PAPER NAME
2018_Tingting VSM_IJRESM.pdf

AUTHOR
Siti Aisyah

WORD COUNT
3234 Words

CHARACTER COUNT
17197 Characters

PAGE COUNT
4 Pages

FILE SIZE
278.8KB

SUBMISSION DATE
Jul 22, 2022 8:42 AM GMT+7

REPORT DATE
Jul 22, 2022 8:42 AM GMT+7

11% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

- 9% Internet database
- 8% Publications database
- Crossref database
- Crossref Posted Content database
- 10% Submitted Works database

Excluded from Similarity Report

- Small Matches (Less then 15 words)
- Manually excluded sources
- Manually excluded text blocks

International Journal of Research in Engineering, Science and Management
Volume-1, Issue-12, December-2018
www.ijresm.com | ISSN (Online): 2581-5792

Analysis of Increasing the Productivity of Using Tinting Machines Based on the VSM Method in the Paint Industry

Gun Nanda Tian Purnama[1], Gunanto[2], Humiras Hardi Purba[3], Siti Aisyah[4]
[1,2,3]*Master of Industrial Engineering Program, Mercu Buana University, Jakarta, Indonesia*
[4]*Polytechnic STMI, Ministry of Industry Republic of Indonesia, Jakarta, Indonesia*

***Abstract*: Paint manufacturers experience the complexity of production planning due to the many color variations for a paint product that is supported by a lack of flexibility in batch production systems. The development of coloring technology with color tinting machines has allowed paint coloring to be done by the paint shop, not necessarily done directly by the paint manufacturer. By using the Value Stream Mapping (VSM) method, the paint production process will be mapped and analysis of improvements with the application of production in the paint manufacturer only white / base and staining done in the shop using Tinting machines. From VSM mapping and comparison before and after the improvement was carried out, the results showed that with improvements made by paint manufacturers will experience increased productivity through reducing production lead time by 41%, reducing NVA (Non Value Added) activities by 21%, increasing VA activity (Value Added) up to 17%, controlling the flow of raw material and simplifying inventory control for finish good paint.**

***Keywords*: VSM, Color Tinting Machines, Improvement.**

1. Introduction

The color demand of wall painting material in Indonesia is very diverse, both for exterior and interior. The colors of the wall painting produced in Indonesia are always following the trend of the world. The color of painting applied not only limited to protecting but the color of painting can affect the aesthetic value of the building or house. Becomes beauty, many people applied to the homes with diverse colors. Consumers are looking forward to having a great selection of colors to suit their tastes. Color psychologically will give a certain message and effect. For examples of pink show love, green for natural comfort while blue for the coolness of the heart. Even businessman have begun to concern about the choice of colors to support their business, both colors for interior shops / outlets, office buildings and even logos that will be used as business symbols. Similar paints or coating compositions such as lacquers, varnishes or wood coloring, are used by skilled professional decorators who are relatively unskilled - the painters themselves for various reasons. Usually, this is to brighten the environment and / or to match the color of certain furniture items, floor coverings or walls, and other surfaces found in buildings. Because consumers have become increasingly sophisticated and individual in their color choices, the demand for a wider range of colors has also increased. This poses a problem for paint producers and retailers or shopkeepers because the first must produce a lot of colors in small quantities, so losing economies of scale and, of course, retailers or shopkeepers must provide additional space to store and display a number of these colored paints. Typical paint is architectural paint used in locations at ambient temperatures [1]. The first factor that influences the complexity of paint product production planning is the many color variations for a paint product. The second factor is a batch production system. The batch production system causes production planning to be less flexible and allows for overproduction of certain products. The third factor is the use of the same limited resources for the production process of various types of existing products. Inappropriate production planning can result in products being produced at an undesirable amount, the use of resources is not optimal and all of these ultimately impact on the unmet demand from consumers and the high total costs to be borne [2]. With the current technological advancements, most paint manufacturers have begun to move to tinting or mixing technology [3]. This technology makes it easier for consumers to get more color choices. Some paint manufacturers in Indonesia who have used this Tinting technology include: Propan Raya ICC, Indaco, Danapaint, ICI Paint, Jotun, San Central, Avian Paint, Mowilex, Rajawali Hiyoto, Nippon Paint, TOA Paint. This analysis aims to calculate the productivity improvement that will be obtained by the paint industry company by using Tinting technology in the process of paint production.

