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Analysis of Waste in the Warehousing Process of PT. Asia Plastik sing Lean Warehousing and Improvement Strategy with Kaizen Method

M. Rizqy Ifaldhi Putra*, Rr. Rochmoeljati
Department of Industrial Engineering, Universitas Pembangunan Nasional "Veteran" Jawa Timur, Jl. Raya Rungkut Madya Gunung Anyar, Surabaya 60294 Indonesia

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A B S T R A C T

PT Asia Plastik is a plastic packaging manufacturing company that specializes in injection and blow molding. In its warehousing management, PT Asia Plastik often experiences excessive waste with a high lead time of 419 minutes with a value added of 276 minutes. The method used is the application of Lean Warehousing with the Value Stream Mapping (VSM) method for mapping the flow of warehousing and information flow in the company, and making Process Activity Mapping (PAM) as an analysis tool. With Process Activity Mapping (PAM), it can be seen which process (time) is really important and which process (time) can be simplified or eliminated. A total of 50 activities were obtained with details of 16 Value Added activities, 7 Non-Value Added activities, and 27 Necessary Non-Value Added activities. Based on the results of the research, activity simplification and Big Picture Mapping were proposed with a total of 36 new activities compared to 50 old activities, a reduction of 14 activities. Then the time obtained is 370 minutes which was previously 419 minutes, saving 49 minutes. In addition, there are also proposals for improvement with the Kaizen method to reduce existing waste.

*Corresponding Author
M. Rizqy Ifaldhi Putra
E-mail: rizqy.ifaldhi@gmail.com

1. INTRODUCTION

PT Asia Plastik is a plastic packaging manufacturing company that specializes in injection and blow molding. PT. Asia Plastik located at Jalan Rungkut Industri III 27A, Surabaya, East Java. Through a continuous process of product and process development, some of the products that PT Asia Plastik has developed include plastic bottles, jerry cans, buckets, gallons, industrial baskets, plastic inflatable pallets, floats, and others. The phenomenon that occurs at PT Asia Plastik often experiences excessive waste because the loading and unloading process uses manual labor so that it has a relatively long activity time. The problem that occurs is that there is a high lead time of 419 minutes with a value added of 276 minutes. This research uses the Lean Warehousing method which is used to find out which activities are really important and which activities can be simplified or discarded so as to reduce the waste that occurs. The application of Lean Warehousing is used with the Value Stream Mapping (VSM) method for

mapping the flow of warehousing and information flow in the company, and making Process Activity Mapping (PAM) as an analysis tool. With Process Activity Mapping (PAM), we can find out which processes (time) are really important and which processes (time) can be simplified or eliminated. 16 Value Added activities, 7 Non-Value Added activities, and 27 Necessary Non-Value Added activities were obtained. After that, an improvement proposal was made to reduce waste that occurred in the warehousing process of PT Asia Plastik, namely by simplifying Process Activity Mapping, making Future Big Picture Mapping, and implementing Kaizen (5S). 5S stands for Seiri (concise), Seiso (clean), Seiton (neat), Seiketsu (care), and Shitsuke (diligent). The purpose of using 5S is to reduce or eliminate Waste of Waiting, Waste of Searching Time, Waste of Processing, Waste of Defect, Waste of Motion, Waste of Inventory, and Waste of Transportation. With the implementation of this research, it is hoped that PT Asia Plastik can reduce the waste that occurs and can eliminate unnecessary activities. Thus, PT Asia Plastik has a better warehousing system and does not harm the company.

2. LITERATURE REVIEW

Lean has the main idea of reducing costs by eliminating waste. Lean represents many tools to achieve the goal. The advantages of implementing Lean are reduced lead times, reduced operating costs, improved quality and customer satisfaction. All actions that cannot add value to our system, are unnecessary and create waste. To eliminate waste, it is important to identify the flow of actions and constantly control the system to find defects and defaults. The Lean approach will uncover Non-Value Added (NVA) and Necessary Non-Value Adding (NNVA) and make Value Added (VA) flow smoothly along the Value Stream Process. Value Added (VA) are activities that can make products or services more valuable. Non-Value Added (NVA) is a type of activity that does not make products or services more valuable and is not even needed in a certain condition, this activity is clearly a waste that should be eliminated immediately. Necessary Non-Value Adding (NNVA) is an activity that does not make a product or service more valuable but this activity is still necessary, this is a type of waste that is more difficult to eliminate in the long-term and short-term goals of an overall activity.

Big Picture Mapping is a tool used to describe the overall Value Stream in a company. With Big Picture Mapping, it is possible to find out the physical flow of information in the system as well as the implementation time of each process (Pradana et al., 2018). Big Picture Mapping is a high-level mapping process that includes different processes but a low level of detail. According to Odi et al (2019) Big Picture Mapping is a tool used in production. This tool makes it easy to identify the existence of waste that can be identified by understanding the physical flow of information in a company and describing it as a whole. Process Activity Mapping (PAM) is used to find out all the activities that happen during the warehousing process and then classify these activities based on the type of waste. Making Process Activity Mapping (PAM) is useful for grouping warehousing activities according to their activities ranging from operation, transportation, storage, inspection, and delay. It also groups warehousing activities according to their VA, NVA, and NNVA categories. This grouping is based on knowing more details about each activity and can see more clearly which activities can be eliminated or can be simplified.

