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Waste Analysis In The Contain Unloading Process Using A Lean Service Approach

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ABSTRACT

PT.X Lhokseumawe Branch is a port that provides berthing services and other facilities for docking, loading and unloading containers, liquid bulk and dry cargo. In practice, several types of waste are produced when containers are unloaded, which can affect company productivity. The problem in this research is that the container unloading process time needs to meet the standards set by the company H. 20 containers/hour while only 9 containers/hour can be unloaded in the field. It is due to activities that need to provide added value, thus affecting transportation times and long waiting times. This research aims to identify the waste in the container unloading process and propose improvements to eliminate this waste. The methods used are lean service and value stream mapping. Based on the data calculations, it is known that the type of waste with the most significant influence is transportation at 45.60% and delay with a weight of 29.47%. Therefore, the proposed improvements must plan and allocate loading and unloading time, provide suitable conditions for cranes and train drivers, and create an SOP for the container preparation area. After implementing lean services, the proposed improvement calculations show that the number of containers increased from 9 containers/hour to 12 containers/hour, throughput time decreased from 413.03 seconds to 300.06 seconds, and process efficiency increased. Rose 34.04% to 58%. 75% means the company's productivity increased after implementing lean service.

Keywords: Lean Service, Waste, Lead Time, Stream Mapping, Fishbone

1. INTRODUCTION

In manufacturing companies, some activities do not add value or waste, resulting in higher use of resources ranging from energy, human resources and time, so the production process becomes inefficient. One method for minimizing waste in the production process is Lean Manufacturing, which functions as an effort to increase the efficiency of the production process by identifying waste. Lean Manufacturing is a systematic approach to identifying and eliminating waste through improvement activities [Gaspersz, V. 2007, 2009]. The tool in Lean Manufacturing generally used to map the entire flow of information and materials and identify waste is Value Streaming Mapping (VSM). Value Stream Mapping is a visual method for mapping a product's production path, which includes materials and information from each workstation (Sandroto, 2007; Rother, M., & Shook, J., 2003). Access to a region or country requires infrastructure in the form of ports that support maritime services that connect regions, islands, countries, continents and countries. To develop regional potential, service and infrastructure support is needed. Sea transportation is an effective, efficient and long-term means of transportation.

Initially, a port was just a beach where ships could dock to load and unload goods and board and disembark passengers. However, as society's social and economic life develops, the need for clothing, food and other living spaces continues to increase. In this case, ports are important trade and distribution centres for goods in Indonesia and other parts of the world. P.T. X is a port that serves domestic and international shipping (export-import). Krueng Geukeuh Port was built in 1989. P.T. X provides dock services and other facilities for docks, container loading

and unloading, liquid bulk, and dry bulk. In carrying out their duties, many non-additional activities become obstacles for companies because they can cause waste, extending processing time and reducing company productivity. Based on research conducted by researchers at P.T. X, The standard for unloading containers is 20 containers/hour, even though in the field, the average is only 9 containers/hour with a crew of 13 people. The high time required to unload containers is caused by several factors such as human factors, environment, procedures, materials and machines. The results of unloading containers must meet the standards set, which becomes an obstacle. The aim is to identify value-added (V.A.) and non-value-added (NVA) activities that influence container unloading times. Comparison of actual lead times and process cycle efficiency with proposed conditions and number of unloaded containers after implementing lean services.

2. LITERATURE REVIEW AND HYPOTHESIS

Definition of Lean

Lean is a continuous improvement effort (continuous effort) to eliminate waste, increase the added value of products (services and goods), and provide value to customers (Ivanto, M. 2012), (Majori, A. R. 2017; Hidayat, 2014). The basic principles of lean are:

1. Identify the value of products (goods and services) based on the customer's perspective, where customers want products (goods/services) of superior quality, with competitive prices and timely service.
2. Identify the process mapping (value stream process mapping) for each product (goods/services).
3. Eliminate waste (activities that do not provide added value) from all value stream mapping activities.
4. Group information, materials, and products so that they flow efficiently throughout the value stream mapping process using a pull system.
5. Continuously seek improvement tools to achieve excellence and continuous improvement.

