ITEJ
Information Technology Engineering Journals
eISSN : 2548-2157

Url : https://syekhnurjati.ac.id/journal/index.php/itej
Email : itej@syekhnurjati.ac.id

Warehousing Process Flow Analysis Using Lean Warehousing Approach For Waste Minimization At PT XYZ

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This study aims to identify and minimize waste in the warehousing process at PT XYZ by applying a lean warehousing approach. The methodology used includes process analysis using VSM and PAM techniques to find and classify various major wastes that occur during warehousing activities. Wastes identified include excessive lead times, inefficient movements, defects in material management, as well as unnecessary excess inventory, all of which hinder process flow and reduce warehouse operational effectiveness. The results of the analysis show that most of the waste is caused by processes that are not well organized and there are still activities that do not add value. Through the implementation of improvements based on the principle of lean warehousing, the warehousing process has experienced a significant improvement. The overall process time was successfully accelerated, and the process efficiency rate increased by more than 25%. In addition, the implementation of measures such as 5S and process reorganization also contribute to improving the organization and cleanliness of the work area. This study shows that the use of the lean warehousing approach is able to provide effective solutions in reducing waste and increasing warehouse productivity and operational efficiency, so that it can be used as a reference for other companies in optimizing warehousing management, especially in the electricity distribution sector. It is hoped that the results of this study can provide practical and academic benefits, supporting the development of more efficient and integrated warehouse management practices.

Keywords— 5S, Lean Warehousing, PAM, Seven Waste, VSM

I. INTRODUCTION

PT XYZ is one of the important units in the provision and maintenance of electricity infrastructure in Indonesia. To support its operational activities, the unit manages an MRO (Maintenance, Repair, and Operations) type warehouse that stores various important materials such as transformers, cables, connectors, and other electrical components. These materials play a strategic role in supporting the construction of new networks and maintenance of existing networks. However, the warehousing system used still faces various obstacles, such as high waiting times, distribution delays, and inventory buildup. These problems are caused by the unoptimized warehouse management system, unstructured mapping of storage locations, and inefficient operational activities, resulting in various types of waste that hinder the efficiency of the process flow. The lean warehousing approach offers a systematic solution to identify and reduce non-value-added activities in the warehousing process [1]. Bestari dan Fatma (2020) menunjukkan bahwa penerapan Value Stream Mapping (VSM) mampu menghemat waktu proses penerimaan barang hingga 47,8% dengan mengidentifikasi aktivitas pemborosan [2]. In addition, research by Dzulkifli and Ernawati (2021) proves that the application of Process

Activity Mapping (PAM) and 5S principles can streamline the number of activities from 45 to 34 and reduce process time by 18 minutes [3]. Although various studies have proven the effectiveness of lean approaches in warehousing, most of the research is still focused on the manufacturing sector or general logistics. Until now, studies that specifically apply lean warehousing concepts to MRO warehouses in the electricity sector, especially in distribution units such as PT PLN UP3 Sidoarjo, are still very limited. Therefore, this research aims to fill the gap by applying Value Stream Mapping (VSM) and Process Activity Mapping (PAM) methods in the context of electricity warehouse. In addition, this research also develops operational improvement proposals based on lean warehousing principles, which are strengthened by the implementation of the 5S method.

II. RELATED WORKS

A. Warehouse

A warehouse is a place that functions as a storage area for various types of goods, both on a large and small scale, for a certain period of time[4]. The warehouse is very important in ensuring the availability of goods when needed, both in order to support the production process and for distribution purposes to customers [5]. In another context, a warehouse can also be interpreted as a storage location for products from the time they are produced until the time they are needed, including as a buffer between the production process and workstations in a manufacturing facility [6][7].

B. Waste

Waste refers to any activity in a process that does not provide added value, but still consumes resources such as time, energy, and costs[8]. The existence of waste in a system can hinder performance and reduce operational efficiency [3][9]. The main activities that take place in the warehouse include the process of receiving goods (receiving), placing goods into storage locations (putting away), storage (storage), order picking (order picking), to shipping goods (shipping) [10]. The Seven Waste concept identifies seven main forms of waste that are common in manufacturing and service processes, namely excessive transportation, excess inventory, unnecessary motion, waiting time, overproduction, overprocessing, and defect [11].