A fishbone diagram or cause and effect diagram is a diagram created with the aim of showing the factors that cause a defect in a product or waste in an activity. This diagram is called a fishbone because it has a shape that resembles a fish bone. Where there are 2 parts, namely the head and the bone. The main part or main segment is called the fish head where the fish head is the main cause of the problem. While the bone part is the related factors that cause the problem. There are various factors that cause waste in the Fish Bone Chart, namely Humans, Materials, Machines, Methods, Environment, Measurement. (Anggraeni et al, 2019). Kaizen is a management method popular in Japan to improve efficiency and productivity in the workplace. Hence, it can be defined as being very simple namely doing something better or continuous improvement. Focus on results is not a key feature of kaizen management, but

rather tends to pay attention to the process and use quality circles to support continuous improvement. (Syahputra, 2022). Some individuals may be acquainted with the term "Kaizen," which means "continuous improvement". Change is represented by the letter Kai, whereas better is represented by the Japanese word Zen. (Sutrisno et al, 2022). This method consists of five concepts (5S), it stands for Seiri, Seiso, Seiton, Seiketsu, and Shitsuke. Most companies in Japan apply the 5S concept as the basis or fundamental of management. The broad definition of 5S is to utilize the workplace (which includes equipment, documents, buildings and spaces) to train workers' habits in an effort to improve work discipline starting with Sorting (Seiri), Arranging (Seiton), Cleaning (Seiso), Stabilizing (Seiketsu). S1 (Seiri), S2 (Seiton) and S3 (Seiso) are started at the same time in accordance with the standard procedures set in S4 (Saiketsu). If the employee has fulfilled all of these activities, they have obtained the S5 (Shitsuke) Discipline status or have fully participated in the development of good work habits according to the rules set.

3. RESEARCH METHOD

In this research, the following flow of problem solving can be seen in Figure 1. The description of the order of the settlement of an event is to conduct a survey of existing problems to define the formulation of problems and research objectives, then identify the dependent variable and the independent variable (waste of waiting, processing, defect, searching time, motion, inventory, transportation). Then collect research data which includes warehousing process flow data, warehousing activity time data, questionnaire data and waste questionnaire distribution. The next step is to process the data., creation of initial Big Picture Mapping, recapitulation and breakdown of questionnaire results, creation and analysis of Process Activity Mapping (PAM), creation of Fishbone Diagram, identification and analysis of the causes of waste. Then make an improvement suggestion with Process Activity Mapping (PAM) simplification, creation of Big Picture Mapping proposal, application of Kaizen method (5S).

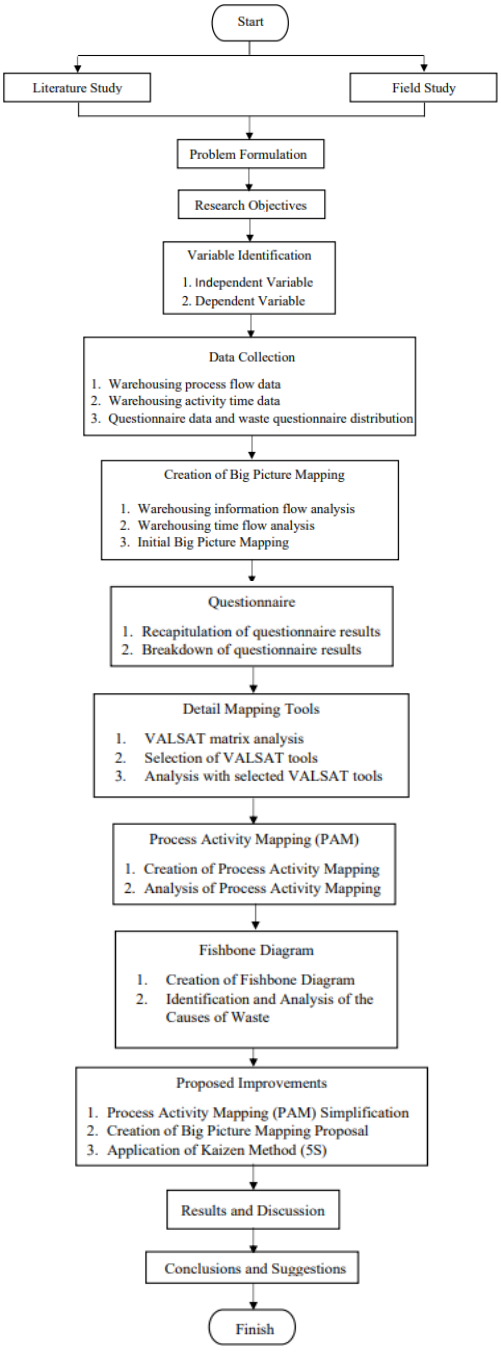

Figure1. Flowchart Analysis
(Source: research method)

4. RESULT AND DISCUSSION

4.1 Warehousing Activity Time Data

Based on the information that has been collected and obtained, starting from the inbound and outbound processes, the time data and the number of activities are known as in Tables 1 and 2.

