



Lean Manufacturing Analysis Using the Value Stream Mapping Method in the Paving Block Production Process at PT. SMX East Java

Mushtofa Lutfil Anshori^{1✉}, Aan Zainal Muttaqin², Doni Susanto³

Department of Industrial Engineering, PGRI University Madiun, Indonesia^(1,2,3)

DOI: 10.31004/jutin.v6i4.18091

✉ Corresponding author:

[aanzm@unipma.ac.id] [Mushtofaa@gmail.com]

Article Info	Abstrak
<p><i>Kata kunci:</i> <i>Value Stream Mapping;</i> <i>Lead Time;</i> <i>Pemborosan;</i></p> <p><i>Keywords:</i> <i>Value Stream Mapping;</i> <i>Lead Time;</i> <i>Waste;</i></p>	<p>PT.SMX merupakan perusahaan yang bergerak dibidang pengecoran dan produksi paving block, untuk proses pembuatan paving block membutuhkan waktu 1 hari dari bahan sampai selesai. Namun selama proses produksi terdapat beberapa kendala yang menyebabkan kegiatan produksi tidak selalu berjalan dengan lancar. Sebab, ada pemborosan selama proses produksi, masalah utamanya adalah Lead Time. Tujuan dari penelitian ini adalah meminimalkan pemborosan dengan menggunakan value stream mapping . Pada penelitian ini akan menggunakan value stream mapping dan data yang digunakan berdasarkan penelitian langsung, setelah data diperoleh dilakukan analisis peningkatan nilai VA pada Current State Mapping sebesar 1,345 menit, setelah dilakukan perbaikan menjadi 345 menit, NNVA yang 337 menit setelah dilakukan perbaikan menjadi 227 menit, dan nilai NVA yang sebelumnya 90 menit menjadi 25 menit. Minimisasi tertinggi terdapat pada proses penyimpanan sementara di penyimpanan Paving block setelah dicetak sebesar 900 menit dan penyebab utama pemborosan persediaan karena gudang penyimpanan perlu ditata ulang..</p> <p>Abstract</p> <p>PT.SMX is a company engaged in the casting and production of paving blocks, for the process of making paving blocks it takes 1 day from material to completion. However, during the production process there were several obstacles that caused production activities not to always run smoothly. Because, there is waste during the production process, the main problem is Lead Time. The purpose of this research is to minimize waste by using value stream mapping. In this study, value stream mapping will be used and the data used is based on direct research. After the data is obtained, an analysis of the increase in the VA value on the Current State Mapping is 1.345 minutes, after repairs it</p>

becomes 345 minutes, NNVA which is 337 minutes after repairs become 227 minutes, and the NVA value which was previously 90 minutes became 25 minutes. The highest minimization is in the temporary storage process in Paving block storage after being printed at 900 minutes and the main cause of wastage of inventory because the storage warehouse needs to be rearranged..

1. INTRODUCTION

In the current era of industrial growth, competition in the market is increasingly intense, especially in the manufacturing industry. Paving block is a technique for making road or yard surfaces using bricks. These bricks are neatly arranged and arranged in different patterns to create an attractive and durable look (Blok et al., 2015).

Concrete brick according to SNI 03-0691-1996, also known as paving block, is a composite building material made from a mixture of Portland cement or similar hydraulic adhesive, water, and aggregate. Bricks may also contain other additives, as long as they do not reduce the quality of the brick product. PT. SMX is a company engaged in the ready mix sector which produces concrete and building materials. The product produced by the company is ready-mix concrete. In this study only focuses on the manufacture of concrete bricks. In this study aims to analyze the wastage occurs during the process of making Paving blocks starting from raw material to in the form of finished goods ready to be sent to consumers

2. METHODS

Storage at PT SMX is quite large at this time, but for the arrangement it is not neatly arranged so that it interferes with the storage process where the placement of the paving blocks itself is still as long as it is in the warehouse, there is no grouping of types of paving blocks that are stored based on production time.

the cause of the longest waiting time is the storage of paving blocks after finishing printing which is placed in the production area so that the next day every time the workers start the production process they need to move the paving blocks to the storage warehouse.

1. Lean manufacturing

Lean manufacturing is defined as a systematic method that functions to find and make efforts to eliminate waste (Kurniawan et al., 2022). waste refers to activities in the context of the world of work that do not add value during the transformation process from input to output in the value stream (Centeno, Fiorella, & Huayanay, 2022) lean manufacturing as a business strategy that focuses on reducing waste, increasing efficiency, and creating systems that are flexible and responsive to changing customer needs. The main objective of implementing Lean manufacturing is to maximize value for customers and eliminate/reduce waste during the production process (Johan & Soediantono, 2022).

