Waste Analysis Using Lean Service Approach In Package Delivery Activities From The Warehouse To The Main Branch (Case Study: PT XYZ Station Center)

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Abstract

The delivery of goods from warehouses to branch offices plays a crucial role in ensuring operational efficiency and customer satisfaction. However, inefficiencies in the delivery process often result in waste, such as excessive waiting times, unnecessary movements, and high operational costs. This study aims to analyze waste in the goods delivery process using the Lean Service approach and provide recommendations for improvement. Data collection methods include direct observation, interviews with logistics personnel, and process mapping to identify non-value-added activities. The results indicate that applying Lean Service principles, such as streamlining workflows, reducing unnecessary handling, and optimizing resource utilization, can significantly enhance delivery efficiency. Implementing these strategies helps minimize delays, reduce costs, and improve service quality. The findings of this study are expected to contribute to the development of more efficient supply chain management strategies and serve as a reference for companies looking to optimize their logistics operations.

Keywords**:** *Lean Service, waste reduction, logistics efficiency, supply chain management, operational improvement.*

1. INTRODUCTION

Service sector hold role important in recovery Indonesian economy post crisis Asian finance. One of the sector services that become booster growth economy is sector transportation, distribution, and logistics (Manning & Aswicahyono in the Ministry of Trade, 2021). Contribution sector logistics to growth Indonesia's economy is quite significant, recorded by 5.98% in the third quarter of 2023 (Central Statistics Agency, 2023). In East Kalimantan Province, the Transportation and Warehousing Business Sector become contributor the biggest to growth economy (y- on -y) in Q3-2022 with growth reached 10.38% (Central Statistics Agency) East Kalimantan Province, 2022).

PT XYZ Balikpapan Branch is one of the company expedition and logistics leading in Indonesia. This company service focused transportation and shipping equipped items with facility warehouse as place storage goods customers. In running Operationally, PT JNE BALIKPAPAN BRANCH has infrastructure Supporter in the form of warehouse center / sorting, branch main, and agent. For the East Kalimantan region, the company own main transit warehouse named PT XYZ Station Center Balikpapan, which is functioning as point connector distribution goods to cities / districts in its working area.

Based on the results studies field through interviews conducted with employee company, delay is events that are still ongoing become subscriber problem in activity delivery goods. At PT XYZ Balikpapan Branch, complaints often arise accepted from customer complaining goods not visit come or exceed estimate expected time. Frequent occurrence found namely information on tracking that shows that package Still is in the transit warehouse (PT XYZ Station Center) and not visit There is continuation movement. Event This make customers come to warehouse For take package because feel like waiting too long arrival wear This warehouse consists of from two operational areas, namely Inbound (shipping) incoming) and outbound (deliveryout). The process in the Inbound area includes: arrival goods from fashion transportation (air, sea, or land), sorting, inspection goods and data (including packing repeat If found damage), as well as delivery goods to branch main in the area objective.

However, based on results interview field with employee company, found problem delay delivery enough stuff often happened. Complaints customer generally related with delay unseen items visit come or exceed estimate time shipping. In tracking, it is often listed information that goods Still is in transit warehouse without movement continued. This is trigger customer come direct to warehouse For take goods Because feel time Wait too long.

Party company confess existence activity in the operational process that hinders productivity, such as wait checking goods, search scattered items, and accumulation goods consequence slow completion process Shipping. Activities the classified as to in activity No worth plus or Non Value Added (Gasperz & Fontana, 2011), which is indication not enough the optimal delivery process at PT XYZ Station Center. Some type identified waste is waiting, overprocessing, and inventory. The three this type of waste influential to decline performance operational warehouse and can impact straight to the delay delivery goods to hand consumers. In fact, the accuracy time delivery is indicator main in evaluate performance company expedition.

Efficiency and effectiveness of work processes become matter important in face competition industry increasingly logistics competitive. Along with increasing business volume logistics, needs will repair sustainable become the more relevant. One of the proven approach effective in increase process efficiency is Lean Service.