Table 1. Inbound information data warehousing activity time

No.	Activities	Time
	RECEIVING	
1.	Submit the road letter to security	2 minutes
2.	Identity recording	5 minutes
3.	Checking numbers, seals, and matching data	5 minutes
4.	Documentation capture	3 minutes
5.	Container and vehicle checks	3 minutes
6.	Recording the road letter and packinglist to the warehouse admin	6 minutes
7.	Truck numbering	3 minutes
8.	Copy packinglist	3 minutes
9.	Handover from admin copy packinglist to checker	2 minutes
10.	Giving instructions to the checker	2 minutes
11.	Truck enters place as instructed	7 minutes
12.	Preparation and placement of pallets according to needs	9 minutes
13.	Seal unloading (checker, admin, and TKBM)	5 minutes
14.	Checking the inside of the container	3 minutes
15.	Checking goods (checker, admin, and operator)	4 minutes
16.	Documentation capture	3 minutes
17.	Checking containers and vehicles	3 minutes
	PUT-AWAY	
18.	The process of lifting goods from containers to pallets and heading to the storage warehouse (checker, admin, and TKBM)	125 minutes
	STORAGE	
19.	Checking of goods that have been placed in place by officers	10 minutes
20.	Filling out the put-away list form	4 minutes
21.	Signing of put-away list by checkers and operators	2 minutes
22.	Submission of all data to the admin	3 minutes
23.	Input item storage location	5 minutes
Total time		**217 minutes**

(Source: Warehousing data PT. Asia Plastik, 2023)

Table 2. Outbound information data warehousing activity time

No.	Activities	Time
	PICKING	
1.	Receipt of goods retrieval data	3 minutes
2.	Record identity and letters	5 minutes
3.	Checking truck condition, number, and corresponding data	5 minutes
4.	Documentation capture	3 minutes
5.	Checking containers and vehicles	3 minutes
6.	Submission of goods release letter and road letter to admin	2 minutes
7.	Checking the list of item data with the available data	3 minutes
8.	Copy of goods release instruction	2 minutes
9.	Handover of copy of dispensing instruction from admin to checker	2 minutes
10.	Instruct the checker to do the picking and loading process	3 minutes
11.	Trucks enter the warehouse according to their place	7 minutes
12.	Checking truck condition, number, and corresponding data	5 minutes
13.	Documentation capture	3 minutes
14.	Checking containers and vehicles	3 minutes
15.	Preparation for picking goods (checker, admin, and TKBM)	9 minutes
16.	Checking the placement of goods	4 minutes
17.	Checking whether or not the goods to be entered are in accordance with the picking doc.	10 minutes
	SHIPPING	
18.	The process of moving goods from the warehouse to the container (checker, admin, and TKBM)	95 minutes
19.	Documentation capture	3 minutes
20.	Checking containers and vehicles	3 minutes
21.	Filling out the put-away list form	4 minutes
22.	Signing of put-away list by checkers and operators	2 minutes
23.	Submission of all data to the admin	3 minutes
24.	Input data according to the put-away list	5 minutes
25.	Truck briefing to exit	3 minutes
26.	Truck check	3 minutes
27.	Recording time-out data and other supporting data	9 minutes
Total time		**202 minutes**

(Source: Warehousing data PT. Asia Plastik, 2023)

4.2 Initial Big Picture Mapping

After obtaining data on warehousing activities and time, the next step is to create an initial Big Picture Mapping or also called a base map of the entire existing process.

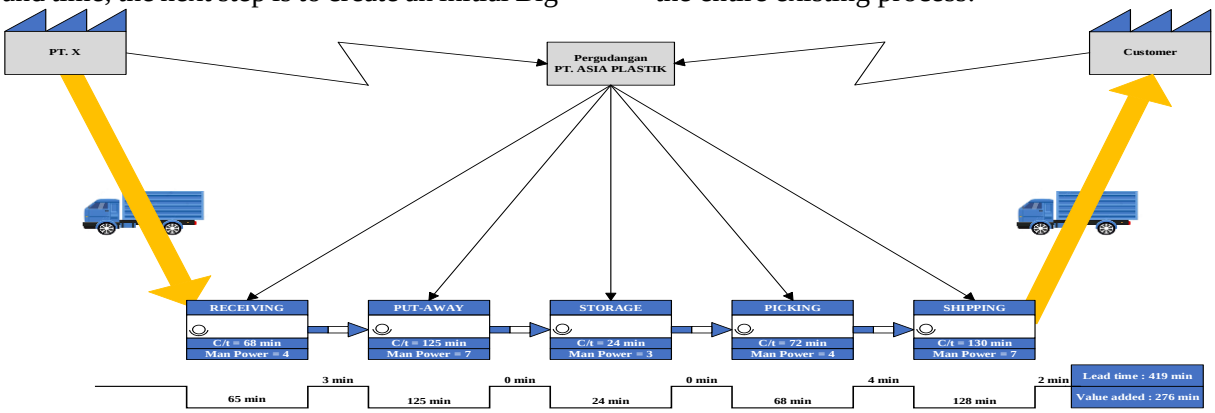

Figure 2. Initial big picture mapping
(Source: processed data, 2023)

4.3 Questionnaire

With a questionnaire that has been distributed to warehousing employees of PT Asia Plastik, then ranking is carried out according to the waste obtained through the respondents' answers. And then this is the results of the questionnaire regarding waste in the warehouse of PT Asia Plastik:

