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PRODUCTION PROCESS OPTIMIZATION TO MINIMIZE GLUE WASTE AT PT TRIMITRA SEJATI JAYA SIDOARJO

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Abstract

Many companies compete to make high quality products. The companys goals are in line with the implementation of lean manufacturing. PT Trimitra Sejati Jaya is a company engaged in the hotmelt adhesive and white PVAC glue industry. In facing competition with competitors, PT Trimitra Sejati Jaya is expected to have an efficient and effective production process. Therefore, the aim of this research is to find non-value-added activities and seven wastes on the production floor in order to increase the efficiency of the company's production process through the process activity mapping method. The results of process activity mapping on production activities show that the process cycle efficiency of raw materials and documents has the lowest efficiency level of 2.33%, and the production process has the highest efficiency level of 99.69%, while the waste that dominates is waiting, motion, and transportation with a total cycle process of 68.34%. This research produces suggestions for improvements, namely the use of virtual collaborative workspaces, running the 5S program, and using a quality control system.

Keywords: Lean manufacturing, Process Activity Mapping, 7 Waste, Production Process Efficiency

INTRODUCTION

The manufacturing industry is currently in an expansive area. Indonesia's Manufacturing PMI recorded a positive figure of 3.90 indicating strong growth in the manufacturing sector. This shows an increase in new orders, production and employment in the industry today. In August, the industrial confidence index showed a value of 53.22%, which reflects the confidence of industrial players in the growth prospects and good business conditions in Indonesia (Kusmayadi & Vikaliana, 2021).

The Central Statistics Agency (BPS) in the third quarter of 2023 proves that Indonesia is not in the process of premature deindustrialization. According to (Darma et al., 2022) the manufacturing industry continues to experience positive and impressive growth compared to the manufacturing industries of other neighboring countries. In fact, this growth exceeds national economic growth, which is also the main support for Indonesia's economic growth in the third quarter of 2023. The industrial sector is again in first place or the largest contributor to investment, namely contributing 41.2 percent of national investment (worth IDR 433.9 trillion) during the period January-September 2023. This figure is 18.8 percent higher than the period five years ago. On the employment side, the manufacturing sector also absorbs 19.35 million people or 13.83% of the total workforce (Central Statistics Agency, 2023).

Several subsectors of the manufacturing industry also showed very good performance. Growth in the industrial sector in the third quarter of 2023 was supported by strong domestic demand for the metal goods, computers, electrical products, optics and electrical equipment industry which increased to 13.68 percent (Zuniawan et al., 2020). This increase mainly occurred in the production of metal

products. Furthermore, the base metal industry grew by 10.86 percent driven by foreign demand, especially for ferronickel and nickelfutter products. Another driver of growth was the transportation equipment industry subsector (7.31%), with an increase in motorbike production. The non-metallic mineral goods industry subsector also recorded positive growth of 7.20 percent due to increasing demand for the country, especially cement products (Ministry of Industry of the Republic of Indonesia, 2023). The development of this industry requires companies to be able to defend themselves and continue to improve effectiveness and efficiency to meet customer needs. and run the production process so that it can advance to competition. According to (Maulana, 2019) the rapid growth of manufacturing businesses requires industry players to be ready to face competition and continue to improve their performance in order to increase productivity and compete effectively in the consumer market.

Lean manufacturing is an ideal method for optimizing the performance of manufacturing systems and processes due to its ability to identify, measure, analyze and find solutions to improve or completely improve performance (Cattleya & Rahmadianto, 2024). Besides that, lean manufacturing can also be interpreted as a process that aims to increase output and reduce lead time by eliminating waste what happened to the company (Aisyah, 2020), therefore it can be concluded that lean manufacturing can be a resource optimization method that aims to eliminate waste for a business in order to increase business competitiveness.inaccurate or incomplete.

METHOD

This research will use a quantitative descriptive approach to examine the problem to be studied. This approach uses lean manufacturing. The researchers used field observation, interviews and questionnaires to collect data from employees responsible for the production floor. The data obtained from this research will be analyzed using the method process activity mapping which will show several important findings regarding the implementation and benefits of the lean manufacturing approach in companies.

RESULTS AND DISCUSSION

Model Quality Control Waste Production

Based on the results of data processing on waste what happened to the company, resulted in these 2 image outputs that there were significant variations in the number and fraction of defective products every month.