Streamlined Services

Currently, lean manufacturing used in the service industry is called lean service. Lean service has the same concept: creating value in activities, eliminating waste in the service process, and creating a flow of added value. The application of lean in the service sector is needed to reduce operational costs, development, transactions and licensing times and increase flexibility to adapt to meet customer demands quickly. Lean has been successfully applied in non-manufacturing sectors, such as banking, hospitals, education, government, administration, insurance and health (Ikatrinasari, Z.F., & Haryanto, E. I. 2014). Lean principles applied to the service sector focus on employees, both in training and increasing autonomy (empowerment), and reinforce the importance of human factors in the service delivery process. Besides focusing on the people who are part of the transformation process, lean service also focuses on customers (Rahman, 2010). Lean service principles consider the same five basic lean principles, while lean service principles that are less applicable to manufacturing are: [Tiarso, 2015, Toyyibah, Z., 2013]

1. Determine what creates value: Value in a service environment is a need that can be satisfied by the end customer. Therefore, it must be defined by the customer.
2. Value stream identification: In services, value is created by customer needs; therefore, the value stream is based on the sequence of activities that enable their satisfaction.
3. Flow: It focuses on optimizing continuous movement through a series of service activities that generate value as perceived by the customer.
4. Pull: In a service environment, pull means distributing customer demand along the value stream, delivering what the customer asks.

5. Striving for perfection: This service translation should focus on the customer's point of view, giving the customer what he wants exactly when he wants it.

Value Added Activities (Value Add Activity)

Value-added activities contribute to customer value and satisfy customers or organizations that need it. There are two types of value-added activities, namely [Ivanto, M. 2012, Rahman, A., Febrianto, G., & Sudiarno, A. 2010, Rother, M., & Shook, J. (2003)

1. Mandatory activities are activities that must be carried out.
2. Discretionary activities are policy activities.

Non-value added activities (Nonvalue Added Activities)

Non-value-added activities do not contribute to consumer value or organizational needs. Activities included in non-value added activities are: (Fadhillah, D.I. 2018, Jakfar, A., Setiawan, W.E., & Masudin, I. 2014, Karyono, A. 2014)

1. Over-production, namely excessive service processes that customers do not need. Overproduction, such as errors or repetition of data input, as well as long and convoluted service steps.
2. Excessive transportation. Excessive physical flow and information flow in the service process.
3. Defects are defects that occur in the service process.
4. Unrequired Inventory Unlike the manufacturing industry, unneeded Inventory can be work orders.
5. Inappropriate Processing, namely services with inappropriate steps and procedures and unclear information.
6. Waiting Occurs when there is a long waiting period between service processes, causing technical service officers to be unemployed. The ideal condition is no waiting period for the mopping process.
7. Unnecessary movement can be defined as unproductive movement of staff or employees (moving, looking and walking).

Fishbones

Fishbone is a method used to help solve existing problems by analyzing the cause and effect of a situation in a diagram shaped like a fishbone. One tool that can be used to solve waste problems is the fishbone diagram. The fishbone image can be seen in Figure 1 (Kusnandi, Eris. 2011).