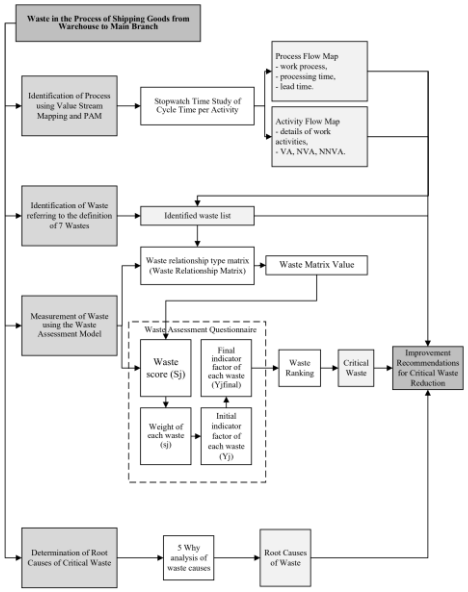
According to Gupta et al. (2016), Lean can applied No only in the sector manufacturing, but also in the sector service like health, IT, to service public. Although there is difference characteristics between services and manufacturing, the Lean approach remains open opportunity improvement efficiency, capacity services, and repair processes sustainable (Lobo & Pinho, 2019). Even with investment low, sustainable Lean implementation can give impact significant to improvement process efficiency and profitability company. A study by Sumantri (2019) also shows that Lean principles have applied with Enough both by the Third Party Logistics company in East Java Province. This is become strong foundation For develop more Lean implementation further, especially in increase performance operational sector logistics.

Study This aiming For identify waste that occurs in the shipping process from warehouse to branch main at PT XYZ Station Center Balikpapan, as well as analyze root the cause. Identification results the will become base in formulate proposal repair use Lean Service approach.

2. METHODS

Lean Service in research This applied For manage waste on objects study so that produce proposal the improvements that are hoped for can help settlement problem the occurrence of waste.

Data collection was carried out after researcher determine design appropriate research with problem from object of research. Planning data collection is arranged based on base research that will be done, as can explained in A framework think of Figure 3.1 as following.



Gambar 1. Research Framework

Analysis waste in the operational process of PT XYZ Station Center Balikpapan is carried *out* use approach *Lean Service* which includes three stages main, namely identification activities and types of waste, waste measurement, and analysis root causes of waste. Stage beginning started with Inbound process mapping using method Value Stream Mapping (VSM). VSM is used For describe process flow comprehensive as well as take notes time cycle every activity. Measurement time done with method Stopwatch Time Study use get accurate data related duration activity.

Next, the process that has been mapped analyzed use Process Activity Mapping (PAM) For grouping activity to in three category, namely Value Added (VA), Necessary Non-Value Added (NNVA), and Non-Value Added (NVA). The purpose of analysis This is identify activities that are not give mark add to get minimized, so that efficiency operational can improved.

After activity waste identified, carried out classification types of waste based on draft Seven Waste from *Toyota Production System*, namely: *overproduction*, *waiting*, *transportation*, *overprocessing*, *inventory*, *motion*, and *defect.* Each type of waste is then measured use method Waste Assessment Model (WAM). In stages these are two questionnaires spread out as instrument data collection, namely Seven Waste Relationship Questionnaire and Waste Assessment Questionnaire (WAQ). Questionnaire First used For compile Waste Relationship Matrix (WRM) and generate mark in Waste Value Matrix, whereas questionnaire second used For count waste score and ranking. Calculation process covering determination score initial (Sj), weight (sj), and indicator beginning and end (Yj and Yj_final), to Finally known type the most dominant waste and become priority repair.

Stage end is analysis root reason waste use tool 5 Whys Analysis. Analysis This done For dig reason fundamental from the waste that occurs based on factors that influence every activities. The stages Data processing used in VSM includes:

1. **Average Cycle Time Calculation**

Cycle time every activity measured in a way direct use method **Stopwatch Time Study,** with calculate the average of the total time observation shared amount observation (Equation 2.1).

2. **Data Uniformity Test**

Data uniformity is tested through control limit chart. The data is stated uniform If all over mark be in between Upper **Control Limit (ECL)** and Lower **Control Limit (LCL)** (Equations 2.2–2.4).