2. Literature study

The use of paint is to provide surface protection, decorative and many special uses for commodities and merchandise by means of organic coatings [4]. The process of making paint uses several raw materials and goes through several stages of the process. The raw materials used in the paint industrial process are resins, solvents, pigments / colors and extenders [5].

- *Resin:* Alkyd, Aklirik, Vinyl etc.
- *Solvents:* Aromatic, Aliphatic, Ketone, Alcohol, Water etc.
- *Pigment / Color:* Organic, Inorganic.
- *Extender:* Calcium carbonate, Lime etc.
- *Auxiliary Material:* Cooking Oil, Plasticizer etc.

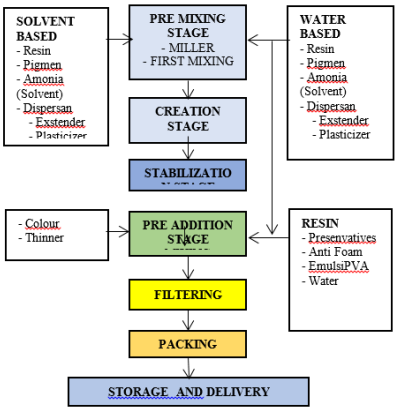

Fig. 1. The process of making paint in general

Tinting is a simple term from the process of mixing various colors to produce certain desired colors [6]. The tinting / coloring process is made on a tinting machine that is technologically advanced with excellent color accuracy. To be able to produce a variety of color choices with a more attractive design and make it easier for consumers to choose colors, many paint manufacturers are now using a Computerized Tinting System. With the tinting system, 2000 colors can be obtained in a short time. This system is used on a machine that functions to produce paint colors that are tailored to the desires of consumers. In this machine there is a computer system that can mix several colors of paint that has been provided to produce the desired paint product. The engine tinting system is intended to meet consumer needs directly in accordance with the consumer's desire for the color of the paint needed. With the tinting machine can also help paint manufacturers in making decisions to produce paint that suits the needs of consumers. In addition, paint manufacturers can also predict what kind of paint products consumers want. With this tinting system, any color choice from consumers is available in just a few minutes. Thus, consumers are no longer confused about the unavailability of paint stock [7]. Choosing paint tinting technology is a very right decision, if the color we want is not ready. Therefore, let's see how the process is made. First of all, of course you as a customer come to our outlet, choose the paint tinting brand that you want. Exacly, not all paint brands provide tinting technology, but we provide quality brands such as Dulux, Envi, Mowilex, Kem-Tone, Danapaint, and so on. After you choose the paint tinting brand, you just choose the color you want on the color card. Each color has its own unique code, which you should note if in the future you want to make paint with the same color code. After you choose the color, our employees will start working on it by providing all the necessary necessities, such as Base color paint (basic color paint that will be added with other colors), lever to open the lid, paint tinter (mixture paint to be mixed into the base paint earlier to give color), and so on. After that, the paint stock base color will be mixed with other colors in the mixing machine as shown next. Every unique color that you choose has its own blend formula to be the color you want. This is where the base paint color will be added the color becomes what you want. Then, after the colors needed are poured into the machine, the final step is to pour the paint into the stirrer. The goal is that the paints can be evenly mixed after being given the color [8].