C. Lean Warehousing

Lean is an approach that focuses on continuous improvement with the main objective of eliminating waste and increasing the added value of products, so as to provide maximum benefits to customers[12]. The essence of lean is to increase value for customers by improving the ratio between value-added activities and non-value-added activities[2], [13]. When applied in warehousing activities, the lean concept can contribute to increasing value as well as decreasing operational costs, because activities in the warehouse are not only a cost center, but can also be a source of competitive advantage in achieving more optimal service levels. In addition, the application of lean warehousing also has a positive impact on the improvement process both inside and outside the company [14].

D. Value Stream Mapping (VSM)

Value Stream Mapping (VSM) is a tool used to thoroughly understand the flow of information and physical flow in warehousing activities [15]. VSM is a mapping method that aims to identify various activities in the manufacturing process, both those that provide added value and those that do not, making it easier to trace the root of the problems that occur in the process[16]. VSM is divided into two types, namely Current State Map and Future State Map. Current State Map is used to describe the overall condition of the ongoing process[17]. In the context of warehousing, the application of VSM is not only useful for mapping the flow of goods and information, but also helps provide a clearer visualization of the entire ongoing operational process[18].

E. Process Activity Mappipng (PAM)

Process Activity Mapping (PAM) is a method used to describe in more detail the elements that have been mapped in Value Stream Mapping, with the aim of identifying activities that take longer than others [2], [19]. This method helps in analyzing the proportion of each activity in the warehouse based on categorization into Value Added (VA), Non-Value Added (NVA), and Necessary Non-Value Added (NNVA). In addition, each activity in the process is classified into five main categories, namely operation, transportation, inspection, storage, and waiting time. Through this classification, the waste that occurs in each activity can be recognized and analyzed further [1].

F. 5S

5S is a workplace management method originating from Japan and is often applied in the Lean concept to increase efficiency and productivity [20]. As part of a lean strategy, 5S aims to create an organized, clean, and more effective work environment by reducing waste in the work process [3]. he five main elements in the 5S method and their explanations are as follows:

a. Seiri:Sorting items that are necessary and getting rid of those that are not.
b. Seiton:Arranging items so that they are easy to find and use.
c. Seiso: Cleaning the work area regularly.
d. Seiketsu: Maintaining cleanliness and order through standardization.
e. Shitsuke:Fostering discipline to consistently implement 5S.

III. METHOD

A. Stages of Data Collection

1) Identification and Definition of Operational Variables

The identification of variables in this study was carried out to determine the variables measured based on data from PT XYZ. These variables are bound variables and independent variables.

a. *Independent Variables*
   1. Warehousing activity process flow data
   2. Warehousing activity process time data
   3. Questionnaire attribute data

b. *Bound Variables*

The bound variable in this study is the minimum level of waste that occurs in the PT XYZ warehouse.

2) Data Collection Techniques

a. Field Studies

   At this step, a field study is carried out on the elements that are influential in the waste of warehousing process flow.

b. Literature Studi

   Data collection and study and seek information about risks and related issues.

c. Interview

Interview dilakukan oleh peneliti untuk mendapatkan informasi tentang aktivitas pergudangan dan pemborosan yang terjadi pada gudang PT XYZ.