Table 3. Questionnaire calculation results

Respondents	Type of Waste						
	Waste of Waiting	Waste of Processing	Waste of Defect	Waste of Searching Time	Waste of Motion	Waste of Inventory	Waste of Transportation
1.	5	1	3	4	3	3	2
2.	4	2	3	4	3	3	1
3.	5	3	4	4	3	3	2
4.	4	2	3	4	3	2	2
5.	5	2	3	4	4	3	1
6.	4	2	2	3	3	3	2
7.	5	2	3	4	3	4	2
8.	5	2	4	4	2	3	1
9.	5	2	3	4	1	3	2
10.	5	2	4	4	3	4	2
11.	4	2	4	4	3	2	2
12.	4	2	4	5	3	3	2
13.	4	1	3	5	3	3	2
14.	4	3	2	5	3	3	2
15.	4	1	3	4	2	2	2
16.	5	2	3	4	3	3	1
17.	4	1	2	4	3	3	2
18.	5	3	3	4	3	2	1
19.	4	2	3	5	3	4	2
20.	4	2	3	3	4	2	1
21.	5	2	3	4	4	3	2
22.	4	1	3	4	4	3	1
23.	5	2	3	4	4	3	2
24.	4	2	3	3	3	3	2
25.	5	3	4	5	4	4	3
Average	**4.48**	**1.96**	**3.12**	**4.08**	**3.08**	**2.96**	**1.76**
Ranking	**1**	**6**	**3**	**2**	**4**	**5**	**7**

(Source: procesed data, 2023)

According to Table 3 a, it is obtained that waste that has a ranking weight in order of ranking 1 to 7 is Waste of Waiting, Waste of Searching Time, Waste of Defect, Waste of Motion, Waste

of Inventory, Waste of Processing, Waste of Transportation.

4.4 Value Stream Analysis Tools

The results of the calculation of the score value obtained through the questionnaire results, then data processing is carried out. Data processing of the average score results will be processed with Value Stream Analysis Tools (VALSAT) to determine what tools to use. The Value Stream Analysis Tools (VALSAT) matrix obtained will be processed by multiplying the average score of the questionnaire by the value in the column contained in the VALSAT matrix.

Table 4. VALSAT score calculation

No.	Type of waste	Value	VALSAT						
			PAM	SCRM	PVF	QFM	DAM	DPA	PS
1.	Waste of waiting	4.48	40.32	40.32	4.48	-	13.44	13.44	-
2.	Waste of processing	1.96	17.64	-	5.88	1.96	-	1.96	-
3.	Waste of defect	3.12	3.12	-	-	28.08	-	-	-
4.	Waste of searching time	4.08	36.72	-	-	-	-	-	-
5.	Waste of motion	3.08	27.72	3.08	-	-	-	-	-
6.	Waste of inventory	2.96	8.88	26.64	8.88	-	26.64	2.96	2.96
7.	Waste of transportation	1.76	15.84	-	-	-	-	-	1.76
Total Value			**150.24**	**70.04**	**19.24**	**30.04**	**40.08**	**18.36**	**4.72**
Ranking			**1**	**2**	**5**	**4**	**3**	**6**	**7**

(Source : processed data, 2023)

According to table 4 above, the tool that has the highest VALSAT value is Proces Activity Mapping (PAM) with a VALSAT value total of 150,24. Therefore, Process Activity Mapping (PAM) was selected and analyzed further.

4.5 Process Activity Mapping (PAM)

Table 5. Process activity mapping

No.	Activities	Machines	Time (minutes)	Labour (people)	Activity					Category (VA/NVA/ NNVA)
					O	T	I	S	D	
	RECEIVING									
1.	Submit the road letter to security		2	1					✓	NNVA
2.	Identity recording		5	1	✓					VA
3.	Checking numbers, seals, and matching data		5	1			✓			NNVA
4.	Documentation capture		3	1					✓	NVA
5.	Container and vehicle checks		3	2			✓			NNVA
6.	Recording the road letter and packinglist to the warehouse admin		6	2	✓					VA
7.	Truck numbering		3	1					✓	NVA
8.	Copy packinglist		3	1	✓					VA
9.	Handover from admin copy packinglist to checker		2	2					✓	NVA
10.	Giving instructions to the checker		2	2	✓					NNVA
11.	Truck enters place as instructed		7	1					✓	NNVA
12.	Preparation and placement of pallets according to needs	Forklift	9	2	✓					NNVA
13.	Seal unloading (checker, admin, and TKBM)		5	3	✓					VA
14.	Checking the inside of the container		3	3			✓			NNVA
15.	Checking goods (checker, admin, and operator)		4	3			✓			NNVA
16.	Documentation capture		3	1	✓					VA
17.	Checking containers and vehicles		3	2			✓			NNVA
	PUT-AWAY									
18.	The process of lifting goods from containers to pallets and heading to the storage warehouse (checker, admin, and TKBM)		125	7				✓		VA
	STORAGE									
19.	Checking of goods that have been placed in place by officers		10	2			✓			NNVA
20.	Filling out the put-away list form		4	2	✓					VA
21.	Signing of put-away list by checkers & operators		2	2	✓					NNVA
22.	Submission of all data to the admin		3	2					✓	NNVA
23.	Input item storage location		5	1	✓					VA
	PICKING									
24.	Receipt of goods retrieval data		3	2	✓					VA
25.	Record identity and letters		5	1	✓					VA