Analyzing the coloring industry where machine manufacturers dispense dyes sell related products and services to paint manufacturers, who install them in retail stores to sell color paint to end consumers. The development of tinting machines integrates existing ones with the following specifications: (i) all relevant costs throughout the product life cycle are considered; (ii) costs of related goods and services are considered; (iii) explicit and hidden costs considered; (iv) the model adapts to the perspective of various actors in the supply chain. [9] This tinting machine is related to coloring machines to deliver coloring agents to the paint container and by a method to channel one or more dyes into a paint container with primer using the coloring machine. [1] Tinting machines are systems and methods including self-service and automatic components for paint coloring [10]. Value Stream Mapping (VSM) is one of the key lean tools used to identify opportunities for various lean techniques. Potential benefits for managers such as reducing production time and lower inventory in the process. Because VSM is involved in all process steps, both added value and non-value added, it is analyzed and uses VSM as a visual tool to help see hidden waste and waste sources. The Current Condition Map is made to document how things actually operate on the production floor. Then, Future State Map was developed to design a stream of lean processes through eliminating the root causes of waste and through process improvements [11].

VSM communicates valuable information, the most important benefits come from its creation. As long as the insight mapping process grows, the paradigm shifts and builds consensus. Mapping not only leads to a better process, but also leads to consensus that enables and enhances implementation. VSM cannot reveal how the current process actually works and works well. This knowledge can be used to develop a more economically efficient future VSM. To eliminate non-value-added waste (NVA) for the procurement of endovascular stents in interventional radiology services by applying value stream mapping (VSM). By eliminating factors that do not add value (NVA) and create a more refined whole process, products and services become more valuable to consumers and also more competitive to compete with competitors in the market [12]. VSM has proven effective in identifying and eliminating waste in facilities with the same or identical product routes, such as in assembly facilities. The process of mapping material flow and information from all components and sub-assemblies in the

value stream that includes manufacturing, suppliers and distribution to customers is known as value stream mapping (VSM) [13]. Value Stream Mapping (VSM) is a process of mapping material flows and information needed to coordinate activities carried out by producers, suppliers and distributors to deliver products to customers. Unlike the traditional process mapping tool used by IE, VSM is a mapping tool that maps not only the flow of material but also the information flow that signals and controls the flow of material. This enhanced visual representation facilitates the identification of value added steps in the Value Stream and elimination of steps that do not add value, or waste / youth [14]. Lead Time (L / T) is the time spent between customer orders and the final delivery of products to customers [15]. With VSM, the process is redesigned to be more effective and efficient than the previous one, namely the reduction of input (resources) needed [15]. A value stream is the entire set of activities running from raw material to finished product for a specific product or product family. Value stream maps are powerful visual tool used to identify waste and understand the flow of material and Information. Value stream maps show all actions required to deliver a product [16].

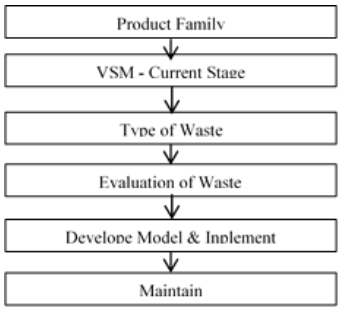

Fig. 2. VSM Flow

3. Research methodology

The methodology used in this analysis refers to the VSM principle by using data from paint manufacturers that have applied Tinting technology in their business processes. The flow of this research is as follows:

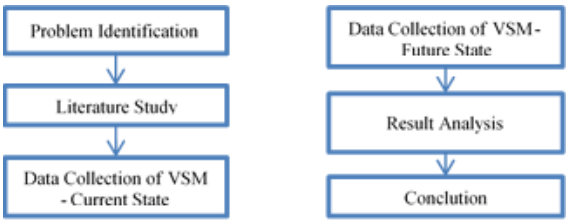

Fig. 3. Research Flow

4. Data collection

The data used is the average data of each process that is passed in the production of paint. Paint production data is divided into 2 types, namely production data for color paint and production data for white paint / base. Color paint production data will be used as VSM current state data that shows production data, if paint coloring is done in the production process, while white paint / base data production data will be used as VSM future state data which shows the store only orders white color and the coloring will done later in the store according to the color of the customer's request. After the data of each time the collected paint production process is made, the Current State & Future State VSM is made as follows