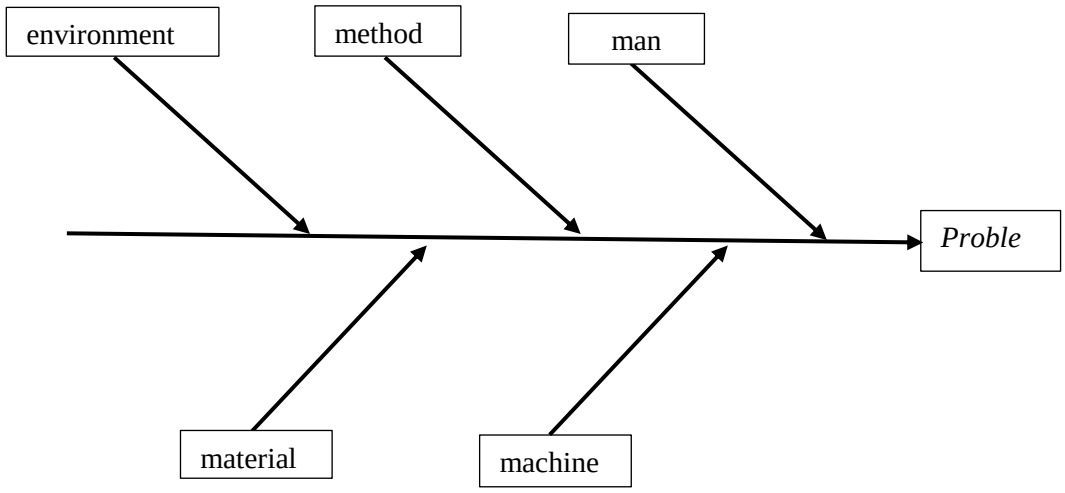

Figure 1. Fishbone Diagram

Value Stream Mapping

Value stream mapping is a technique used to describe the flow of information and materials from a company. Value stream mapping is used to facilitate the lean implementation process by identifying value-added activities (V.A.) in the process flow and eliminating non-value-added activities (NVA). After observing Value Stream Mapping (VSM), the company can see production lead time, production costs and waste. (Majid, Miftahul. 2018, Naibaho, H.H. 2014, Trismi R, Muhsin. A, and Nurani .P.P 20170).

3. RESEARCH AND METHOD

The object of this research is the container loading and unloading process at PT.X. In the process of unloading containers at PT.X, still not usually with the standard set company was accouse same factors like long time waiting and more expensive. Several types of data were collected in conducting this research, namely, based on the data used. The data collection method consists of:

1. Interviews are used to obtain information about the processes that occur and the causes of waste that occurs and crosscheck the results of critical waste data processing. Resource persons are responsible and competent in their respective fields when conducting interviews.
2. Field observations.
3. Historical data used to support data processing.

Based on the results of observations and data collection carried out, data processing was carried out. The analysis method used is through the application of lean service. Identification of activity elements is carried out by identifying activities along with calculating the operational time for each element of container unloading activities. The problem-solving steps in research are as follows:

1. Cycle time, average time, standard time
2. Process cycle efficiency
3. Calculation of task time

4. Process identification
5. Identify waste
6. Initial description of the current state of the value stream mapping
7. Determine the causes of waste

4. RESULT AND DISCUSSION

Operational Time of Activity Elements

A. Calculation of cycle time, average and standard time

Based on the results of data processing that has been carried out, the values of average cycle time and standard time are summarized in Table 1:

Table 1. Recapitulation of average time and standard time values

No	Activity Elements	Cycle Time	Normal Time	Standard Time
1	Check the location of the container	27.7	34.07	35.68
2	Indicates the container to be unloaded	32.5	39.98	41.59
3	Sling strap installation	21.2	42.04	43.96
4	Lifting **c**ontainers	59.4	71.87	73.32
5	Placing containers in temporary stacking	21.6	26.14	27.59
6	Sling strap release	17.4	21.40	23.33
7	Kalmar walked towards the stacking	33.9	42.04	43.38
8	**C**ontainer transfers	56.7	70.31	71.65
9	Asking where the container is	21.5	26.66	28.00
10	Place the container in the final stacking	18.7	23.19	24.53

B. Process Activity Mapping

Calculation process activity mapping container unloading process. Process activity mapping, the recapitulation of the results of process activity mapping in the container unloading process, can be seen in Table 2:

Table 2 Recapitulation of process activity mapping

Activity	Amount	Time	Weight
Operation	2	67.29	16.29%
Delay	4	121.71	29.47%
Transportation	3	188.35	45.60%
Inspection	1	35.68	8.64%
Storage	-	-	-
Total	10	413.03	100%

Table 3 shows that the most influential waste is transportation, with a weight of 45.60% and delay, with a weight of 29.47%.