3. **Data Adequacy Test**

Data is considered Enough if mark **N' < N**. If **N' > N**, then the data is considered Not yet sufficient and necessary done measurement repeat (Equation 2.15.

4. Creating Value Stream Mapping Images

Use **Microsoft Visio**, VSM illustrated start from activity arrival goods until transportation go out warehouse. Loading diagram all over grouped activities to in Value Added (VA), Necessary but Non-Value Added (NNVA), and Non-Value Added (NVA).

Processing Waste Relationship Matrix (WRM) aiming For produce Waste Matrix Value, namely results conversion from score questionnaire *Seven Waste Relationship* (SWR). The first step done with add up score from six question For every waste couples in 31 respondents. Total score the Then converted to in symbol connection between waste based on criteria: A (Absolutely necessary), E (Especially Important), I (Important), O (Ordinary Closeness), U (Unimportant), and X (No relation). Matrix arranged in form a 7x7 square, where each row represents a how much big one waste affects other wastes, and each column show how much big a waste is affected by another waste. Symbol in matrix Then converted become number with weight certain (A=10, E=8, I=6, O=4, U=2, X=0), forming Waste Matrix Value as initial input method Waste Assessment Model (WAM).

Stage furthermore is data processing from Waste Assessment Questionnaire (WAQ). Input from the WAQ is used For count total waste score (*Sj*), total weight (*sj*), and frequency emergence mark (Fj and *fj*). The total waste score *is* calculated with share weight waste relationship (*Wj,k*) with amount question For every type (*Ni*) uses formula:

$$Sj = \sum \quad (Wj, \frac{k}{Ni})$$

Then, the total weight of waste is calculated. with multiply results answer respondents (*Xk*) with weight waste relationship:

$$Yj = \left(\frac{sj}{Sj}\right) \times (\frac{fj}{Fj})$$

Next, it is calculated **indicator waste start (Yj)** based on comparison waste score and frequency using formula:

$$Yj_{final} = Yj \times Pj = \left(\frac{sj}{Sj}\right) \times \left(\frac{fj}{Fj}\right) \times Pj$$

Yj_final value become base determination ranking waste priority, from the highest until lowest, as reference in determination focus repair.

Stage final done analysis root reason use method **5 Whys**. Waste with mark highest from WAQ results are used as focus main (fish head) in the cause diagram effect (*fishbone diagram*). Causal factors main grouped based on approach **4M+1E** (Man, Machine, Method, Material, and Environment). Each cause Then analyzed with asking "why" up to five times for identify root problem in a way deep, so that solution improvements made more appropriate target and sustainable

3. RESULT AND DISCUSSION

Delivery process goods from warehouse center going to branch The main thing at PT XYZ Station Center Balikpapan is series complex and involving activities many work units, starting from officer sort, staff warehouse, up to team shipping. Based on results observation and interview direct with internal company, flow delivery goods This divided to in seven stages large, each of which consists of from a number of activity more operational detailed. In detail Overall, there are 20 activities Work main identified in this process.

Activity started from the morning briefing conducted by the head operational to all over officer warehouse and driver, then to be continued with reception goods enter from transportation carrier (good air, sea, or land). Goods This furthermore moved to the sorting area, checked completeness, and processed For delivery go out going to branch. After the sorting and checking process finished, goods entered to in vehicle delivery in accordance routes and destinations that have been determined, then done delivery by driver. After finish delivery, driver back to warehouse and hand over report

delivery.

Every activity in this process observed in a way direct and done measurement time use Stopwatch Time Study method. This method chosen Because capable give estimate time accurate cycle For each activities, which will later useful in analysis efficiency and identification waste. Time data the resulting cycle No only give description average duration of each activities, but also includes information about variation time, standard deviation, and range time used as base taking decision process improvement.

This high total lead time become indicator beginning that the work process at PT XYZ has potential inefficiency, especially if part big activity the including in Non-Value Added (NVA) category. Therefore that, mapping and grouping activity furthermore will be very important For see contribution each activity to mark add and define priority repair in the process of working.