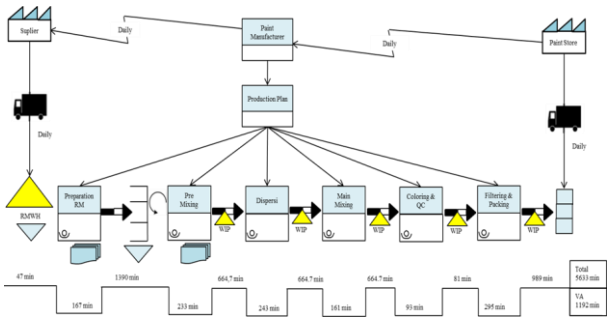
Fig. 4. Current State VSM

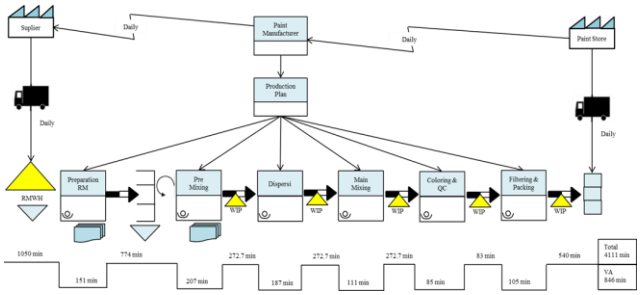
Fig. 5. Future State VSM
Source (Internal Data of Paint Manufacturers)

5. Result

In the Current State VSM the paint production process is carried out with various types of colors ordered by the customer while in the Future State the production process is only base / white paint when sent to the customer / shop and coloring can be done by tinting machine. Correctly argue that whenever there is a product for a customer, there is a flow of values. The challenge lies in seeing and doing it. VSM can be done in the same way for almost all business activities and extended upstream or downstream. This sophisticated tool not only highlights process inefficiencies, transactional and communication mismatches, but also guidance on areas of improvement [17].

The following are the results of the current state and future state VSM comparisons of this research:

- In the current state of VSM, customer orders and supplier orders are "by order" which means that customers will place an order with the paint manufacturer according to the vacancy in the store stock and the minimum order set by the paint manufacturer. Paint manufacturers will also order raw materials according to the need to reduce the amount of inventory of their raw materials and adjust the

Table 1
VSM data

in Minutes		Warehouse of raw materials	Preparation of raw materials	Wait for Production	Pre Mixing	wip	Dispersion	wip	Mixing	wip	Coloring & QC	wip	Filtering & Packaging	finished goods warehouse	Total	Lead Time (NVA+VA)	VA / NVA	VA / Total
Current State	NVA	1410.0		1390.0		644.7		644.7		644.7		81.0		989.0	**5804.0**	**6996.0**	**21%**	**17%**
	VA		167.0		233.0		243.0		161.0		93.0		295.0		**1192.0**			
Future State	NVA	1050.0		774.0		272.7		272.7		272.7		83.0		540.0	**3265.0**	**4111.0**	**26%**	**21%**
	VA		151.0		207.0		187.0		111.0		85.0		105.0		**846.0**			
															Increased Productivity	**41%**	**21%**	**17%**

minimum order. This shows that typical batch production and very volatile color paint demand make it very difficult to control the amount of production.

- In the future state of VSM, customer orders and supplier orders become "daily". Customers only need to pay attention to the minimum order as needed without having to sort by color and the paint manufacturer is easier to control the raw materials that will be ordered
- From current and future state data, VSM is known about the activities of Non-Value Added (NVA) and Value Added (VA) activities so that it can be seen as a comparison before and after applying coloring with Tinting machines done in the store. NVA and VA data and the comparison are as follows:

From the results listed in Table 1 above, it is known that there has been a change in the time of the paint production process after the company applied the coloring done in the shop according to customer demand. The effects of these changes are:

- Lead time is shorter with improvements because in the production process there are not many batches and types. Amount only adjusted according to order with one color that is white.
- Comparison of VA activities with total activity and NVA also increased. Of the 2 (two) points above, it shows an increase in productivity if the company wants to apply coloration outside the production process by utilizing a Tinting machine technology machine placed in the customer's shop.