C. Calculation of Service Lead Time and Process Cycle Efficiency

The following service lead time calculations for value-added time and non-value-added time activities can be seen in Table 3:

Table 3 Service lead time value-added time and non-value-added time

No	Activity	Standard Time (Minutes)	Value Added Time (V.A.)	Non Value Added Time (NVA)
1	Check the location of the container	35.68		35.68
2	Indicates the container to be unloaded	41.59		41.59
3	Sling strap installation	43.96	43.96	
4	Lifting **c**ontainers	73.32	73.32	
5	Placing containers in temporary stacking	27.59		27.59
6	Sling strap release	23.33	23.33	
7	Kalmar walked towards the stacking	43.38		43.38
8	Container transfers	71.65		71.65
9	Asking where the container is	28.00		28.00
10	Place the container in the final stacking	24.53		24.53
	Total		413.03	272.42

Process Cycle Efficiency calculations for all process activities are as follows:

$$\text{Process Cycle Efficiency} = \frac{\text{Value Added Time}}{\text{Manufacturing Lead Time}} \text{ x100\% = 34,04\%}$$

$$\text{Calculation of Takt Time = Task Time } = \frac{\text{Total Time Available}}{\text{Costumer Demand}} \text{= 180 seconds/ container}$$

D. Current Value Stream Map

Process value stream container unloading map: The current state map can be seen in Figure 2.