Quality Control Results

Sample	Number of Defects	Fraction Defective		3 sigma (99.73%)
January	78	,1692	Total Defects	2222
February	56	,1215	Total units sampled	5532
March	38	,0824	Defect rate (pbar)	,4017
April	249	,5401	Std dev of proportions	,0228
Mei	344	,7462		
June	461	1	UCL (Upper control limit)	,4702
July	300	,6508	CL (Center line)	,4017
August	56	,1215	LCL (Lower Control Limit)	,3332
September	258	,5597		
October	62	,1345		
Novermber	253	,5488		
December	67	,1453		

Figure 1 Model Quality Control Waste Production

Sources: Production Operation Qauntity Methode

The fraction of defective products will determine how large a proportion of products do not meet the expected quality standards. From the table "Quality Control Results," it can be seen that the highest number of defects occurred in June with 461 defects and a defect fraction of 1,000. On the other hand, the month with the lowest number of defects was March with 38 defects and a defect fraction of 0.0824.

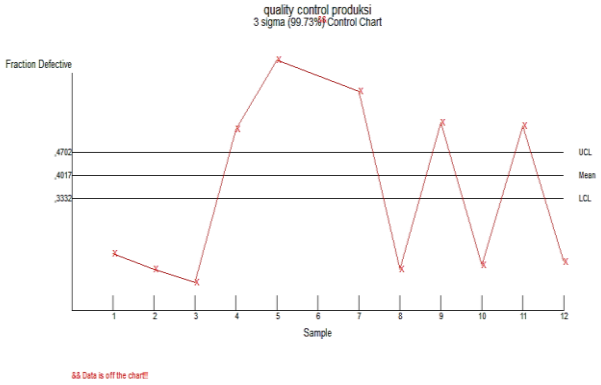

Figure 2 Chart quality control prduct

Sources: Production Operation Qauntity Methode

Control chart showed that some months had a defect fraction that exceeded the upper control limit (UCL) and was outside the lower control limit (LCL), indicating the presence of abnormal variations in the production process during those months. Overall, these data show that there are significant fluctuations in production quality from month to month. Further analysis is required to identify the causes of these variations and take appropriate corrective action to maintain production quality within desired control limits.determination of optimum lag.

Weighting Waste

Distribution of questionnaires is given to employees who are responsible for the production floor such as the production section, section quality control, and operator team.

Table 1 Weighting Waste

No	Waste	Total Value	Percentage
1	Waiting	18	29%
2	Unnecessery motion	17	27%
3	Excessive transportation	10	16%
4	Innaporiare processing	7	11%
5	Defect	6	10%
6	Unnecessary inventory	4	6%
7	Overproduction	0	0
Total		**62**	**100%**

Sources: Data Processing

This distribution is provided so that company employees can find out the perspective of the problem before it can be identified in more depth. The results of distributing the questionnaire showed that there were 3 waste that dominate the production process, including waiting, motion, and transportation.

Calculation Value Stream Analysis Tools

The results of distributing questionnaires are processed by selecting the most effective tool to identify waste by using the highest value shown in the VALSAT calculation.

Table 1 Calculation Value Stream Analysis Tools

No	Waste	PAM	SRCM	PVF	QFM	DAM	DPA	PS
1	Overproduction	0	0		0	0	0	
2	Waiting	162	162	18		54	54	
3	Transportation	90						30
4	Inappropiate Process	63		21	7		7	
5	Unnecessary Inventory	12	36	12		36	12	4
6	Unnecessary Motions	153	17					
7	Defect	6			54			
Total		**486**	**215**	**46**	**61**	**90**	**73**	**34**

Sources: Data Processing

The results with a total value of 486. Therefore, the method that will be used is process activity mapping.

Process Activity Mapping

The results of research on process activity mapping show activity necessary non value added has the highest number among other activities with a percentage of 55.1%. Activity was also found non value added in the production process it has a percentage of 10.2%. Value added has a percentage of 34.7%.

Table 2 Process Activity Mapping

Activity	Amount	Percentage	Time	Percentage
Raw material and document	6	12,2%	410	1,5%
Preparation and Inspection	11	22,4%	1.407,85	5,0%
Production Process	12	24,5%	14.880,23	52,7%
Post production	20	40,8%	11.546,58	40,9%
Total	**49**	**100%**	**28.244,66**	**100%**
Value Added	17	34,7%	19.318,53	68,4%
Non-Value Added	5	10,2%	523,13	1,9%
Necessary Non-Value Added	27	55,1%	8.403	29,8%
Total	**49**	**100%**	**28.244,66**	**100%**

Sources: Data Processing

This result is drained a lot by the many activities that can be optimized from non-value added and necessary non value added.