6. Conclusion

By applying paint coloring done in the shop by setting up a Tinting machine and paint manufacturers only make base paint / white color, the production process at the factory will experience an increase in productivity. These improvements are as follows: Lead Time Paint manufacturers will get faster by 41%. Reduce the activity of Non-Value Added paint production by 21%. Increase the activity of Value Added paint production by 17%. Orders from customers can be made more regularly than previous orders which are not fixed (by order). Both paint manufacturers and shops can more easily control stock inventory of finish good paint material because there is only one type of paint in the inventory, namely white paint / base.

References

[1] Christopher, I., Ord, J., Walden, S., Gb, E., & Cane, M. R. (2018). (19) United States.
[2] Mulyono, M. F. & Shahab, A. (2012). Optimasi Perencanaan Produksi Cat di PT. XYZ dengan Metode Mixed Integer Programming. Prosiding Seminar Nasional Manajemen Teknologi XVI.
[3] Utama Paint Center. (2016). Mesin Tinting. date accessed 25 Desember 2018, dari http://www.utamapaint.com/produk/mesin-tinting/
[4] Goldschmidt & Streitberger (Eds.). (2007). Basics of Coating Technology, Hannover: BASF Coatings AG.
[5] Wernadewita, H., Rahman, N. A., & Md Deros, B. (2012). Penanganan Limbah Industri Cat Ditinjau dari Sisi Clean Technology Dalam Manajemen Industri. Jurnal teknik mesin, 4(2), 108-113.
[6] SCI Pusat. (13 Juni 2012). About Tinting: Cat Tembok Spectrum. https://sci-pusat.blogspot.co.id/2012/06/about-tinting-cat-tembok-spectrum.html
[7] Edupaint.com. (16 Juni 2011). Sistem Tinting Mesin Pada Produksi Cat. Date accessed 25 Desember 2018, dari. http://edupaint.com/cat/pengetahuan-dasar/478-read-110616-sistem-tinting-mesin-pada-produksi-cat.html.
[8] Toko Cat Citra Warna. (29 Desember 2015). Pembuatan Cat dengan Teknologi Tinting. Download Date 25 Desember 2017, from http://cwabali.com/artikel/view/Pembuatan-Cat-dengan-Teknologi-Tinting.
[9] Taylor, P., Caniato, F., Ronchi, S., Luzzini, D., & Brivio, O. (2014). Production Planning & Control : The Management of Operations Total cost of ownership along the supply chain : a model applied to the tinting industry, (March 2015), 37–41.
[10] Paint, M. F. O. R. (2018). Application Publication (10) Pub. No . : US 2018 / 0296995 A1, 1.
[11] Ar, R. (2012). Production Flow Analysis through Value Stream Mapping : A Lean Manufacturing Process Case Study, 41(Iris), 1727–1734. https://doi.org/10.1016/j.proeng.2012.07.375.
[12] Teichgräber, U. K., & Bucourt, M. De. (2012). Applying value stream mapping techniques to eliminate non-value-added waste for the procurement of endovascular stents. European Journal of Radiology, 81(1), e47–e52.
[13] Taylor, P. (n.d.). Production Planning & Control : The Management of Application of value stream mapping for lean operations and cycle time reduction : an Indian case study, (October 2012), 37–41.
[14] Rahani, S. A., & Zhou, J. (2011). Value stream mapping of a complete product. Department of Industrial, Welding and Systems Engineering, The Ohio State University, Columbus, OH, 43210.
[15] Amarath, R., & Prakash, G. S. (2014). Lead time reduction using lean manufacturing principles for delivery valve production. Glob J Financ Manag, 6(1), 35-40.
[16] Modi, D. B., & Thakkar, H. (2014). Lean thinking: reduction of waste, lead time, cost through lean manufacturing tools and technique. International Journal of Emerging Technology and Advanced Engineering, 4(3), 339-334.
[17] Reddy, G.S; Lingareddy, H & Jagadeeshwar, K. (2013). Value stream mapping in a manufacturing industry. International Journal of Advanced Engineering Technology, 4(2); 20-23.