26.	Checking truck condition, number, & corresponding data		5	1			✓			NNVA
27.	Documentation capture		3	1					✓	NVA
28.	Checking containers and vehicles		3	2			✓			NNVA
29.	Submission of goods release letter and road letter to admin		2	1					✓	NNVA
30.	Checking the list of item data with the available data		3	1			✓			NNVA
31.	Copy of goods release instruction		2	1	✓					VA
32.	Handover of copy of dispensing instruction from admin to checker		2	2					✓	NVA
33.	Instruct the checker to do the picking and loading process		3	2	✓					NNVA
34.	Trucks enter the warehouse according to their place		7	1					✓	NNVA
35.	Checking truck condition, number, and corresponding data		5	1			✓			NNVA
36.	Documentation capture		3	1	✓					VA
37.	Checking containers and vehicles		3	2			✓			NNVA
38.	Preparation for picking goods (checker, admin, and TKBM)		9	3					✓	NVA
39.	Checking the placement of goods		4	2			✓			NNVA
40.	Checking whether or not the goods to be entered are in accordance with the picking doc.		10	3			✓			NNVA
	SHIPPING									
41.	The process of moving goods from the warehouse to the container (checker, admin, and TKBM)	Forklift	95	7		✓				VA
42.	Documentation capture		3	1	✓					VA
43.	Checking containers and vehicles		3	2			✓			NNVA
44.	Filling out the put-away list form		4	1	✓					VA
45.	Signing of put-away list by checkers and operators		2	2	✓					NNVA
46.	Submission of all data to the admin		3	2					✓	NNVA
47.	Input data according to the put-away list		5	1	✓					VA
48.	Truck briefing to exit		3	1					✓	NVA
49.	Truck check		3	1			✓			NNVA
50.	Recording time-out data and other supporting data		9	1					✓	NNVA
Total			**419**	**25**	**19**	**1**	**15**	**1**	**14**	**VA=16 NVA=7 NNVA=27**

(Source: processed data, 2023)

The Proces Activity Mapping (PAM) processing result is the number of all activities in warehousing activities from receiving to shipping. The results of the calculation of the percentage and time of warehouse activity frequency are known as in Table 6.

Table 6. Percentage of warehouse activity frequency and time

No.	Activity	Frequency	Frequency Percentage	Time (minutes)	Time Percentage
1.	Operation	19	38%	74	17.66%
2.	Transportation	1	2%	95	22.68%
3.	Incpection	15	30%	67	15.99%
4.	Storage	1	2%	125	29.83%
5.	Delay	14	28%	58	13.84%
Total		**50**	**100%**	**419**	**100%**

(Source : procesed data, 2023)

The results of the calculation of the percentage of frequency and time for each activity type based on VA, NVA, and NNVA are known as in Table 7.

Table 7. Percentage of frequency and time of each activity type

No.	Activity Type	Frequency	Frequency Percentage	Time (minutes)	Time Percentage
1.	Value Added	16	32%	276	65.87%
2.	Not Value Added	7	14%	25	5.97%
3.	Neccesery Not Value Added	27	54%	118	28.16%
	Total	**50**	**100%**	**419**	**100%**

(Source : processed data, 2023)

4.6 Fishbone Diagram

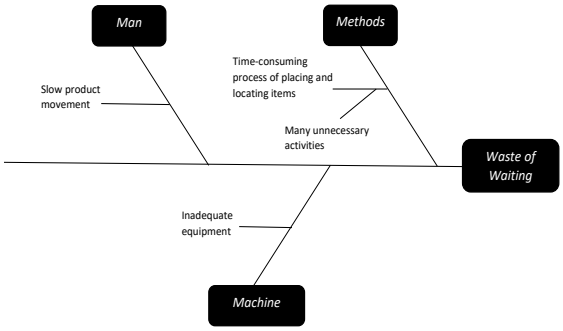

Figure 3. Fishbone diagram waste of waiting
(Source: processed data, 2023)

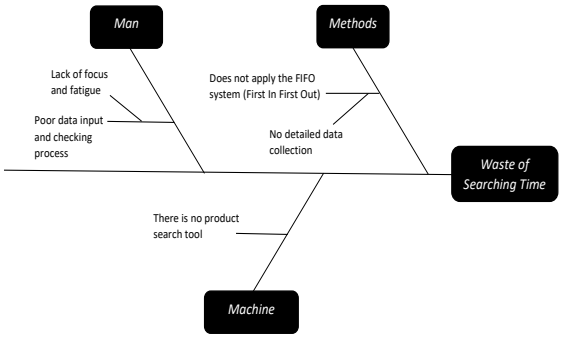

Figure 4. Fishbone diagram waste of searching time
(Source: processed data, 2023)

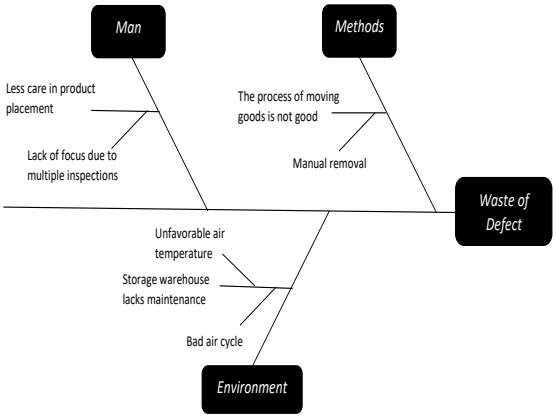

Figure 5. Fishbone diagram waste of defect
(Source: processed data, 2023)

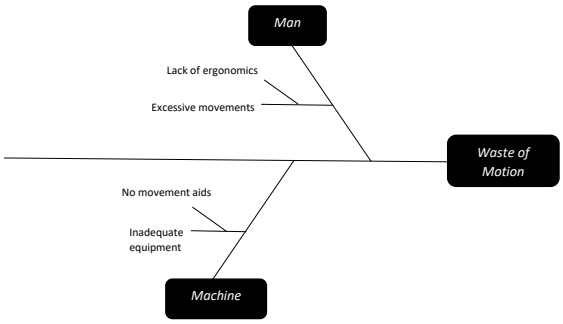

Figure 6. Fishbone diagram waste of motion
(Source: processed data, 2023)

