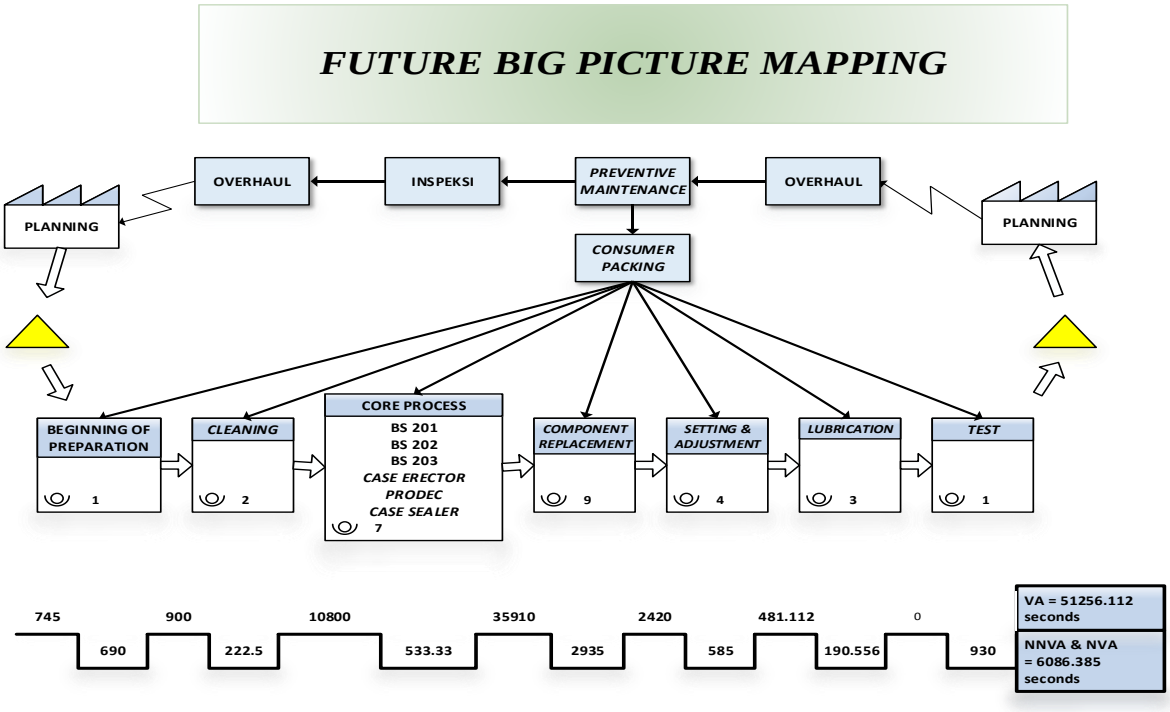

Figure 5. Future Big Picture Mapping

2.2.5.2 Sigma Improvement

From the sigma level calculation above, it can be seen that the proposed improvement to overcome the defect component that has been applied has not been able to increase the sigma value. It can be seen that the percentage value still exceeds the provisions of 5% and the sigma value is still less than 6-sigma because it takes a long time, namely at least 3 months to 1 year to be able to find out the increase in sigma value in the process of maintaining consumer packaging machines.

3. Conclucion dan Suggestion

3.1 Conclucion

From measurements and calculations it can be concluded that:

1. From the results of identifying the level of waste using a questionnaire in the value stream analysis tool (VALSAT), critical waste that often occurs is waste waiting (waiting time) with an average value of 3.2. Then waste unnecessary motion (unnecessary movements) with an average value of 2.8, Defects (disability) with an average value of 2.6, waste Transportation with an average of 2.6, overprocessing with an average value average 1.
2. At the sigma level measurement stage with the six sigma method it is known that the average sigma value of the consumer packing maintenance section is 2.88. From the average value of sigma it is still far from world standards and is still far from the 6-sigma value which means that improvements are still needed.
3. Proposed improvements reduce waste and reduce defects, namely:
   a. Reducing waste with the Tool process activity mapping (PAM) from the results of data processing using value stream analysis tools (VALSAT) which is produced has reduced the time from 76895 seconds to 57342,497 seconds. In addition to reducing the dominant waste that is waste waiting by way of the company paying more attention to the workings of the consumer packing machine maintenance operators and

giving guidance on the best use of time by doing work that the operator can do to reduce waiting time. Conduct regular evaluations to find out the problems that occur and can handle them appropriately.

b. Reducing defects in damaged components by performing engine maintenance as much as possible by increasing the engine maintenance schedule to minimize engine damage that occurs. Supervise the use of the machine on the maximum packing so that the machine does not work extra so it allows excessive component damage.

3.2 Suggestion

a. The following are suggestions that can be given to companies from this research, namely:

1. From the results of waste identification, the company should immediately make improvements to existing work problems as a way to improve the factors that affect the occurrence of waste in the consumer packing machine maintenance process because this can harm the company and customers.
2. To further improve the supervision of the work process and to consider the human resources that are owned, so that it can reduce the waiting time for the maintenance process of the consumer packing machine.

b. The following are suggestions that can be given for future research with this research, namely:

1.Provide maximum improvement suggestions not only for the maintenance process of the consumer packing machine, but also for other maintenance departments.

2.It is necessary to do a modeling using simulation so that the real system conditions can be well described. With this simulation, it can help verify data so that it can be closer to the actual machine maintenance process conditions.

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