11% Overall Similarity

Top sources found in the following databases:

- 9% Internet database
- Crossref database
- 10% Submitted Works database
- 8% Publications database
- Crossref Posted Content database

TOP SOURCES

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	University of Lincoln on 2022-03-28 Submitted works	<1%
2	ijrte.org Internet	<1%
3	estudogeral.sib.uc.pt Internet	<1%
4	The University of Manchester on 2014-04-01 Submitted works	<1%
5	eprints.umm.ac.id Internet	<1%
6	scribd.com Internet	<1%
7	dergipark.org.tr Internet	<1%
8	informaworld.com Internet	<1%

9	link.springer.com Internet	<1%
10	Universitas Mercu Buana on 2019-11-28 Submitted works	<1%
11	ijret.org Internet	<1%
12	mmt.its.ac.id Internet	<1%
13	slideshare.net Internet	<1%
14	International Islamic University Malaysia on 2015-06-11 Submitted works	<1%
15	papers.ssrn.com Internet	<1%
16	Federico Caniato, Stefano Ronchi, Davide Luzzini, Olimpio Brivio. "Total... Crossref	<1%

Excluded from Similarity Report

- Small Matches (Less then 15 words)
- Manually excluded text blocks
- Manually excluded sources

EXCLUDED SOURCES

ijresm.com Internet	81%
tandfonline.com Internet	3%
researchgate.net Internet	2%
North West University on 2013-03-11 Submitted works	1%
ijarse.com Internet	1%
University of Witwatersrand on 2018-08-27 Submitted works	1%
Caniato, Federico, Stefano Ronchi, Davide Luzzini, and Olimpio Brivio. "Total c... Crossref	1%
S.P. Jain Institute of Management and Research, Mumbai on 2017-10-03 Submitted works	<1%
CSU, Stanislaus on 2017-04-27 Submitted works	<1%
Kwame Nkrumah University of Science and Technology on 2013-04-28 Submitted works	<1%

Kwame Nkrumah University of Science and Technology on 2013-02-26 Submitted works	<1%
Higher Education Commission Pakistan on 2019-03-12 Submitted works	<1%
pdfsr.com Internet	<1%
lib.asprova.com Internet	<1%
typeset.io Internet	<1%
sciencedirect.com Internet	<1%
ijariit.com Internet	<1%
s3.amazonaws.com Internet	<1%
isem.com.vn Internet	<1%
cyberleninka.org Internet	<1%

EXCLUDED TEXT BLOCKS

Analysis of Increasing the Productivity of UsingTinting Machines Based on the VS...

so03.tci-thaijo.org

By using the Value Stream Mapping (VSM)method, the paint production process w...

godriswo.com

value stream mapping(VSM

Universitas Indonesia on 2018-08-15

A value stream isthe entire set of activities running from raw material to finishedpr...

pdfs.semanticscholar.org

International Journal of Research in Engineering, Science and ManagementVolume

University of Newcastle upon Tyne on 2021-04-06

International Journal of Research in Engineering, Science and ManagementVolume

University of Newcastle upon Tyne on 2021-04-06

International Journal of Research in Engineering, Science and ManagementVolume

University of Newcastle upon Tyne on 2021-04-06

argue that wheneverthere is a product for a customer, there is a

Dinesh Seth *, Vaibhav Gupta. "Application of value stream mapping for lean operations and cycle time redu...

International Journal of Research in Engineering, Science and ManagementVolume

University of Newcastle upon Tyne on 2021-04-06

process steps, both

A.R. Rahani, Muhammad al-Ashraf. "Production Flow Analysis through Value Stream Mapping: A Lean Manu...

the followingspecifications: (i) all relevant costs

University of Glamorgan on 2018-07-31

VSM has proven effective in identifying and eliminating wastein

George, Gikku J. "A simulation model to analyze post reflow processes at an electronics manufacturing facil...

but alsoleads to consensus that enables and enhances implementation.VSM

Ulf K. Teichgräber, Maximilian de Bucourt. "Applying value stream mapping techniques to eliminate non-valu...

and other surfacesfound in buildings

patents.google.com

To eliminate non-value

worldwidescience.org

provide additional space to storeand display

patents.google.com