1. Activity Time and Lead Time Analysis

After all over activity in the process of delivery goods identified, stage furthermore is do measurement time cycle time For every activity use to obtain better understanding comprehensive to duration work and potential inefficiency in process. Measurement process This done with use method Stopwatch Time Study, where each activity observed in a way direct and time the process noted in several repetitions. Focus measurement directed at estimation time actual average, not at time standard, so that the result more reflect condition real work in the field.

For ensure that the time data obtained can reliable, two types of statistical tests were carried out, namely data uniformity test and data sufficiency test.

a) Data Uniformity Test

This test aiming For ensure that time data results observation No contain extreme deviation or outliers. In the context of study this, testing done with compare every mark time observation against the control limits, namely Upper Control Limit (ECL) and Lower Control Limit (LCL). If all data is within control limit range, then the data is considered uniform and can used For analysis continued.

Table 1 Briefing Activity Time

data to -	time (minutes)	(data)^2	(x-mean)^2	BCA	BKB	S
1	5.23	27,3529	0.001369	5.82	4.72	0.27
2	5.45	29,7025	0.033489	5.82	4.72	0.27
3	4.98	24,8004	0.082369	5.82	4.72	0.27
4	4.95	24,5025	0.100489	5.82	4.72	0.27
5	5.2	27.04	0.004489	5.82	4.72	0.27
6	5.18	26,8324	0.007569	5.82	4.72	0.27
7	5.77	33,2929	0.253009	5.82	4.72	0.27
8	5.65	31.9225	0.146689	5.82	4.72	0.27
9	5.21	27,1441	0.003249	5.82	4.72	0.27
10	5.05	25.5025	0.047089	5.82	4.72	0.27
amount	52.67	278,0927	0.68			
average	5.27	55.62				
N'	3.92	**BCA**	5.82	**SD**	0.27	
		BKB	4.72			

Example uniformity test results can seen in the briefing activity, which is activity Opener before the shipping process started. All mark observation briefing time is in range control, with BKA of 5.82 minutes and BKB of 4.72 minutes, and standard deviation as big as 0.27 minutes. This is show that variation between observation classified as low, and data can be considered homogeneous.

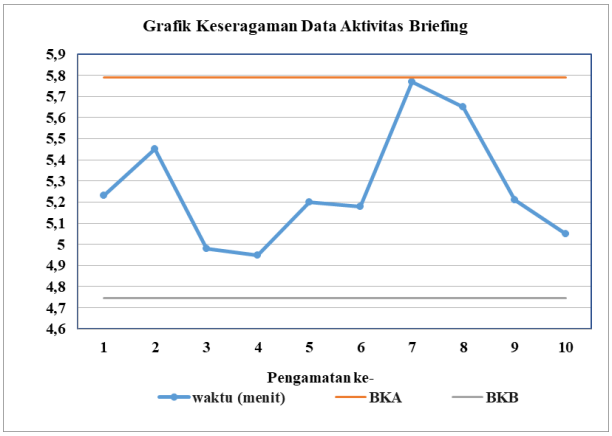


Figure 2. *Briefing* Activity Data Uniformity Graph

b) Data Adequacy Test

After data uniformity is ensured, data adequacy tests are also carried out to determine whether amount observation (n) that has been done Already fulfil minimum standards required For produce estimate accurate time. In this test used formula statistics For compare amount observation current with mark calculation data requirement (N'). If the value of N' < n, then the data is considered Enough.

In case briefing activity, test results show that N' = 3.92, whereas amount observations made is n = 10. Because N' < n, then the data is stated sufficient and worthy For analyzed more carry on.

In addition to briefings, measurements time done For all 20 existing activities in the process of delivery goods. All time cycle Then summarized in Table 2. Recapitulation of Stopwatch Time Study, which includes mark average time, standard deviation, and control limits For each activity. Based on calculation, obtained that total time (lead time) For finish the entire shipping process goods from beginning until end is as big as 316.12 minutes.