2. Value Stream Mapping (VSM)

Value Stream Mapping (VSM) is a concept that comes from lean manufacturing which is used to visually describe all activities or activities carried out by a company (Kale & Parikh, 2019). VSM covers various stages starting from raw material suppliers, manufacturing processes and product assembly, to the distribution network to the end users of these goods. (M. Majid, 2018) There are 2 types of Value Stream Mapping (Komariah, 2022) :

a) Current Value Stream Mapping which contains the initial state of the flow of material and information.

b) Future Value Stream Mapping is VSM design for the future as a form of repair of a production line.

in the context of Value Stream Mapping (VSM) is a tool used to map value streams and focus on value-adding processes, thus facilitating understanding of the value stream as a whole. One approach that can be used to find waste during the production process

The types of activities in Value Stream Mapping that often occur in the process are:

- Value adding activity, is a form of activity while producing products or services that provide added value.
- Non value adding activity, is a form of activity during the production process that does not provide added value. This activity is called waste which must be the goal to be eliminated.

- Necessary non-value adding activity, is a form of activity during the production process that does not add value, but this activity must be present in a production. This activity cannot be eliminated in the short term but can be made more efficient

3. Fishbone Diagram

Fishbone diagrams or are used to analyze the causes of a problem or condition. This diagram is also known as a cause-and-effect diagram. The main causes that affect quality in the fishbone diagram consist of five factors called 5 Why's, namely machines, people, methods, production materials, and measurements (A. Vandy Pramujaya, 2019)

3. RESULT AND DISCUSSION

3.1 Identification Current State Mapping

To identify waste, the VSM is the most efficient method because it describes the flow of activity processes from raw materials to finished products. Current state mapping describes the process flow to identify wasted time in the current paving block production

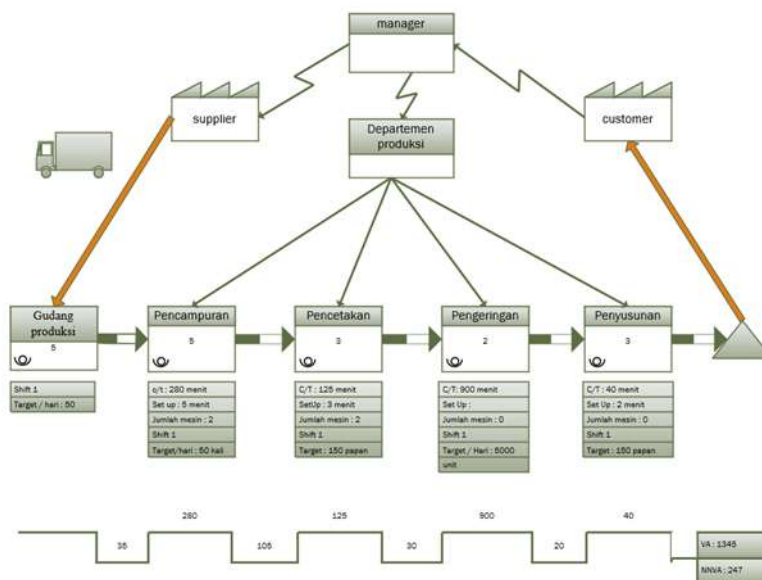


Fig. 1 Current State Mapping

Table 1 Process Activity Current State Mapping

No	Work station	Description	time (menit)	category		
				VA	NNVA	NVA
1	Inventory	Checking raw materials	10			
2		Raw materials are transferred to the production area	35			
3	Mixing	Transfer of sand to the mixer machine	50			
4		Filling cement into the mixer	50			
5		Filling water in the mixer machine	30			
6		Mixing all materials	150			
7		The dough is transferred to the multiblock machine	60			
8		Cleaning of used cement containers	10			
9	Pressing	Spilled dough cleaning	15			
10		Filling of multi block machines	50			
11		Board taking Printing board	25			
12		Printing board installation	25			

13		The process of pressing paving blocks	75			
14		Retrieval of prints	10			
15		Cleaning spilled dough around the machine	20			
16		Cleaning of hardened dough	5			
17	drying	Delivery of paving to the drying area	30			
18		Preparation of paving blocks	15			
19		Check for defects in paving	30			
20		Drying	900			
21	Warehouse preparation	Cart pick-up	2			
22		Setting up paving blocks on a cart	20			
23		Delivery of paving blocks to the warehouse	20			
24		Preparation of paving blocks	40			
25		Retrieval of plinths	10			
26		Return to the drying area	5			
27	Inventory	Waiting to be shipped				
28		Transfer of paving to a car for delivery	30			

Based on the results of the current process activity it is known that there are 28 activities in the manufacture of paving blocks consisting of operations, inspection, transportation, storage and waiting. the VA value is 1,345 minutes while the NNVA is 337 minutes then the NVA is 90 minutes. the biggest waste is in the temporary drying process for paving blocks after printing, because it requires extensive storage in the production process area.