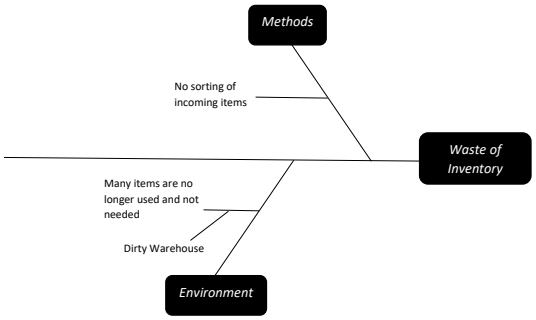

Figure 7. Fishbone diagram waste of inventory
(Source: processed data, 2023)

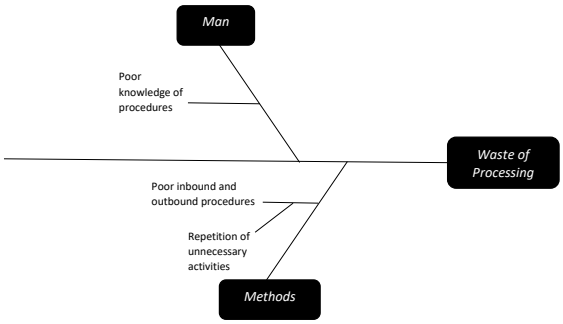

Figure 8. Fishbone diagram waste of processing
(Source: processed data, 2023)

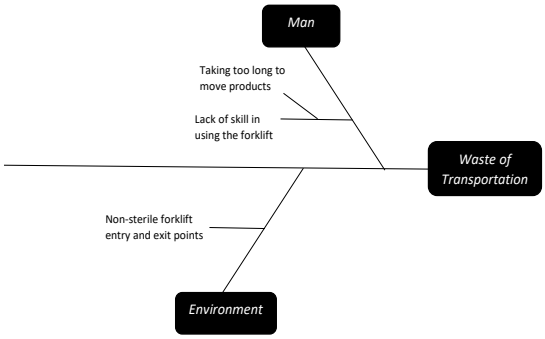

Figure 9. Fishbone diagram waste of transportation
(Source: processed data, 2023)

From Figure 3-9 the fishbone diagram above is the root cause of each type of waste studied, namely Waste of Waiting, Waste of Searching Time, Waste of Defect, Waste of Motion, Waste of Inventory, Waste of Processing, Waste of Transportation. Where the root data from the causal diagram is derived through a variety of sources, namely, first by conducting direct observations at the company's warehouse, and identifying the factors that are the root causes of waste. Second, derived from qualitative data collection such as interviews with managers or staff, to obtain their insights and perspectives.

4.7 Simplification of Process Activity Mapping (PAM)

After several analyzes that have been carried out previously, suggestions for improvement results are obtained, taking into account several recommendations, including the following: **Receiving Activity:** (i) In the 4th activity of taking documentation is omitted because it can be done once in the 16th activity of documenting, (ii) In the 5th activity, checking trucks and containers is omitted because it can be done once in the 17th activity to save inspection time, (iii) In the 7th activity, the truck numbering is omitted because when the truck enters, it directly matches the pallet placement, (iv) In the 9th activity can be done at the same time as the instruction activity, (v) In the 12th activity, the preparation and placement of pallets is carried out at the same time as giving instructions, then when the truck enters, it adjusts the presence or place of the pallet, (vi) Activities 14, and 15 can be performed simultaneously to save inspection time. **Put-away Activity:** In the process of lifting from the container to the warehouse area, the time waiting for the forklift to wait for the lifting preparation is obtained. **Storage Activity:** Shorten the time of the 20th activity, data submission to the admin. **Picking Activity:** (i) The 27th activity can be done once only in the 36th activity, (ii) The 28th activity can be done once only in the 35th activity, (iii) Activities 32, 33 and 34 can be done together, (iv) The 37th activity can be done once only in the 35th activity, (v) 38th activity omitted. **Shipping Activity:** (i) The 43rd activity can be done once only in the 49th activity, (ii) 48th activity omitted. From the analysis that has been done, the simplified Process Activity Mapping (PAM) table are known as in table 8 below.

Table 8. Process activity mapping that has been simplified

No.	Activities	Machines	Time (minutes)	Labour (people)	Activity					Category (VA/NVA/ NNVA)
					O	T	I	S	D	
			RECEIVING							
1.	Submit the road letter to security		2	1					✓	NNVA
2.	Identity recording		5	1	✓					VA
3.	Checking numbers, seals, and matching data		5	1			✓			NNVA
4.	Recording the road letter and packinglist to the warehouse admin		6	2	✓					VA
5.	Copy packinglist		3	1	✓					VA
6.	Giving instructions to checkers, and preparing and placing pallets as needed	Forklift	9	2	✓					NNVA
7.	Truck enters the place as instructed		7	1					✓	NNVA
8.	Seal unloading (checker, admin, and TKBM)		5	3	✓					VA
9.	Checking the inside of the container and product		5	3			✓			NNVA
10.	Documentation		3	1	✓					VA
11.	Checking the vehicle		4	2			✓			NNVA
			PUT-AWAY							
12.	The process of lifting goods from containers to pallets and heading to the storage warehouse (checker, admin, and TKBM)		120	7				✓		VA
			STORAGE							
13.	Checking of goods that have been placed in place by officers		10	2			✓			NNVA
14.	Filling out the put-away list form		2	2	✓					VA
15.	Signing of put-away list by checker and operator		2	2	✓					NNVA
16.	Submission of all data to the admin		3	2					✓	NNVA
17.	Input of goods storage location		5	1	✓					VA