Table 2. Recapitulation of Stopwatch Time Study

No	Activity	Time (min)	SD	Uniformity Test	Adequacy Test
1	Briefing	5.27	0.27	Enough	Enough
2	Wait sort goods	3.6	0.28	Enough	Enough
3	Driver assignment	3.22	0.16	Enough	Enough
4	Fleet preparation	2.27	0.14	Enough	Enough
5	Pickup of goods	45.25	0.60	Enough	Enough
6	Queue taking goods	36.19	0.34	Enough	Enough
7	Check condition goods	16.61	0.31	Enough	Enough
8	Loading goods	10.5	0.19	Enough	Enough
9	Wait letter road	6.51	0.24	Enough	Enough
10	Checking receipt	7.31	0.25	Enough	Enough
11	Check goods & system input	9.16	0.29	Enough	Enough
12	Preparation departure	2.19	0.16	Enough	Enough
13	Giving letter road	7.27	0.16	Enough	Enough
14	Delivery goods	7.98	0.12	Enough	Enough
15	Waiting for goods unloading	5.12	0.07	Enough	Enough
16	Unloading goods	12.12	0.25	Enough	Enough
17	Inspection goods	21.15	0.25	Enough	Enough
18	Write minutes at the branch	2.46	0.18	Enough	Enough

19	Giving letter road & minutes	0.58	0.04	Enough	Enough
20	Back to warehouse	7.08	0.08	Enough	Enough

This lead time value become measure measuring beginning in analyze process efficiency. Long lead time show that There is potential big to waste time, especially If found activities that have time cycle Far moretall compared to activity others. This is will analyzed more carry on in stages Value Stream Mapping (VSM) and mapping activity based on mark add (VA, NVA, NNVA), which will explained in the section furthermore.

2. Mapping (VSM and PAM)

For to obtain comprehensive overview about channel activity in the process of delivery goods from warehouse going to branch main, done visual analysis through method Value Stream Mapping (VSM). VSM is a tool important in a Lean approach that works For map all over process flow, start from initial input until product or service accepted by customers. In context study this, VSM does not only describe order activities, but also displays time cycle (cycle time), involvement source power, and relationships interactivity, both valuable plus and also No.

VSM mapping is performed based on results observation field and measurement time current on every activities. The VSM diagram contains activity from beginning namely briefing, then to be continued to the inspection process goods entry, sorting, preparation documents, driver assignment, transportation goods, until the return process vehicle to warehouse. Every activity annotated with duration average time based on Stopwatch Time Study results, so that reader can direct see duration and position activity the in channel large shipping process.

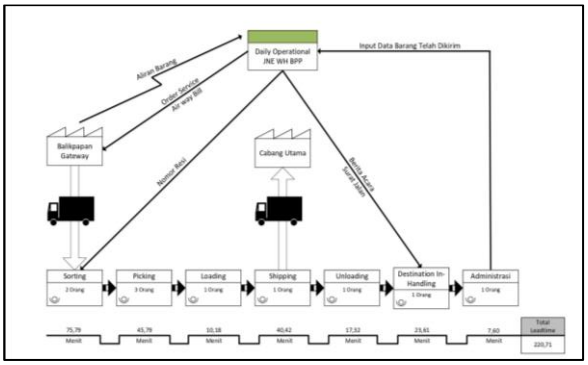


Figure 3. Value Stream Mapping Service Process Delivery

Based on VSM, it was found that there is **inequality duration between activities,** which have the potential cause waste time. Some activity stand out own duration very high time compared to activity others. For example:

a) Pickup of goods: 45.25 minutes
b) Queue taking goods: 36.19 minutes
c) Inspection goods arrived: 21.15 minutes

On the other hand, some activity it happened very fast:

a) Giving letter road and minutes: 0.58 minutes
b) Driver assignment: 3.22 minutes

Difference significant duration This become indication beginning existence imbalance burden work and process flow that is not optimal. Inequality the can cause bottle neck, accumulation goods, and time high wait on activity next.

After process flow mapped through VSM, done classification to every activity use method Process Activity Mapping (PAM). This method share activity to in three category:

a) Value Added (VA): Activities that are direct give mark for customers, such as loading goods to vehicles and shipping to objective.
b) Necessary but Non-Value Added (NNVA): Activities that are not give mark plus in a way direct but required by the system, such as internal administration.

c) Non-Value Added (NVA): Activities that do not give mark add and better eliminated or minimized, such as waiting, queuing, and movement No efficient.