B. Research Flowchart

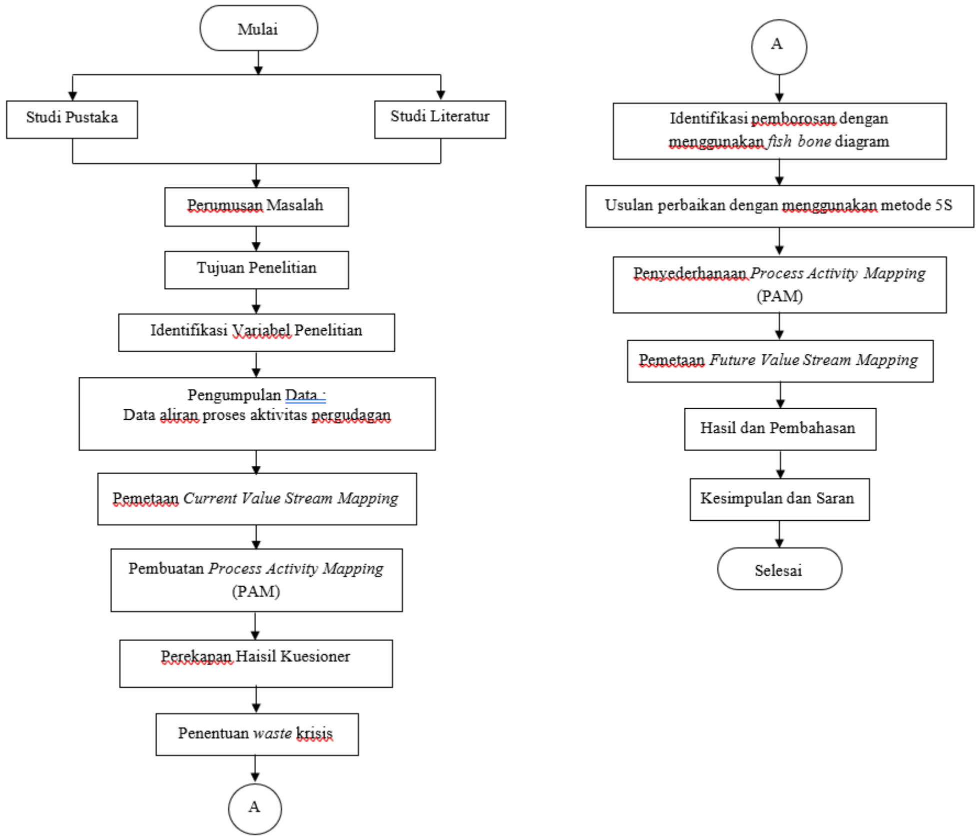

Figure 1. Flowchart

Research Flowchart This figure presents the overall research flow, outlining the systematic steps taken in this study. The research starts from literature study, problem formulation, to variable identification. Data was collected through observation of warehouse activities and distribution of questionnaires. Furthermore, Current Value Stream Mapping (CVSM) and Process Activity Mapping (PAM) were conducted to identify waste. The main wastes were analyzed with fishbone diagrams, then improvement proposals were made using the 5S method. Evaluation was conducted by remapping through Future Value Stream Mapping (FVSM) to see the impact of improvements. The study ends with a discussion, conclusions, and suggestions.

IV. Result and Discussion

A. Data Warehousing Acttivvity Process Flow

Warehousing activity process time data is obtained by several direct observations. The number of observations will be averaged to get the time of each activity.

Table 1. Data Warehousing Activity Process Flow

No	Activity	Time (Minutes)	Activity Type
	Material Receiving and Inspection		
1.1	Materials from suppliers arrive at the warehouse receiving area	8	VA
1.2	Officers verify the physical condition of materials and documents (PO and road letter)	9	VA
1.3	Check the number and type of materials according to the documents	12	VA
1.4	Operator inputs data to the system as incoming stock	6	VA
1.5	Operator matches PO data with manual receipt from supplier	9	NNVA
1.6	Operator waits for manual check form before inputting data	20	NVA

	Material transfer to warehouse storage area		
2.1	Waiting for an order to move goods	10	NVA
2.2	Waiting for the operator to move the material	10	NNVA
2.2	Transfer of materials to the storage aisle area using tools/manual handling	15	VA
	Material Storage		
3.1	Searching for empty racks for material storage	12	NVA
3.2	Preparing empty racks to store materials	7	NNVA
3.3	Moving materials from the aisle floor to the storage rack	20	VA
3.4	Recording product name, storage location, and quantity on the stock card	6	VA
3.5	Placing the stock card on the storage rack	7	NNVA
	Material Request by Work Unit		
4.1	Waiting for material requests to come in (via system/manual)	4	VA
4.2	The officer searches for materials in the system	7	VA
4.3	The staff searches for items on the shelves according to the request.	10	VA
	Material Retrieval and Preparation		
5.1	The officer waits for the order to pick up the goods	14	NNVA
5.2	Petugas menyiapkan alat bantu untuk mengambil material	17	NVA
5.3	The officer prepares tools to assist in retrieving the material.	18	VA
5.4	Materials are taken to the staging area	10	VA
5.5	Materials are waiting because there is no delivery note/approval yet.	20	NVA
5.6	Recheck the quantity and type of material before shipping	13	VA
	Creation of Delivery Order		
6.1	Inputting delivery order data (type of goods, quantity, and destination) into the system and checking its accuracy	8	VA
6.2	Printing the delivery note and completing it with supporting documents	7	NNVA
6.3	Waiting for the division head's signature and making corrections	17	NNVA
6.4	Archiving a copy of the delivery order and handing it over to the shipping officer	7	NNVA
	Delivery to Destination Location		
7.1	Materials are loaded onto the vehicle	7	VA
7.2	Security check	7	NNVA
7.3	The driver waits in line to exit the warehouse	16	NVA
7.4	Inputting material output data into the system	5	VA
	Total waktu	338	

B. Current Value Stream Mapping

Current Value Stream Mapping (CVSM) is a visual mapping technique used to describe the real conditions of material and information flow in a process, including activities in the warehouse.