				PICKING						
18.	Acceptance of goods collection data		3	2	✓					VA
19.	Recording identity and letters		5	1	✓					VA
20.	Checking goods		5	1			✓			NNVA
21.	Submission of goods release letter and road letter to admin		2	1					✓	NNVA
22.	Checking the list of goods data with the available data		3	1			✓			NNVA
23.	Copy of goods release instruction		2	1	✓					VA
24.	Instructing the checker to load and the truck to enter the warehouse.		7	2	✓					NNVA
25.	Checking the condition of trucks, containers, and appropriate data		6	1			✓			NNVA
26.	Documentation		3	1	✓					VA
27.	Checking the placement of goods		4	2			✓			NNVA
28.	Checking whether or not the goods to be loaded are in accordance with the picking document.		10	3			✓			NNVA
				SHIPPING						
29.	The process of moving goods from the warehouse to the container (checker, admin, and TKBM)	Forklift	95	7		✓				VA
30.	Documentation		3	1	✓					VA
31.	Filling in the put-away list form		2	1	✓					VA
32.	Signing of put-away list by checker & operator		2	2	✓					NNVA
33.	Submission of all data to the admin		3	2					✓	NNVA
34.	Input data according to the put-away list		5	1	✓					VA
35.	Checking trucks		5	1			✓			NNVA
36.	Recording time-out data and other supporting data		9	1					✓	NNVA
	Total		**370**	**25**	**18**	**1**	**10**	**1**	**6**	**VA=16 NVA=0 NNVA=20**

(Source: processed data, 2023)

This is the calculation result of the percentage and time of new warehouse activity frequency consist of operation, transportation, inspection, storage, and delay, are known as in Table 9.

Table 9. Frequency and time percentage of new warehouse activities

No.	Activity	Frequency	Frequency Percentage	Time (minutes)	Time Percentage
1.	Operation	18	50%	72	19.46%
2.	Transportation	1	2.78%	95	25.68%
3.	Incpection	10	27.78%	57	15.41%
4.	Storage	1	2.78%	120	32.43%
5.	Delay	6	16.66%	26	7.02%
	Total	**36**	**100%**	**370**	**100%**

(Source : procesed data, 2023)

The results of the calculation of the percentage of frequency and time for type of new activity based on VA, NVA, and NNVA are known as in Table 10.

Table 10. Frequency and time percentage of each type of new activity

No.	Activity Type	Frequency	Frequency Percentage	Time (minutes)	Time Percentage
1.	Value Added	16	44.44%	276	74.59%
2.	Not Value Added	0	0%	0	0 %
3.	Neccesery Not Value Added	20	55.56%	94	25.41%
	Total	**36**	**100%**	**370**	**100%**

(Source: processed data, 2023)

Therefore, the following are the changes from the old warehousing activity frequency and time to the new warehousing activity frequency and time consist of operation, transportation, inspection, storage, and delay (Table 11).

Table 11. Changes in frequency and time of warehousing activities

No.	Activity	Old Frequency	New Frequency	Old Time (minutes)	New Time (minutes)
1.	Operation	19	18	74	72
2.	Transportation	1	1	95	95
3.	Incpection	15	10	67	57
4.	Storage	1	1	125	120
5.	Delay	14	6	58	26
	Total	**50**	**36**	**419**	**370**

(Source: processed data, 2023)

And the following is the change from the frequency and time of the old activity type to the frequency and time of the new activity type based on VA, NVA, and NNVA (Table 12).

Table 12. Change in frequency and time of each activity type

No.	Activity Type	Old Frequency	New Frequency	Old Time (minutes)	New Time (minutes)
1.	Value Added	16	16	276	276
2.	Not Value Added	7	0	25	0
3.	Neccesery Not Value Added	27	20	118	94
	Total	**50**	**36**	**419**	**370**

(Source: procesed data, 2023)

From the results of simplifying the activities that have been carried out, a total of 36 new activities are obtained compared to 50 old activities, a reduction of 14 activities and then the time gained is 370 minutes which was formerly 419 minutes, saving 49 minutes.

4.8 Big Picture Mapping Proposal

After the simplifications that have been made, the Big Picture Mapping of the proposal is made. Receiving from 68 minutes to 54 minutes. Put-away from 125 minutes to 120 minutes. Storage from 24 minutes to 22 minutes. Picking which was 72 minutes to 50 minutes. Shipping from 130 minutes to 124 minutes. Lead time from 419 minutes to 370 minutes with a Value Added of 276 minutes.