Grouping results This served in Table 3. Process Activity Mapping for Shipping Goods, which contains type activity, time its cycle, as well as VA/NNVA/NVA classification.

Table 3. Process Activity Mapping of Goods Delivery

No.	Activity	Minute	Type Activity	Category Activity
1	Briefing	5.27	operation	VA
2	Driver waiting to sort goods	45.25	delay	NVA
3	Driver assignment	3.22	operation	VA
4	Preparation of transportation fleet	22.07	delay	NVA
5	Queue to pick up goods	36.19	delay	NVA
6	Pickup of goods	3.60	transportation	VA
7	Check the condition and quantity of goods	6.00	inspection	VA
8	Loading goods	10.18	operation	VA
9	Driver waiting for delivery note and receipt	6.51	delay	NVA
10	Checking receipt number	7.31	operation	VA
11	Goods checking and system input	9.16	inspection	NNVA
12	Preparation for driver departure to the main branch	2.19	delay	NVA

From the results PAM analysis, found that from a total of 20 activities:

a) 13 activities (65%) is VA
b) 1 activity (5%) is NNVA
c) 6 activities (30%) is NVA

Percentage NVA activity of 30% is sufficient significant and indicative existence potential repair big in system operational. Activities This contribute to high total lead time and become target main in analysis waste.

Recapitulation distribution type activity served in Table 4. Percentage of Activity Types, which describes composition activity based on classification mark plus.

Table 4. Percentage of Activity Types

Activity Type	VA	NVA	NNVA
Total	13	6	1
Ratio	65 %	30%	5%

With mapping this, then the delivery process goods can evaluated No only from aspect flow and time, but also based on efficiency each activity. Information This will become base important in waste identification and design leaner process improvements.

3. Identification of Types of Waste

Identification waste done For know activities that are not efficient in the process of delivery goods from warehouse to branch main in PT XYZ Balikpapan Branch. Using approach Seven Waste from the Toyota Production System (TPS), the types of waste analyzed includes: waiting, motion, defects, inventory, transportation, overprocessing, and overproduction.

From the results observation, interviews, and Seven Waste Relationship questionnaire, found that activity wait results sort, queue taking goods, and movement look for tool protector self including in Non-Value Added (NVA) activities. The most dominant waste is waiting, which is caused delay vehicles and sorting process queues. Motion appear consequence movement No efficient officer warehouse, while defect related with error document like letter road or lost receipt.

Types of waste in the process of delivery goods at PT XYZ Balikpapan Branch were identified through filling Seven Waste Relationship questionnaire by internal team. Questionnaire This containing six question For every partner types of waste, and results evaluation in the form of score added up For determine level proximity connection between waste. Total score Then categorized to in five levels relation: score 17–20 is classified as Absolutely Necessary (A), 13–16 as Especially Important (E), 9–12 as Important (I), 5–8 as Ordinary Closeness (O), and 1–4 as Unimportant (U). The symbols This used For describe strength connection between waste based on perception respondents.

Table 5. Conversion *of Seven Waste Relationship Values*

Range	Types of Relationships	Symbol
17-20	*Absolutely Necessary*	A
13-16	*Especially Important*	E
9-12	*Important*	I
5-8	*Ordinary Closeness*	O
1-4	*Unimportant*	U

Questionnaire results show that a number of waste pairs such as DW (Defect–Waiting), MW (Motion–Waiting), and PW (Processing–Waiting) obtain score height that reflects very close relationship (category A). On the other hand, the relationship such as OI (Overproduction–Inventory) and PI (Processing–Inventory) are in Unimportant (U) category, with very low score. This data describe that No all waste has the same influence strong between One with other.

Conversion from all over results evaluation the used For compile matrix influence between waste, which is displayed in Table 6.– Waste Matrix Value. Matrix This show how much the size of each type waste influencing and being influenced by other types of waste, with total score and percentage calculation contribution.