Fig. 2 Temporary Storage

Then an analysis was carried out using a fishbone diagram to find out the cause of the occurrence wastage during the production process

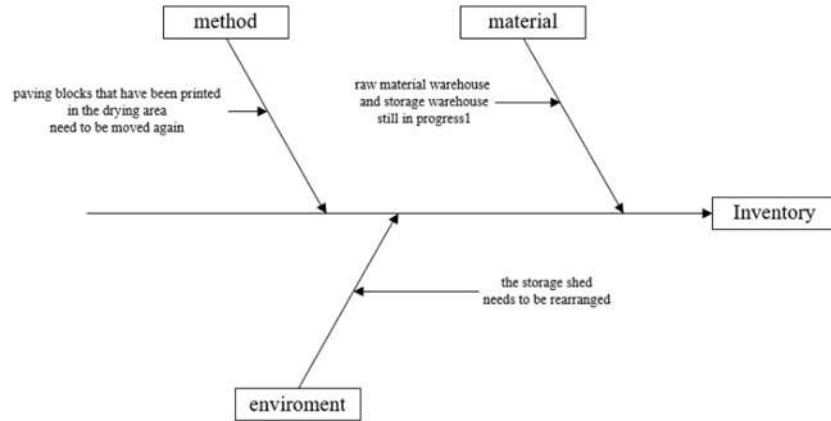


Fig. 3 Fishbone Diagram

The causes of wastage are as follows:

- raw material warehouse is still 1
- Removing paving blocks for 2 times causes the longest waste considering that large storage areas should be placed directly in the storage warehouse
- there needs to be a separation of the material warehouse and storage

Improvement recommendations

Recommendations for improvement are based on the type of waste with the highest value. Improvements that can be given include:

- The company needs to change the storage system for paving blocks after printing by placing them directly in the storage warehouse so that they can cut the time by 900 minutes
- Create a warehouse for cement raw materials in the production area so that the warehouse is neatly arranged and eliminates the process of moving cement from the warehouse to the production area.
- Replaced several spare parts on the mixer machine with holes so as to reduce the amount of dough spilled during production activities

3.2 Identification Future State Mapping

the results of the VSM Current state map that was made previously, to minimize waste in the paving block manufacturing process, a future state mapping is made by improving the paving block production process. The results of improvements based on the future state mapping can be seen in the picture:

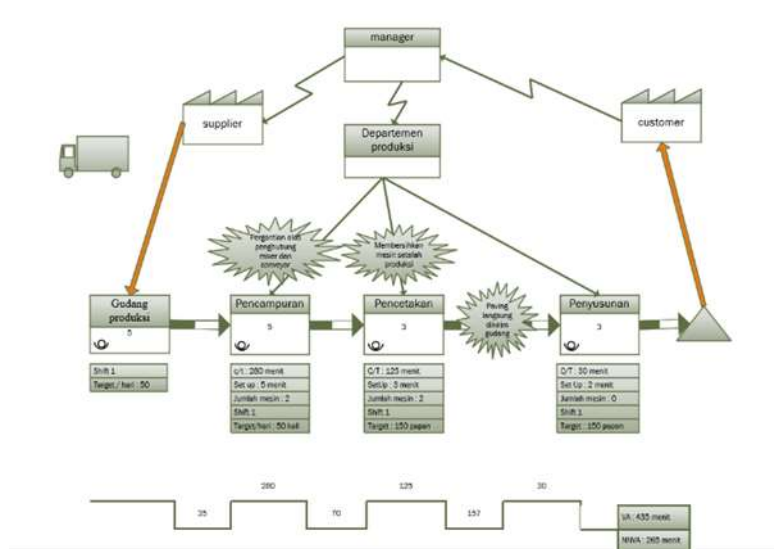


Fig. 4 Future State Mapping

The VA value in the Current State Mapping is 1,345 minutes and after repairs it becomes 345 minutes, by eliminating the drying process in the production process area because it is a waste of inventory which causes waiting time so that when the paving blocks that have been printed are sent directly to the storage warehouse and when the paving blocks are dry, they can be arranged immediately. The previous NNVA was 337 minutes after the repair was carried out to 227 minutes, because there was a process of taking spilled material on the mixer machine section to the conveyor machine, this needs to be repaired by replacing the base using a new board and adjusting its size then on a multi block machine water can be sprinkled on the machine when the operation process is complete so that the rest of the dough is clean. As well as the NVA value which was previously 90 minutes to 25 minutes assuming the multi block machine has been routinely cleaned after completion of production.