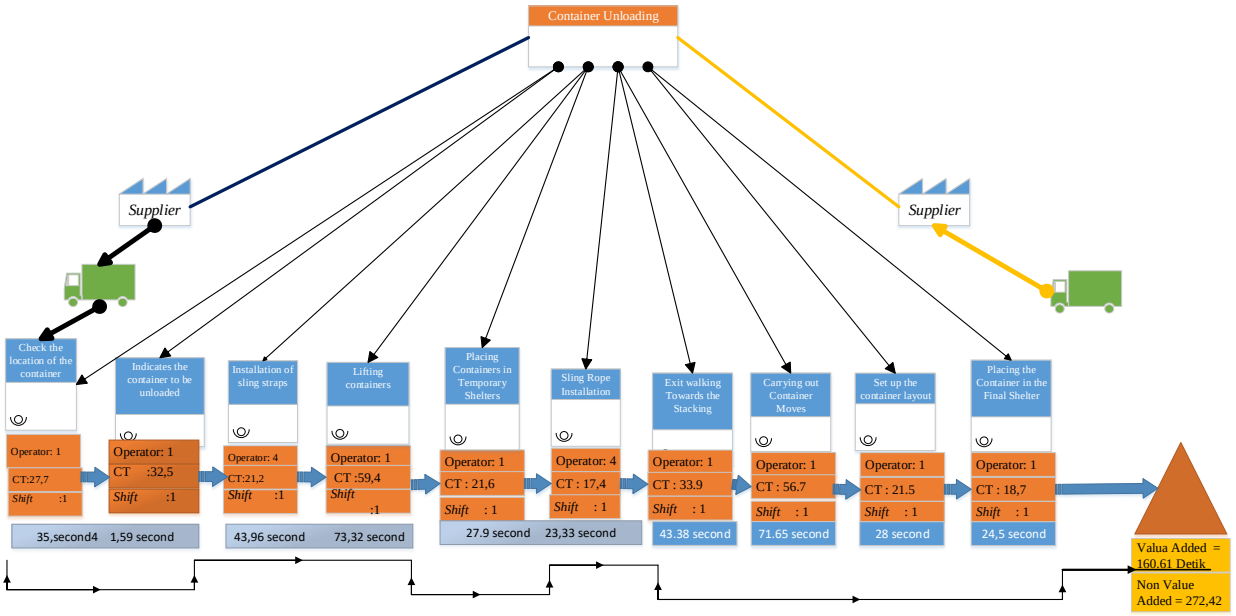

Figure 2 *Current State Map*

E. Identify Factors Causing *Waste*

Making a Fishbone diagram by carrying out cause and effect analysis of a situation, namely machines, humans, methods, environment and materials. Cause and Effect Diagram of Transportation Activities and Causes and Effect Activity Diagram Waiting can be seen in pictures 3 and 4.

