# MANUAL MATERIAL HANDLING FLEET SIZING USING SIMULATION MODEL

# **A THESIS**

Submitted in Partial Fulfillment of the Requirement for the Bachelor Degree of Engineering in Industrial Engineering



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#### **IDENTIFICATION PAGE**

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I certifity that the research entitled "Manual Material Handling Fleet Sizing using Simulation Model" in this thesis has not be submitted for any other degree.

I certify that to the best of my knowledge and belief, this thesis which I wrote does not contain the works of parts of the works of other people, except those cited in the quotation and bibliography, as scientific paper should.

In addition, I certify that I understand and abide the rule stated by the Ministry of Education and Culture of The Republic of Indonesia, subject to provisions of Peraturan Menteri Pendidikan Nasional Republik Indonesia Nomor 17 tahun 2010 tentang Pencegahan dan Penanggulangan Plagiasi di Perguruan Tinggi.

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#### ACKNOWLEDGEMENT

This thesis is written as the partial fulfilment of the requirement for the Bachelor Degree of Industrial Engineer from Universitas Atma Jaya Yogyakarta. This thesis based on the research in a manufacturer.

I would like to express my deepest gratitude to the God Almighty, who gave me strength during this thesis completion. I would like to deliver appreciaton and gratitude to :

- 1. Mr. The Jin Ai, S.T., M.T., D.Eng. as the faculty supervisor who guide me during this research
- 2. Mr. Dr. A. Teguh Siswantoro, M.Sc. as the Dean of Faculty of Industrial Technology, Universitas Atma Jaya Yogyakarta
- 3. Mrs. Ririn Diar Astanti, S.T., M.MT., D.Eng. as the Head of Industrial Engineer Program Universtas Atma Jaya Yogyakarta
- 4. Mrs. Bening Parwitasuci, S.Pd., M.Hum. for her guidance during my study at Universitas Atma Jaya Yogyakarta
- 5. Mr. Drs. Luddy Indra Purnama, M.Sc. as academic supervisor during my study at Universitas Atma Jaya Yogyakarta
- 6. All parties that helped me during this thesis completion and study in Universitas Atma Jaya Yogyakarta

Last but not least, I realised that this research is still far from the perfection. I would like to received criticisism and suggestion to boost motivation for my next research.

Yogyakarta, October 2018

Eleonora Maria Pribadi

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#### ABSTRACT

In the lean principle, there are several waste to be reduced from the manufacturing process. One of the seven waste is inventory waste which included the material handling tool. Material handling took 30-75% cost of the production, on the other hand an optimized material handling system could save the cost around 15-20%. Therefore, in order to reduce the cost and waste, it is important to know the optimized material handling system. There are several criteria of a good material handling system, one of them is the amount of material handling tool.

The research purpose is to know the amount of material handling in a manufacturer. The current material handling tool that operated was not based on the production requirement. In other hand, the production system has a lot of station that spread on different location. Therefore, simulation model will be used to solve this research. The simulation divided into three different stage based on the current condition.

The simulation objective is to find the highest utilization among all of the amount of trolley alternatives. However, the highest utilization does not verify that the trolley could serve the system as good as the current system. Thus, the number of queue and the queue duration would be defined as the consideration to deterimine the solution. The alternatives on the simulation developed based on the lead time and demand of three different condition, the first alternative based on the average demand, the second alternative based on the maximum demand, and the third alternative based on the minimum demand. The result of the simulation is the number of trolley for stage 1 is 170 trolley, stage 2 is 154 trolley and it was based on the first alternative.

Keywords : Manufacturer, Lead Time, Transportation Model, Simulation, ARENA,

Lean Manufacturing.