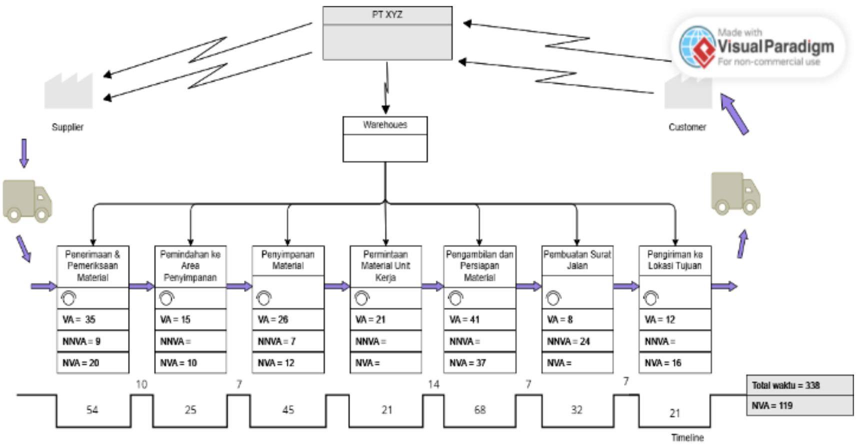

Figure 2. CVSM

Based on the Current Value Stream Mapping (Figure 2), it is known that the total warehousing activity time at PT XYZ reaches 338 minutes, with a non-value-added activity (NVA) time of 119 minutes. The Process Cycle Efficiency (PCE) calculation shows a value of 46.74%, which indicates that the process flow in warehousing activities has not been running efficiently. This is because the PCE value is still below the optimal efficiency threshold, which is 50%, so improvement efforts are needed in the warehousing process flow.

C. Process Activity Mapping Creation

This process describes the warehousing flow process activities using Process Activity Mapping before the proposed improvements to the PT XYZ warehousing process.

Table 2. Summary of PAM Mapping Result

No.	Activity Category	Total Activity	Total Time (minutes)	Persentage Activity	Persentage Time
1	*Value Added* (VA)	16	158	51.6%	46.7%
2	*Non Value Added* (NVA)	6	95	19.4%	28.1%
3	*Necessary Non Value Added* (NNVA)	9	85	29.9%	25.1%
	Total	31	338	100%	100%
1	*Operation*	8	59	25.8%	17.5%
2	*Transportation*	7	88	22.6%	26%
3	*Inspection*	6	62	19.4%	18.3%
4	*Storage*	1	7	3.2%	2.1%
5	*Delay*	9	122	29%	36.1%
	Total	31	338	100%	100%

D. Summary of Questionnaire Results

Identification of the most critical waste is done by calculating the average weight of the results of respondents' answers to each waste attribute. After all attribute weights are obtained, the next step is to rank them based on the weight value, starting from the highest to the lowest.

Table 3. Weighting Ranking Questionnaire Results

No	*Waste*	Waste Atribute	Respondent's Score				Wight	Rank
			1	2	3	4		
1	Transportation 1	How often is the movement of goods done manually?	2	2	2	2	3.75	12
2	Transportation 2	How often is there an inefficient warehousing transportation path?	3	3	3	2	3.75	8
3	Excess Inventory 1	How often do the various types and quantities of products sold have limited product storage space?	2	2	2	1	3.75	14
4	Excess Inventory 2	How often is the accumulation of product inventory in the warehouse that is rarely needed so that it	4	3	3	3	3.5	5

		becomes unnecessary inventory?						
5	Excess Inventory 3	How often are goods placed on distribution channels?	3	3	2	2	3.25	9
6	Excess Inventory 4	How often are goods placed in an unorganized manner?	4	3	3	2	3.25	7
7	Unnecessary Motion 1	How often is there back-and-forth movement caused by product layouts that change frequently?	4	4	3	3	3	4
8	Unnecessary Motion 2	How frequent is the movement of workers back and forth due to inefficient warehouse layout?	4	4	4	3	2.75	3
9	Waiting Time 1	How often is there a delay in moving goods?	3	2	2	2	2.5	11
10	Waiting Time 2	How often is there a lack of coordination between workers?	1	2	1	2	2.5	15
11	Waiting Time 3	How often is there waiting time for the next process?	4	4	4	3	2.25	1
12	Waiting Time 4	How often are operators less dexterous and sluggish in carrying out their work?	2	2	1	1	2	16
13	Over Production 1	How often does the purchase of materials exceed demand?	3	3	4	3	2	6
14	Over Production 2	How often is the storage of large quantities of goods due to Minimum Order Quantity (MOQ)?	3	2	2	3	1.75	10
15	Over Processing 1	How often is there repetitive material	2	1	1	2	1.5	17

		inspection?						
16	Over Processing 2	How often is there an excessive administrative process?	2	1	2	1	1.5	18
17	Defect 1	How often is material placement incorrect?	4	3	4	4	1.5	2
18	Defect 2	How often are Forklift lanes not clean or blocked?	1	2	2	3	1.5	13
19	Defect 3	How often is the movement of goods done manually?	2	1	1	2	1.5	19
20	Defect 4	How often is there an inefficient warehousing transportation path?	2	2	1	1	1.5	20