Production Time Cycle

The research results show that the production process has the highest cycle time with a time of 14,880.23 seconds, while the lowest cycle time is in the document and raw material process with a time of 410 seconds. The production process also has the highest VAA time with 14,834.15 seconds, and the document and raw material process has the lowest VAA time with 9.59 seconds. So, from this result time Non-Value Added has a major influence on the preparation and inspection process.

Table 3 Production Time Cycle

No	Process	Total Cycle Time	VAA Time	NVAA Time	NNVAA Time	PCE
1	Raw material and material	410	9,59	73,04	327,37	2,33%
2	Preparation and Inspection	1.407,85	259,85	433,14	988,72	18,96%
3	Production Process	14.880,23	14.834,15	0,00	46,08	99,69%

4	Post production	11.546,58	4.207,73	16,95	5.529,58	36,44%
Total		**28.244,66**	**19.310,9**	**523,13**	**6.891,71**	**68,37%**

Sources: Data Processing

The results of this percentage also show that the production process is the main stage that does not need to be improved because it already has a good level of efficiency, while the other main stages show low values so research will focus on several of these main stages.

Cause analysis waste

The research results for process Raw material and material, Preparation and Inspection, and Post production will be the focus of the analysis waste because it has a low level of efficiency, meanwhile Production Process will not be analyzed because it already has a good level of production efficiency.

1. Causes of Waste in Raw Material and Material Process

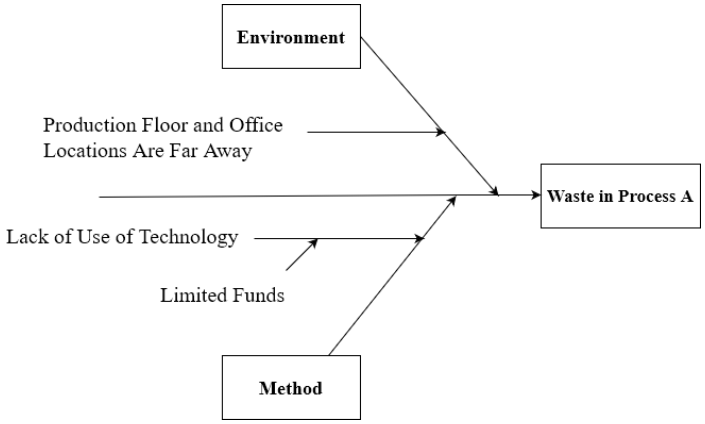

Figure 3 Causes of Waste in Raw Material and Material Process

Sources: Data Processing

The results of observations and interviews with the production team showed that the production team often had to travel long distances to get the formula and wait for the documents to be prepared, according to their observations and interviews. This is caused by the large distance between the office and the production floor. In addition, waste is exacerbated by the lack of use of technology. .