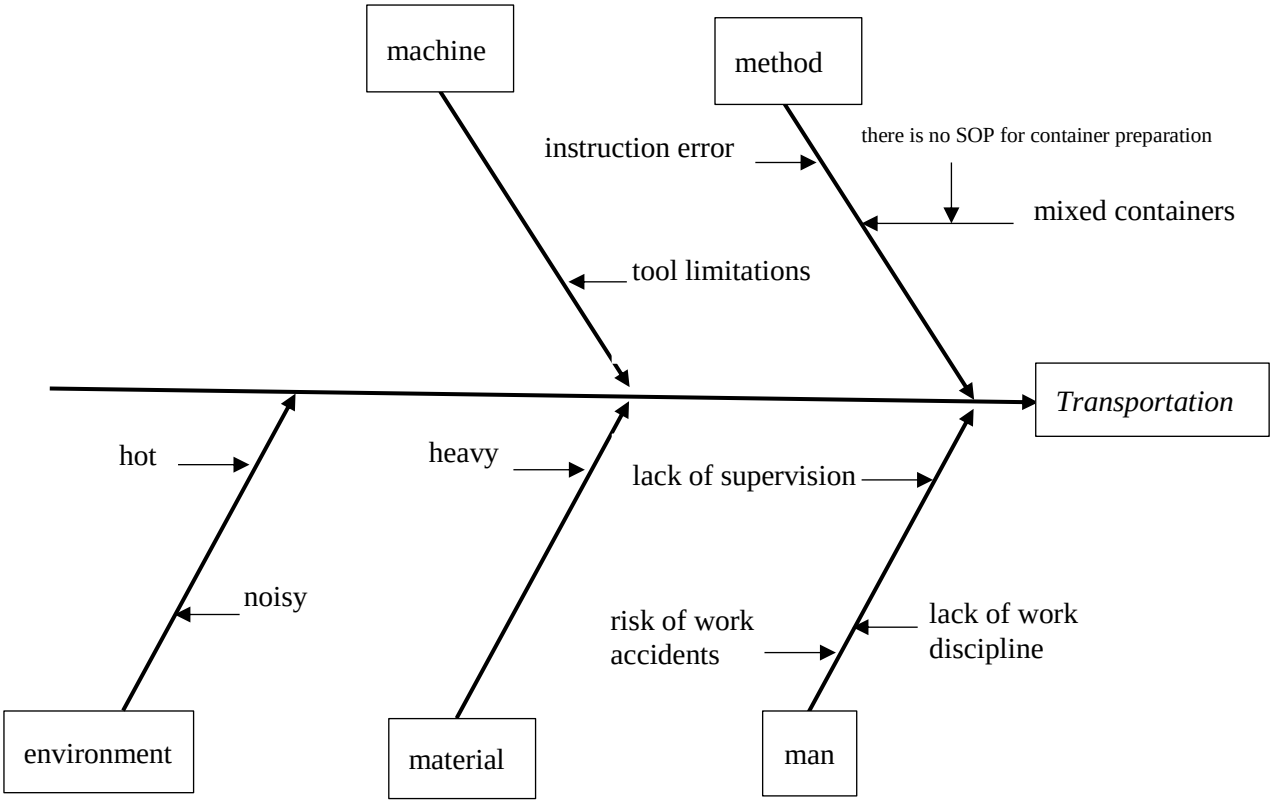

Figure 3. *Cause and Effect Diagram of Transportation* Activities

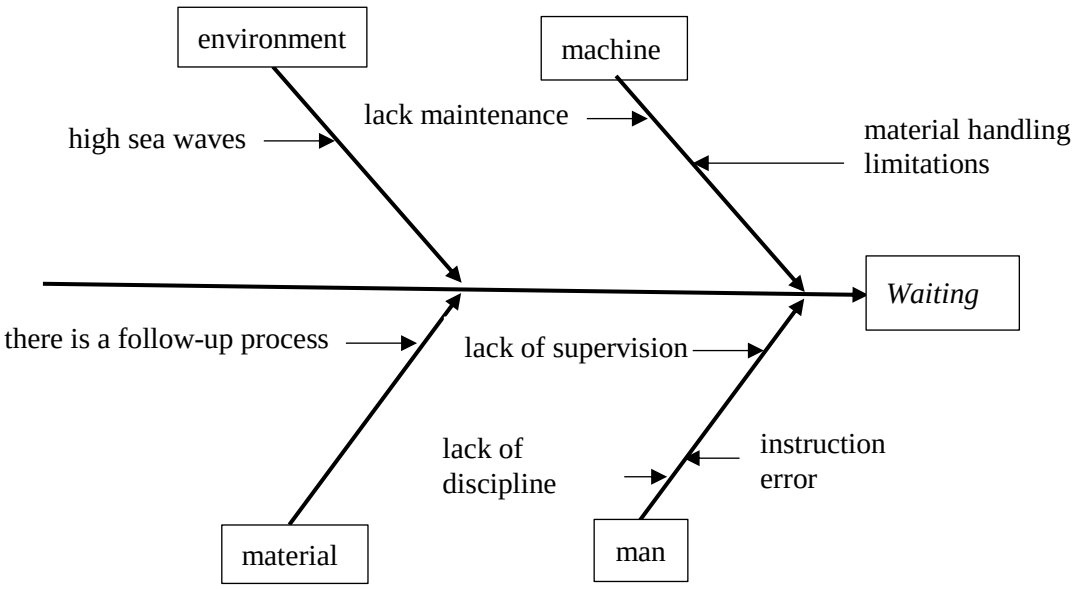

Figure 4. *Cause and Effect Diagram of Waiting* Activities

F. Proposed Improvements to Service Lead Time and Process Cycle Efficiency

The improvements in manufacturing lead time and process cycle efficiency and recapitulation *of value-added time* and *non-value-added time* can be seen in Table 4:

Table 4 *Service Lead Time* Calculation, *Improvement of Value Added Time* and *Non-Value Added Time* Recapitulation

No	Activity	Standard Time	*Value Added Time* (Minute)	*Non Value Added Time* (Minute)
1	Inspection and showing *the container* to be unloaded	35.68		35.68
2	*Sling* strap installation	43.96	43.96	
3	Lifting *Containers*	73.32	73.32	
4	Placing *containers* in temporary stacking	27.59		27.59
5	*Sling* strap release	23.33	23.33	
6	*container* transfers	71.65		71.65
7	Place *the container* in the final stacking	24.53		24.53
	Total	**12**	300.06	123.77

Process Cycle Efficiency calculations for all process activities are as follows:

$$\text{Process Cycle Efficiency} = \frac{\text{Value Added Time}}{\text{Manufacturing Lead Time}} = \frac{176,29}{300,06} = 58.75\%$$

G. Designing Future Value Stream Mapping

Flow design information and material from container unloading process company with a value model streams mapping, future value stream mapping can be seen in Figure 5.