E. Identify The Causes of Waste Using Fishbone Diagram

The fishbone diagram is used as a tool to identify the root causes of wastage that occur in the warehousing process flow, with the aim of formulating appropriate improvement solutions. This analysis was carried out on the five types of waste that appear most frequently, namely: waiting time 3, defect 1, unnecessary motion 2, unnecessary motion 1, and excess inventory 2.

a. Waiting time for the next process (Waiting Time 3)

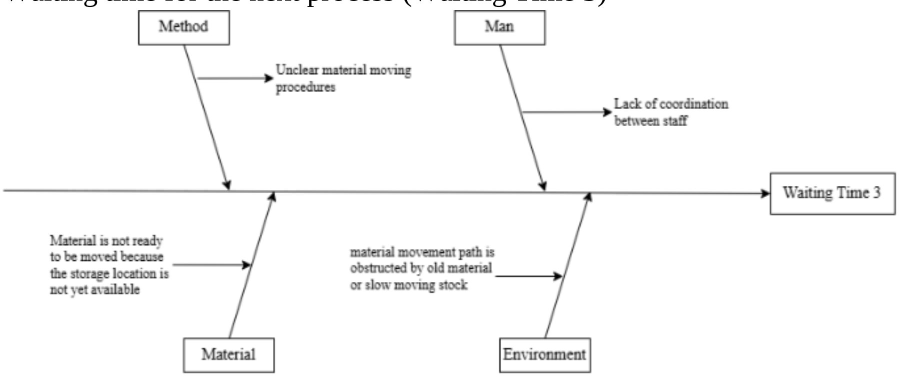

Figure. 3 Fishbone Diagram Waiting Time 3

b. Placement of materials that are not in the right place (Defect 1)

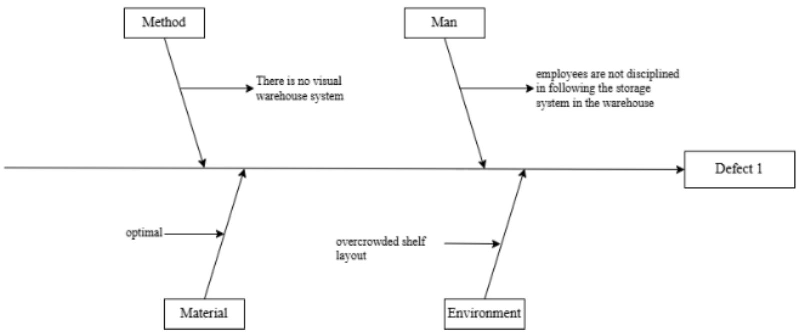

Figure. 4 Fishbone Diagram Defect 1

c. Back and forth movement of workers due to inefficient warehouse layout (Unnecessary Motion 2)

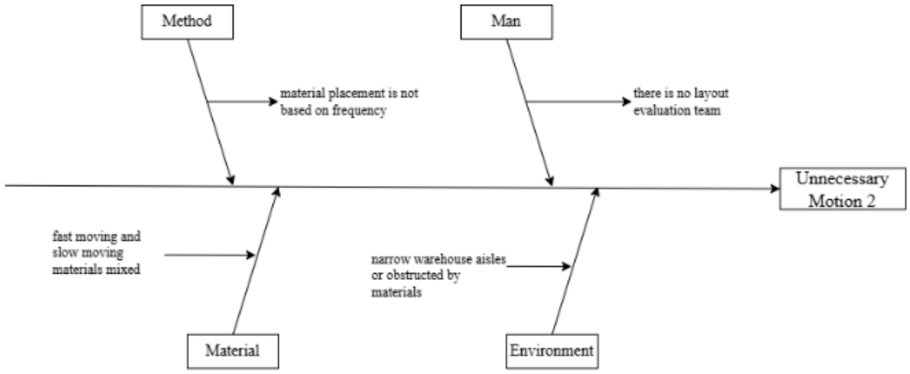

Figure. 5 Fishbone Diagram Unnecessary Motion 2

Back and forth movement of workers due to frequently changing material arrangements (Unnecessary Motion 1))