Table 6. Waste Matrix Value

	Waste Matrix Value								
F/T	**O**	**I**	**D**	**M**	**T**	**P**	**W**	Score	Perc.
O	10	2	8	4	4	0	10	38	15.7%
I	2	10	8	4	2	0	0	26	10.7%
D	4	2	10	8	6	0	10	40	16.5%
M	0	4	6	10	0	10	10	40	16.5%
T	2	2	6	4	10	0	10	34	14.0%
P	2	2	10	6	0	10	10	40	16.5%
W	4	4	6	0	0	0	10	24	9.9%
Score	24	26	54	36	22	20	60	242	100.0%
Perc.	9.9%	10.7%	22.3%	14.9%	9.1%	8.3%	24.8%	100.0%	

From the table mentioned, it is seen that waiting waste (W) has mark highest with percentage of 24.8%, making it the most influential waste in overall system. Followed by defect (D) and motion (M), each of which is recorded percentage by 16.5%. Findings This confirm that the three wastes become focus main in effort improvement efficiency operational and reduction activity No worth

added to PT XYZ Balikpapan Branch.

4. Determination of Critical Waste and Priority Repair

Determination of critical waste done with method Waste Assessment Model (WAM), uses two data sources: wastewater results conversion connection between waste from Waste Matrix Value and assessment weighting from Waste Assessment Questionnaire (WAQ).

Evaluation level priority waste done with use instrument Waste Assessment Questionnaire (WAQ), which aims to For evaluate level severity, frequency, and impact of each type of waste on the operational process. WAQ is performed after stage identification and influence between waste arranged through Waste Matrix Value.

Based on Table 4.9 – Waste Matrix Value, known that waste waiting own the biggest influence to waste others, with percentage contribution highest by 24.8%. This is show that waiting no only appears most frequently, but also has connection close with the formation of other types of waste such as defects and motion.

However, when done analysis more carry on via WAQ, results calculation amount score (Sj) and frequency (Fj) in Table 7. Scores and Frequencies Each Type of Waste show that waste defect occupy position First as the most critical waste. Defects have highest total score compared to other types of waste, reflecting that error in process (such as mismatch document, receipt lost, or incorrect data input) has the most impact to operational. Followed by waiting and motion, which also show level high severity and frequency based on results questionnaire respondents.

Next, the calculation weighting and determination priority based on WAQ results summarized in Table 8. Calculation Waste Rating. In the table said, third type waste with score highest is:

1. Defect
2. Waiting
3. Motion

Table 7. Scores and Frequencies Each Type of Waste

No	Question Aspects	Question Types (i)	This	Initial Weight of Each Type of *Waste* (Wj,k)						
				O	I	D	M	T	P	W
1	Man	To Motion	*5*	4	4	8	10	4	6	0
2		From Motion	*4*	0	4	6	10	0	10	10
3		From Defect	*3*	4	2	10	8	6	0	10
4		From Process	*5*	2	2	10	6	0	10	10
5	Material	From Transportation	*2*	2	2	6	4	10	0	10
6		From Inventory	*1*	2	10	8	4	2	0	0
7		From Process	*5*	2	2	10	6	0	10	10
8		From Transportation	*2*	2	2	6	4	10	0	10
9	Machine	From Waiting	*4*	4	4	6	0	0	0	10
10		From Waiting	*4*	4	4	6	0	0	0	10
11		From Waiting	*4*	4	4	6	0	0	0	10
12		To Motion	*5*	4	4	8	10	4	6	0
13		From Process	*5*	2	2	10	6	0	10	10
14		To Transportation	*3*	4	2	6	0	10	0	0
15		From Waiting	*4*	4	4	6	0	0	0	10
16		To Motion	*5*	4	4	8	10	4	6	0
17	Method	From Motion	*4*	0	4	6	10	0	10	10
18		From Defect	*3*	4	2	10	8	6	0	10
19		From Motion	*4*	0	4	6	10	0	10	10
20		To Wait	*1*	10	0	10	10	10	10	10
21		From Process	*5*	2	2	10	6	0	10	10

22	To Defect	*1*	8	8	10	6	6	10	6
23	To Transportation	*3*	4	2	6	0	10	0	0
24	To Motion	*5*	4	4	8	10	4	6	0
25	To Transportation	*3*	4	2	6	0	10	0	0
26	To Motion	*5*	4	4	8	10	4	6	0
27	From Motion	*4*	0	4	6	10	0	10	10
28	From Overproduction	*1*	10	2	8	4	4	0	10
29	From Process	*5*	2	2	10	6	0	10	10
30	From Defect	*3*	4	2	10	8	6	0	10