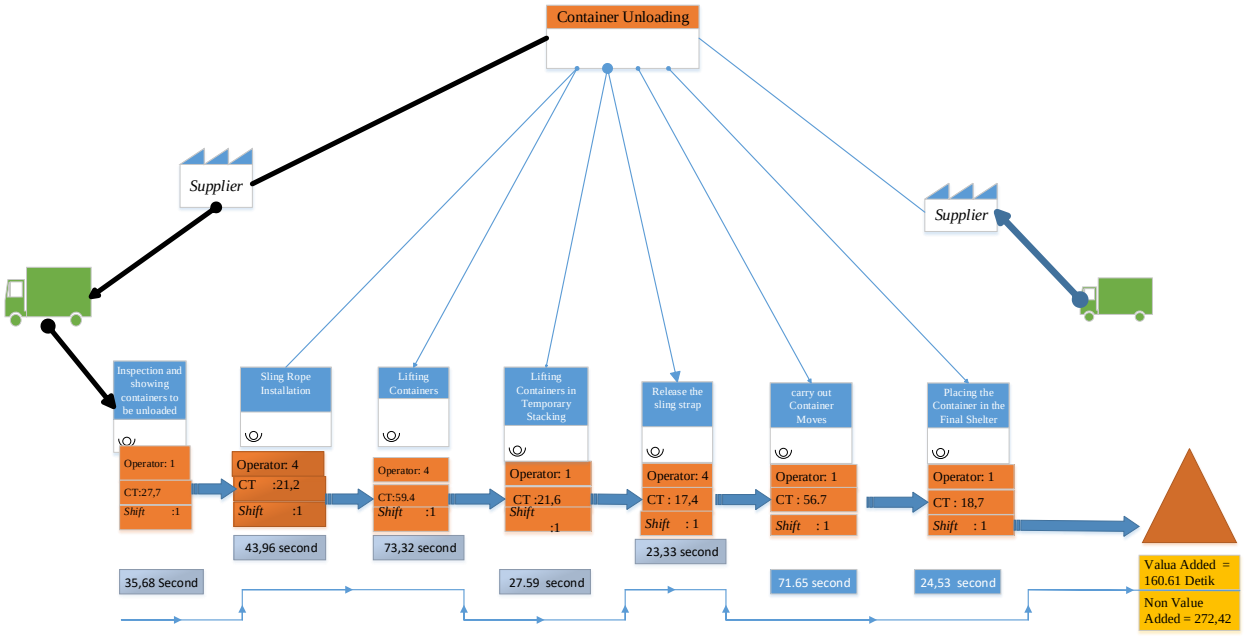

Figure 5. Future value stream mapping

H. Actual Lead Time and Process Efficiency Values with Proposed Conditions

Table 5. Comparison of actual lead time and process cycle efficiency values with proposed conditions

No	Mark	Actual	Proposal	Difference
1	Number of Containers	9	12	3
2	Lead Time	413.03	300.06	112.97
3	Process Cycle Efficiency (%)	34.04	58.75	24.71

5. CONCLUSION

Based on the Processing that the researcher has completed, the conclusions that can be drawn from this thesis are as follows:

1. Based on waste identification, value-added activities (V.A.) when unloading containers are installing sling ropes, lifting containers and removing sling ropes, while non-value-added activities (NVA) are checking the location of containers, indicating which containers will be dismantled. , places the container on a temporary stack, kalmar walks to the stack, moves the container, asks where the container is and places the container on the final stack.
2. The results of comparing the actual lead time with the proposal are 413.03: 300.06 seconds. This means that the lead time was reduced by 112.9 seconds after implementing lean service. The results of comparing the efficiency of the actual process cycle with the proposal are 34%: 58.75%; this means that after implementing lean service, an efficiency increase of 24.71% was obtained.

3. After implementing lean service, the number of containers unloaded increased from 9 containers to 12 containers.

6. ACKNOWLEDGEMENT

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