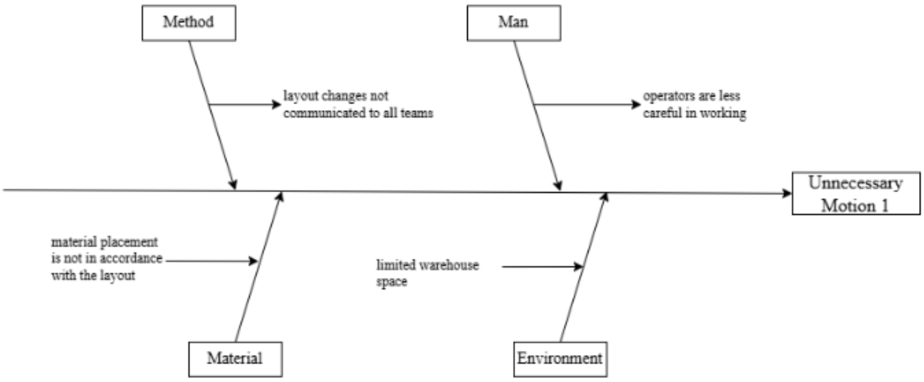

Figure. 6 Fishbone Diagram Unnecessary Motion 1

d. Accumulation of inventory of products or materials in the warehouse that are rarely needed (Excess Inventory 2)

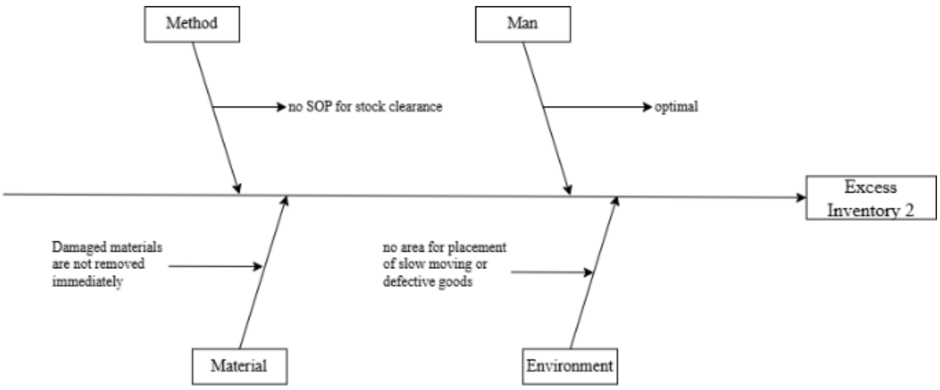

Figure. 7 Fishbone Diagram Excess Inventory 2

F. 5S Improvement Proposals

a. Waiting time for the next process (Waiting Time 3)

Table 4. Table Proposed Improvement Waiting Time 3

No	Factors	Cause	Proposed Improvement
1	*Man*	Lack of coordination between officers in the material transfer process	Apply the Seiton (Set in Order) principle is applied by compiling a clear SOP for coordination between officers, equipped with a systematic flow of communication, so that each officer understands their respective responsibilities and can coordinate quickly without waiting for further instructions.
2	*Method*	Unclear material transfer procedures	Apply the Seiri (Sort) principle to sort out old ineffective procedures and recast new procedures that are standardized, easy to understand, and outlined in concise yet informative work instructions. a This will avoid staff ignorance in taking action.
3	*Material*	Material is not ready to be move because the storage location is not yet available	Apply the Seiton (set in order) principle by visually and structurally organizing storage locations, and providing a special place for materials that are ready to be moved and materials that are still waiting for location. This facilitates the process of identifying material readiness
4	*Environment*	Movement path is blocked by old material/slow moving stock	Apply the Seiri (sort) principle is applied by sorting and moving slow moving materials to a special location so as not to obstruct the active route. The main line must be kept clean and free of obstacles to facilitate the movement of new materials.

b. Placement of materials that are not in the right place (Defect 1)