Table 2 Process Activity Future State Mapping

No	Work station	Description	Time (menit)	category		
				VA	NNVA	NVA
1	Inventory	Raw material checking	10			
2	Mixing	Transfer of sand to the mixer machine	50			
3		Filling cement into the mixer	50			
4		Filling water in the mixer machine	30			
5		Mixing all ingredients	150			
6		The dough is transferred to the multiblock machine	60			
7		Cement container cleaner	10			
8		Pressing	Filling of multi-block machines	50		
9	Board taking		25			
10	Printing board installation		25			
11	Paving block pressing process		75			
12	Retrieval of prints		10			
13	Cart pick-up		2			
14	Setting up paving blocks on a		20			

		cart				
15		Delivery of paving to the warehouse area	30			
16		Paving block arrangement	15			
17		Check for defects in paving	30			
18	Warehouse preparation	Paving block arrangement	40			
19		Retrieval of plinths	10			
20		Return to the drying area	5			
21	inventory	Waiting to be shipped				
22		Transfer of paving to a car for delivery	30			

After making improvements to the production process, for the activity mapping process at this time it can be seen that activities that previously had 28 times are now only 22 times, then for operational activities which were previously 14 activities now become 11 activities, the transportation process which was previously 9 activities became 7 activities, then the inspection process has the same number of activities as before, then the storage process which was 1 activity is now 0 and finally the delay activity which has a waiting time of 900 minutes can be eliminated.

4. CONCLUSION

The highest waste in the paving block production process lies in inventory where the drying process should be carried out directly in the storage warehouse area without going through drying in the production area considering that this causes the highest waiting time and the storage warehouse at PT.SMX can also be widely utilized.

if PT.SMX can apply pruning to the process automatically so that the amount of paving block production can increase. Then PT.SMX needs to replace several parts of the mixer machine considering that the dough often spills in the area due to holes.

5. ACKNOWLEDGMENTS (Optional)

thanks to the big family of industrial engineering at PGRI Madiun University

6. REFERENCES

- A. Vandy Pramujaya. (2019). *Analisis Penyebab Kegagalan Packer Machine Pada Bag Transfer System Dengan Menggunakan Metode Fault Tree Analysis (Fta), Failure Mode And Effect Analysis (Fmea), Dan Fishbone Analysis (Studi Kasus Di Pt Semen Bosowa Banyuwangi)*. Universitas Islam Sunan Kalijaga , Yogyakarta.
- Blok, J., Rohayati, T., Musa Hubeis, H., & Pandjaitan, N. H. (2015). Efektivitas Pembiayaan Dan Strategi Pengembangan Usaha Paving Blok Di Pd Telaga Jaya Blok, Tangerang Cost-Effectiveness And Business Development Strategy Paving Blok At Pd Telaga. In *Manajemen Ikm, Februari* (Vol. 201). Retrieved From [Http://Journal.Ipb.Ac.Id/Index.Php/Jurnalmpj/](http://Journal.Ipb.Ac.Id/Index.Php/Jurnalmpj/)
- Catur Kurniawan, D., Imron Zamzani, M., Studi Teknik Industri, P., Teknologi Kalimantan Jl Soekarno Hatta, I. K., Joang, K., & Timur, K. (2022). *Identifikasi Waste Pada Proses Remanufaktur Blade Lift Cylinder D-8r Dengan Pendekatan Lean Manufacturing*.
- Centeno, Fiorella, & Huayanay. (2022). Lean Manufacturing: Literature Review And Implementation Analysis. *Journal Of Scientific And Technological Research Industrial*.

- Johan, A., & Soediantono, D. (2022). Literature Review Of The Benefits Of Lean Manufacturing On Industrial Performance And Proposed Applications In The Defense Industries. In *Journal Of Industrial Engineering & Management Research* (Vol. 3). Retrieved From [Http://Www.Jiemar.Org](http://Www.Jiemar.Org)
- Kale, S. V., & Parikh, R. H. (2019). Lean Implementation In A Manufacturing Industry Through Value Stream Mapping. *International Journal Of Engineering And Advanced Technology*, 8(6 Special Issue), 908–913. <https://doi.org/10.35940/ijeat.F1172.0886s19>
- Komariah, I. (2022). *Penerapan Lean Manufacturing Untuk Mengidentifikasi Pemborosan (Waste) Pada Produksi Wajan Menggunakan Value Stream Mapping (Vsm) Pada Perusahaan Primajaya Alumunium Industri Di Ciamis*.
- M. Majid. (2018). *Identifikasi Dan Pengurangan Waste Pada Proses Produksi Minuman Herbal Instan Menggunakan Valuestream Mapping*. Universitas Islam Indonesia, Yogyakarta.