2. Reason Waste in the Preparation and Inspection Process

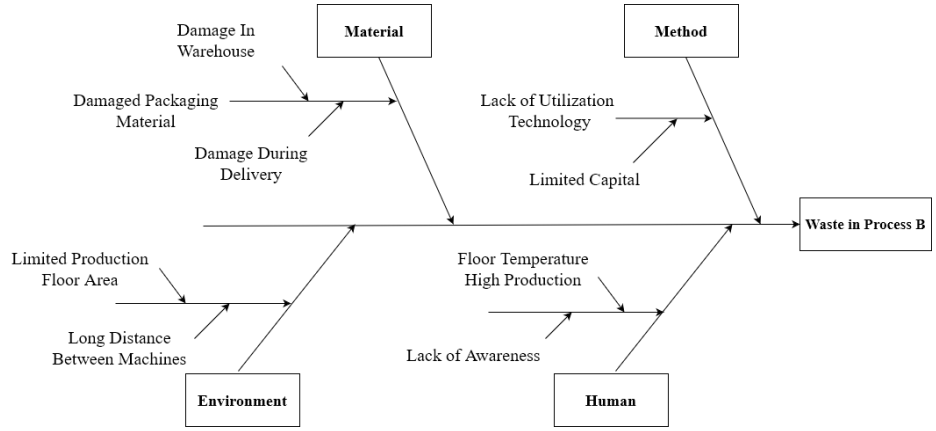

Figure 4 Reason Waste In the Preparation and Inspection Process

Sources: Data Processing

The results of observations and interviews with production parties show that there are many factors that cause waste, including humans, nature, methods and materials. For example, the machine inspection process is carried out at a distance from the machine at the top and bottom, so the operator often has to go up and down stairs. The ineffectiveness is also reinforced by the absence of advanced technology for machine inspection, such as centralized control, which would have eliminated the need for operators to climb up and down ladders. During field observations, operators are often in a hurry which causes material to spill over the top. The hot and stifling temperature of the production floor exacerbates this condition. As a result, operators need to clean up a lot of scattered raw materials. If operators are more careful, raw material spills will not occur under ideal circumstances.

3. Reason Waste in the Post Production Process

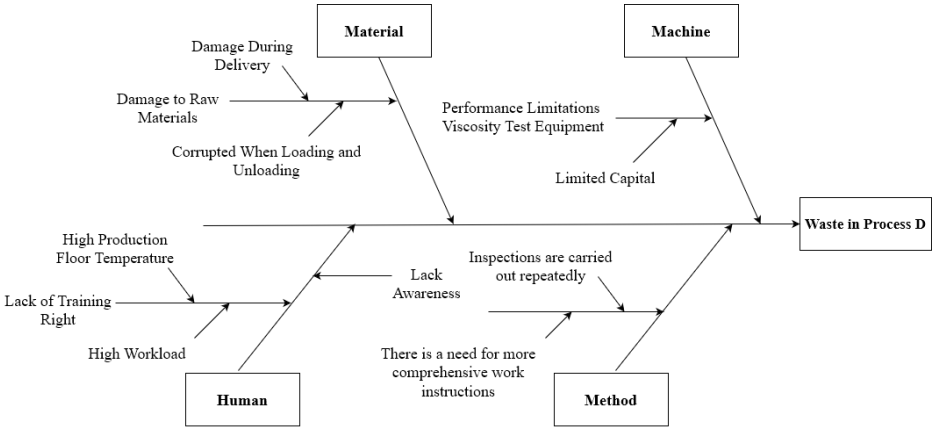

Figure 5 Reason Waste In the Post Production Process

Sources: Data Processing

Based on the results of observations and interviews conducted with production parties, it is known that operators often have to visit the QC office to take sample glasses. In addition, viscosity

and solidity inspection activities dominate waste in process D. This waste can be caused by many things, including less than comprehensive work instructions, operators lack of awareness of what they are doing while working, tool limitations, and damage to raw material. If inspections are not carried out because there are many processes involving humans, such as transportation by forklift (loading dan unloading), pouring raw materials into the mixer, setting up the machine and so on, will raise concerns about defective products if inspections are not carried out. for example, spills often occur due to operator negligence when pouring raw materials. This waste is further exacerbated when viscosity testing is carried out by the operator and then validated by the QC department.

CONCLUSION

The results of this research show that the application of the approach lean manufacturing through method value stream mapping can help companies find wasteful parts of the production process by knowing the layout of the waste that occurs. The quality of a company products can also be improved by eliminating processes that do not add value and reducing waste which will have a positive impact on more efficient and controlled processes to reduce the possibility of errors and defects. Based on this data processing, this research shows that the raw material and document processing process has the lowest efficiency level of 2.33%, the preparation and inspection process 18.52%, the production process 99.69%, and post-production with the highest efficiency level amounting to 36.44%. This data was obtained after identifying the production process which consists of 4 main stages. Transportation, motion and wa iting is waste the one that dominates the most is PT Trimitra Sejati Jaya with a Total PCE from the entire cycle process of 68.34%.

Suggestions that the author can give to PT. Trimitra Sejati Jaya is that at the main stage raw material and material processing activities can be carried out Virtual collaborative workspace with microsoft teams which is a platform that allows various internal company stakeholders to collaborate with each other virtually. This proposal was given because observations showed that there was quite a distance between the production floor and the company office. Staff on the production floor often have to go to the office just to pick up documents or hang out with other employees. The suggestions for preparation and inspection activities can be carried out with the 5R program consistently which can have an impact on the condition of the production floor and employee satisfaction while working, this can be seen from the problem of production floor conditions which are less conducive. The final suggestion can be given to post-production activities with the proposal to implement quality control systems that can be used to ensure that the product does not contain defects. The system can provide information about production process efficiency, failure rates, and other metri

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