Table 5. Table Proposed Improvement Defect 1

No	Factors	Cause	Proposed Improvement
1	*Man*	Employees are not disciplined in following the storage system in the warehouse	Apply the Shitsuke principle (sustain / habituation) by practicing discipline through routine training, daily briefings, and reward systems for employees who consistently follow storage procedures. A disciplined work culture is built on an ongoing basis so that placements are in line with standards.
2	*Method*	No visual warehouse system	Apply the Seiton (set in order) principle by creating a visual system that includes location labels, storage area information boards, and clear floor marking. This helps operators find the correct storage location quickly and precisely.
3	*Environment*	*Shelving layout is too dense, making it difficult to place materials correctly*	Apply the Seiketsu (Standardize) principle by rearranging the warehouse layout and setting a standard aisle width and maximum capacity of each shelf. Visual layout guidelines were socialized so that the placement of materials according to the zone and not piled on top of each other.

c. Back and forth movement of workers due to inefficient warehouse layout (Unnecessary Motion 2)

Table 6. Table Proposed Improvement Unnecessary Motion 2

No	Factors	Cause	Proposed Improved
1	*Man*	No layout evaluation team	Apply the Seiketsu (Standardize) principle by forming a special team to evaluate the warehouse layout on a regular basis to ensure that changes in the placement of goods are in accordance with operational needs. This standardization will create a consistent layout and minimize unnecessary movement.
2	*Method*	Material placement is not based on frequency	Apply the Seiton (Set in Order) principle by arranging storage layouts based on the frequency of material movement. Fast moving items are placed in easily accessible locations, while slow moving items are placed further away, to reduce the distance and intensity of worker movement.
3	*Material*	Fast moving and slow moving materials are mixed in one storage location	Apply the Seiri (Sort) principle by separating fast moving and slow moving materials into different storage areas. With this sorting, the material retrieval process becomes faster, and workers do not need to routinely search for or pass by unneeded items.
4	*Environment*	Narrow passageway or obstructed by materials	Apply the Seiton (Set in Order) principle by reorganizing the storage aisles to keep them open and free of obstacles. Materials that are not frequently used should be placed in areas that do not interfere with the main line, so that workers can move efficiently without the need to avoid obstacles. Apply the Seiso (Shine) principle by cleaning the storage aisle area to keep it open and free of obstacles. Materials that are not used frequently should be moved or rearranged to reduce disruption to the main line. Seiso can play an important role in keeping spaces clean and efficient.

d. Back and forth movement of workers due to frequently changing material arrangements (Unnecessary Motion 1)

Table 7. Table Proposed Improvement Unnecessary Motion 1

No	Factors	Cause	Proposed Improvement
1	*Man*	Operators are less careful in their work	Apply the Shitsuke principle (sustain / refraction) so that operators have discipline and consistency in following work standards. Periodic training and daily briefings can help raise awareness of the importance of accuracy in placing and recording material locations. Consistent work discipline will prevent material placement errors that cause unnecessary movement.
2	*Method*	Layout changes were not communicated to all teams	Apply the Seiketsu principle (standardize) to the communication flow and layout change procedures. A standard operating procedure (SOP) is needed that stipulates that any layout changes must be informed through team meetings, visual announcements, or a current layout map that is easily accessible to all workers. This

			standardization will minimize location confusion and reduce unnecessary movement.
3	Material	Placement of materials is not in accordance with the layout	Apply the Seiton (set in order) principle to be implemented by reorganizing the storage location of materials based on frequency of use and type of item. Materials with high usage rates should be placed in areas that are easily accessible. Location labeling and visual management such as floor marking will also facilitate searching, thus avoiding back-and-forth movement.
4	*Environm ent*	Limited warehouse space	Apply the Seiri (sort) principle to overcome space limitations. Irrelevant or rarely used materials need to be sorted and removed from the main storage area. This will reduce space congestion and make it easier to manage the layout according to capacity. A more compact warehouse will also reduce the need to move materials multiple times.

e. Accumulation of inventory of products or materials in the warehouse that are rarely needed (Excess Inventory 2)

Table 7. Table Proposed Improvement Excess Inventory 2

No	Factors	Cause	Proposed Improvement
1	*Method*	There is no SOP for stock cleaning	Apply the Seiri (Sort) principle by developing routine SOPs to identify and segregate obsolete or unused stock, and remove irrelevant stock from the warehouse. This SOP should be a mandatory and scheduled procedure.
2	Material	Damaged/defective materials are not removed immediately	Applying the Seiton (Set in Order) principle is important to ensure that there is a system of segregating defective goods into special areas. Warehouses should have separate storage zones with clear visual markings and colors so that defective goods are not mixed up.
3	*Environm ent*	No special area for placement of slow moving or defective goods	Apply the Seiketsu (Standardize) principle to standardize storage layouts, including the allocation of space for slow moving/defective goods, with documented layout guidelines and regular training for warehouse personnel.