Table 8. Calculation Waste Ranking

	O	I	D	M	T	P	W
Score Yj	0.37265	0.28659	0.395143	0.37844	0.282756	0.436413	0.414489
Acting	1.6%	1.2%	3.7%	2.5%	1.3%	1.4%	2.5%
Yfinal	0.005803	0.003308	0.014574	0.009305	0.003611	0.005962	0.010192
%	11%	6%	28%	18%	7%	11%	19%

These three wastes impact direct to process delay, decline quality services, and waste source power. Therefore that, repair strategy will focused on defects, waiting, and motion, with objective reduce potential obstacle in the process of delivery goods. Third waste This Then analyzed more carry on For identify root the cause through 5 Why's method, as base in compile proposal appropriate and applicable improvements in the field.

5. Analysis and Plan Repair

Three priority wastes that have been determined previously defect, waiting, and motion analyzed more carry on use method 5 Why's For dig root reason main. Analysis This refers to the 4M + 1E approach (Man, Method, Machine, Material, Environment), which is used in discussion group with PT XYZ Balikpapan Branch internal team. Analysis results displayed in Table 9 Recap of 5 Critical Why's Waste of PT XYZ.

Table 9 Recap of 5 Critical Why's Waste of PT XYZ

No	Types of *Waste*	*Waste* Activities	Why 1	Why 2	Why 3	Why 4	Why 5
1	*Waiting*	Queue to pick up goods	Operator/ staff takes too long to sort items	Operators often have difficulty finding equipment	Items piled up irregularly	Poor Warehouse Management	There is no implementation of 5S yet
2	Motion	Preparation of transportation fleet	There is a change in vehicle condition	Driver movement is too much back and forth	Driver allocations often change	Need to check and confirm by the driver beforehand	Driver is not responsible for one vehicle that is fixed
3	*Defect*	delivery note and receipt no complete	The customer has not prepared the	There is no operational standard	Lost on the way back to PT JNE	Driver negligence	There is no agreement between the two parties (driver and

No	Types of *Waste*	*Waste* Activities	Why 1	Why 2	Why 3	Why 4	Why 5
			waybill in advance	for drivers and Section Heads)			Section Head)

For **defect,** root problem the main thing is No existence of inspection SOP document in a way systematic before shipping. This is cause often happen error or lack document like letter road and receipt. In waiting, the cause main is Not yet implementation 5S principle, which causes time Wait increase Because irregularity in storage and search goods. While that, motion appear consequence No existence system allocation vehicle still For each driver, so that the preparation process vehicle become slow and not efficient.

Based on results mentioned, the following is plan proposed improvements:

1. Defect: Compiling and implementing SOP checking document before delivery For ensure completeness and accuracy document.
2. Waiting: Applying principle 5S in the warehouse area, especially at the point sorting and storage goods, for speed up the search and retrieval process.
3. Motion: Apply system assignment vehicle fixed (assigned vehicle) For each driver, so that the preparation process Can done more fast and structured.

Plan This expected can reduce the most dominant waste and at the same time increase efficiency as well as accuracy time delivery goods from warehouse to branch main.

4. CONCLUSION

Based on results analysis regarding the delivery process goods at PT XYZ Balikpapan Branch, it is known that the total processing time reached 316.12 minutes with a number of activity duration length that causes inefficiency. Through mapping activity, found that 30% of all over activity including Non-Value Added (NVA). Identification waste use The Seven Waste approach shows that waiting, defect, and motion are the most dominant type of waste. The results of the Waste Assessment Questionnaire (WAQ) questionnaire confirm findings said, with the defect as most critical waste. Analysis root problem to reveal that waste the happen consequence No existence of inspection SOP document, not yet implementation 5S principles in the warehouse, as well as Not yet existence system allocation vehicle for the driver. Therefore that, repair directed at the preparation of SOPs, implementation of 5S, and systems assignment vehicle still use increase efficiency and accuracy time delivery goods.

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