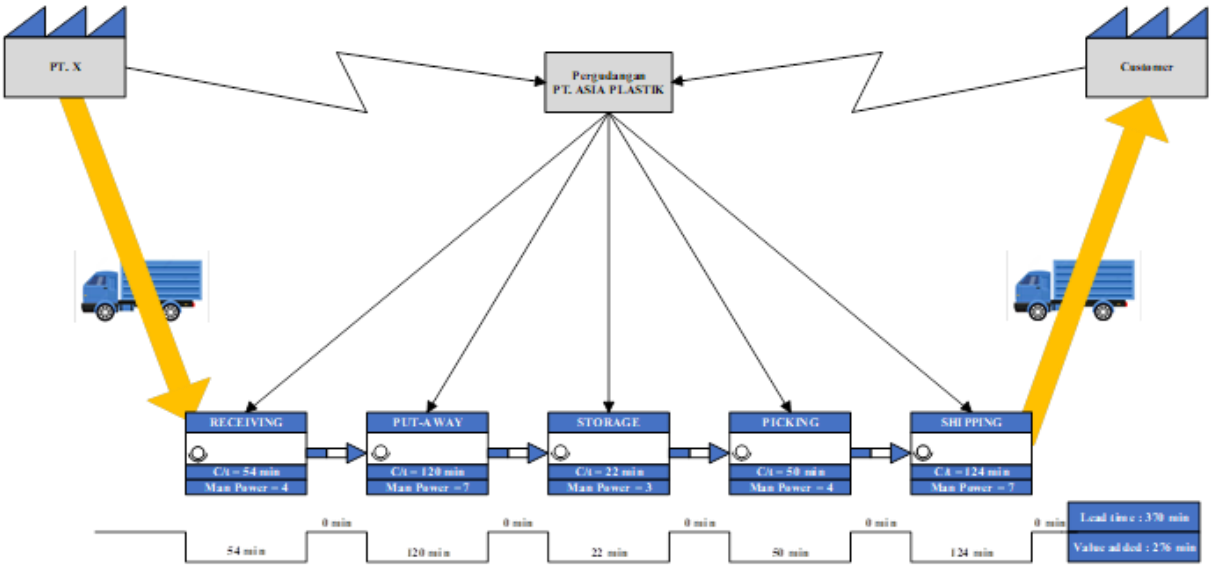

Figure 10. Big picture mapping proposal
(Source: processed data, 2023)

4.9 Proposed Improvements Using 5S

To reduce waste from the previous explanation, improvements are made using 5S (Seiri, Seiton, Seiso, Seiketsu, Shitsuke) including the following:

Table 13. Proposed improvements with 5S

5S	Action	Output
Seiri	Disposing of items that are no longer used to the disposal site	Storage space becomes more efficient, because it is used to store goods that are important and needed
	Implementation of FIFO (first in first out) system	The flow of products in and out becomes clear
	Creation & use of labels and redtags	Sorting products according to arrival date, order and other information
Seiso	Scheduling daily pickets	Inspection and maintenance of cleanliness
	Cleaning up the roads used by forklifts and workers when entering and leaving the warehouse.	Uninterrupted flow of activity
	Make improvements to the condition of the warehouse room and provide a blower to improve air circulation	Better air circulation
	Checking the condition of the warehouse room regularly and consistently.	If there is a damaged condition of the warehouse room, it can be repaired immediately
Seiton	Product placement according to product arrival	Product placement location is good so that the search for goods is fast
	The grouping of finished products is carried out according to the shipping clusters	Facilitate and speed up workers when moving products
	Arrangement and provision of lines / lines for pedestrians and for the passage of forklifts	Inbound and outbound activities are not interrupted
	Pallet arrangement of finished products properly	To keep products from being easily damaged
	Provision of lifting aids such as webbingsling or roundsling	Save search time and make it easier for workers so that there are not many wasted movements, not easily tired, and ergonomically not easily tired
Seiketsu	Providing knowledge sharing about procedures directly	Understanding of procedures for workers
	Conducting periodic group discussion forums	Consistent understanding of procedures for workers
	Conducting periodic audits	Create standardization and all individuals must comply with the predetermined standards
Shitsuke	Maintenance of employees' personal discipline	All company employees can understand the usefulness of 5S as a basis for company progress
	Implementing the 5S program consistently and maintaining the 5S program that is already running	Efficiency, all activities run well, good service, and increased productivity and profits

(Source: processed data, 2023)

With the Lean Warehousing method and improvements with the Kaizen (5S) method, companies can consider implementing the improvement recommendations that have been given to reduce waste that occurs in the warehousing process so that it becomes effective and efficient.

5. CONCLUSION

From the results of simplifying the activities that have been carried out and making the Big Picture Mapping proposal, a total of 36 new activities are obtained compared to the old 50 activities, a decrease of 14 activities. Then the time gained is 370 minutes which was formerly 419 minutes, saving 49 minutes. Proposed improvements to PT Asia Plastik's warehousing using the Kaizen method are Seiri (sorting); sorting items that are no longer used and disposing of them, implementing the FIFO (first in first out) system, making and using labels and redtags. Seiso (cleaning); scheduling daily pickets, cleaning the forklift path, providing blowers, checking the condition of the warehouse room regularly and consistently. Seiton (structuring); placement of products according to product arrival, grouping of finished products according to delivery clusters, providing lines for the passage of forklifts and pedestrians, arranging pallets on finished products properly, providing lifting aids such as webbingsling or roundsling. Seiketsu (stabilization); providing direct knowledge sharing of procedures, conducting periodic group discussion forums, conducting periodic audits. Shitsuke (habituation); maintenance of employees' personal discipline, implementing the 5S program consistently and maintaining the 5S program that is already running. Recommendations for future researchers are expected to use data with more detail and detail so that the problems analyzed can be more complex and accurate.

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