G. Simplification of Process Activity Mapping

The implementation of the proposed improvements to reduce waste in the Finished Product Warehouse of PT XYZ will have an impact on the results of remapping using the Process Activity Mapping (PAM) method. The rearrangement of PAM is done by considering the conditions that are expected after the improvements are implemented. The comparison between activity mapping before and after the implementation of improvements is presented as follows.

Table 7.Summary of Simplification Process Activity Mappin

No.	Activity Category	Total Activity (Before Proposed Improvement)	Total Activity (After Proposed Improvement)	Percentage Activity (Before)	Percentage Activity (After)
1	*Value Added* (VA)	16	16	46.7%	64%
2	*Non Value Added* (NVA)	6	0	28.1%	0
3	*Necessary Non Value Added* (NNVA)	9	9	25.1%	36%
	Total	31	25	100%	100%
1	*Value Added* (VA)	158	158	46.7%	65%
2	*Non Value Added* (NVA)	95	0	28.1%	0
3	*Necessary Non Value Added* (NNVA)	85	85	25.1%	35%
	Total (minutes)	338	243	100%	100%
No.	Activity Category	Total Activity (Before Proposed Improvement)	Total Activity (After Proposed Improvement)	Percentage Activity (Before)	Percentage Activity (After)
1	*Operation*	8	7	25.8%	28%
2	*Transportation*	7	7	22.6%	28%
3	*Inspection*	6	5	19.4%	20%
4	*Storage*	1	1	3.2%	4%
5	*Delay*	9	5	29%	20%
	Total	31	25	25	100%
1	*Operation*	59	42	17.5%	30.48%
2	*Transportation*	88	88	26%	42.25%
3	*Inspection*	62	50	18.3%	23.53%
4	*Storage*	7	7	2.1%	3.72%
5	*Delay*	122	56	36.1%	23.1%
	Total (minutes)	338	243	100%	100%

H. Future Value Stream Mapping

Future Value Stream Mapping is used to describe the process flow in PT XYZ Finished Product Warehouse after the implementation of the proposed improvements. The results of the Future State VSM mapping showed a Process Cycle Efficiency (PCE) value of 72.1%, which increased by 25.36% compared to the previous PCE which was only 46.74%. This increase reflects an improvement in the effectiveness of PT XYZ's warehousing process after the implementation of improvements. Future Value Stream Mapping can be seen in the following figure 8 :

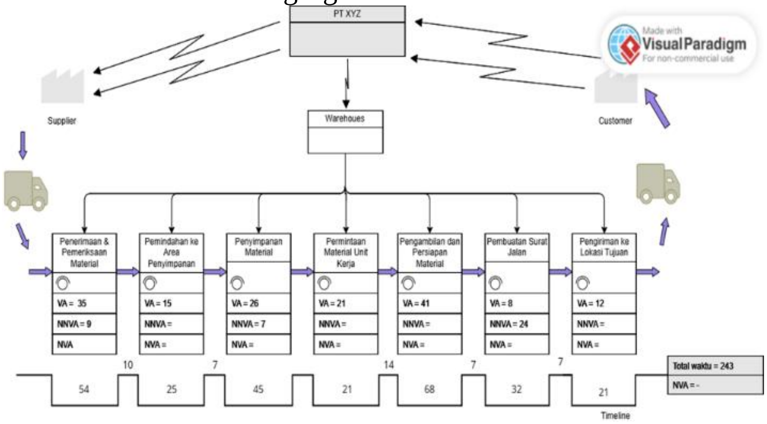

Figure. 8 FVSM

V. CONCLUSION

The results showed that there are five main types of waste in the warehousing process of PT PLN UP3 Sidoarjo, namely waiting time, defects, unnecessary motion, and excess inventory, with the highest weights of 3.75 to 3.25 respectively. Through the application of Value Stream Mapping (VSM) and Process Activity Mapping (PAM), there was a reduction in waste time by 95 minutes, from a total of 338 minutes to 243 minutes, as well as a reduction in six Non Value Added (NVA) activities. The proposed improvements include the application of 5S principles, layout rearrangement, standardized SOP preparation, use of visual management, improved coordination, provision of special areas, and regular training for employees. The implementation of these improvements also reduced the number of activities from 31 to 25. In addition, process effectiveness increased with an increase in Process Cycle Efficiency (PCE) by 25.36%, from 46.74% to 72.1%. This shows that the proposed improvements have a significant impact on reducing waste and improving warehouse operational efficiency. This research is expected to be a practical and academic reference in the application of lean warehousing in the electricity sector..

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