DEVELOPMENT OF LEAN MANUFACTURING SIMULATION MODEL FOR MADURA SHIPYARD

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ABSTRACT

The design of lean manufacturing system to solve the problem of inefficiency or waste in the ship production system in Madura shipyard, with consideration because in a manufacturing system can always be found things that actually do not provide added value or things that are too excessive in doing so. This is commonly called waste workshop. Lean's approach aims to eliminate waste and non value added activity elimination, facilitate the flow of material, product and information, and continuous quality improvement. With lean approach, it is expected that the Madura shipyard will be more efficient and productive.
In this study developed a lean manufacturing simulation model for Madura Shipyard. The simulation model includes functional batch processes, product flow processes, and Lean Flow Frees Up Space. Development of simulation models is done with ARENA software.
Based on three alternative ship production systems such as functional process, production flow, and lean productin system, it can be concluded that lean production system is a production system that minimizes waste workshop such as mean workin process 1.2 tons, meanflow time 1.5 years, and mean waiting time 7 months. Based on this matter Madura shipyard should adopt lean production system in its production system

Key words: Lean Manufacturing, Shipyard, Simulation Model

INTRODUCTION

Lean thinking can also be defined as a method to define value, construct value added activity in the best order, make it flow without hindrance, and maximize more and more effective performance (Womack and Jones, 1996)
To build Lean Enterprises there are five main principles in Lean Production applied:

1. Specify value is a set of actions that can and can not be gained by adding value from a customer perspective rather than a company perspective.
2. Identify the value stream is to identify all the steps needed to design, order, and produce the product on the Whole Value Stream to see waste that does not add value.

3. Flow is to create an action that adds value in the production flow such as in the absence of activities that stop, the way that rotate, the flow back, the use of the rest of the material.
4. Pull is just making what consumers want.
5. Perfection is striving to achieve perfection by continuously eliminating waste.

Development of Simulation Model

The selection of software to be used in the simulation will have a major impact on the success of the researcher. This will affect the model's accuracy, model validity, execution time, and overall research completion time.

Simulation Model Using ARENA Software

The programming language used for manufacturing system simulation here is the programming language with the special purpose of SIMAN-ARENA.Pegden (1995), revealed some characteristics of SIMAN-ARENA are:

1. H as some special functions to model manufacturing systems
2. C ompatibility of mainframe computers, minikompueter, microcomputer to facilitate operation without having to modify the program.
3. G raphical modeling capabilities, interactive definitions of experiments and models.
4. C inema system that produces real time, high resolution, and animated graphics for the System being modeled
5. M odular structure that allows integration with analytical tools.

ConfiguringLean Manufacturing System

To provide optimal lean manufacturing system design in this research will be made three alternative lean manufacturing configuration, where the three alternative configuration will be simulated to know the response (result) from the three alternative.

Program Trial and Validation

Trial program here done to do the validation. Then the test results of the program are re-examined to detect whether there are errors in the model and if necessary there are modifications. The ways that can be done to implement the program validation are:

1. Using sensitivity analysis to know the influencing aspects based on specified performance criteria.
2. Compare the simulation results with past performance (historical data). If the performance results do not differ significantly (meaning) then the simulation model is said to be valid.

Results and Discussion

Lean manufacturing's main focus is to create one-piece flow. This means identifying the component family (part family) that undergoes the same process and mapping the production line for the product family. All products assigned to a machine cell will go through the operation one by one. This allows some parts to skip one step so that not every part has to go through each step. Typically, this approach has been used for large volume production, but world-class shipyards have been widely implemented, especially Japanese shipyards.

In a lean shipyard, docks are arranged in "product lines." The product line does not mean a separate ship component but has a similar component family, in this case a flat block passing through a series of processes and a separate set of processes reserved for the curved block. So all the flat profiles are cut on the same process path, as the profile is straight, and then a small batch is brought to the flat block path for assembly. The paint part is separated into two parts, one for the flat block and one for the curved block. Flat blocks and curved blocks are then installed in separate areas and finally assembled in grand block construction. In the picture can be seen an elaborate path in the process of functional batch and how clean and smooth current in the product flow process. Figure 1 shows fuctional batch process simulation model, figure 2 shows production flow simulation model, and figure 3 shows lean production system simulation model.

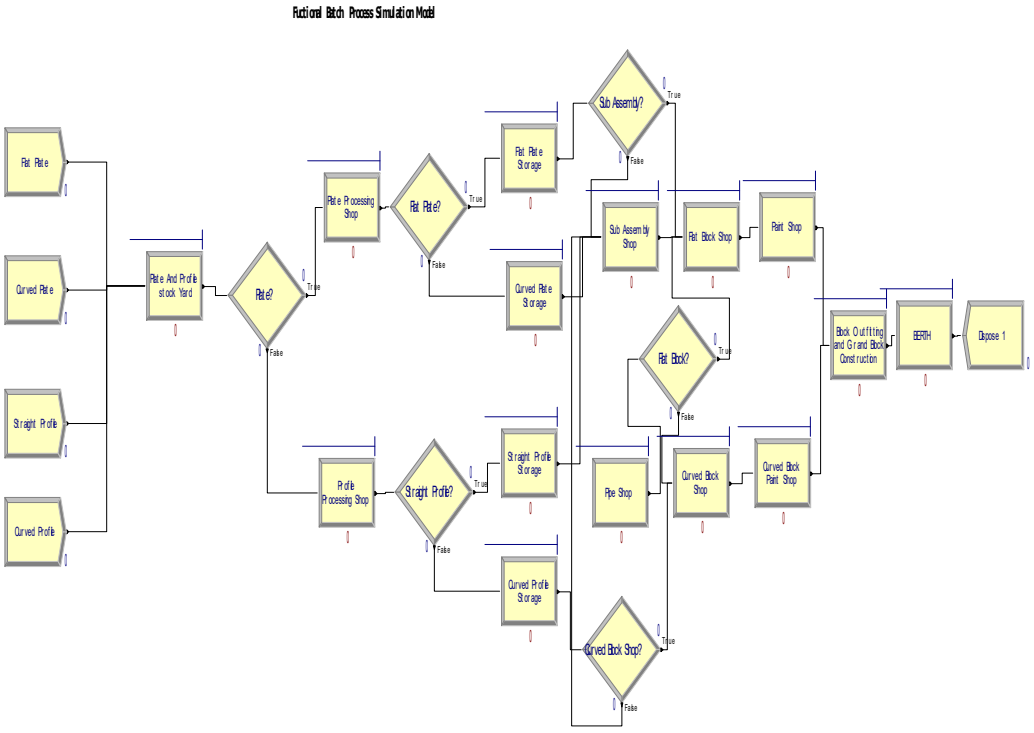

Figure 1. Fuctional Batch Process Simulation Model

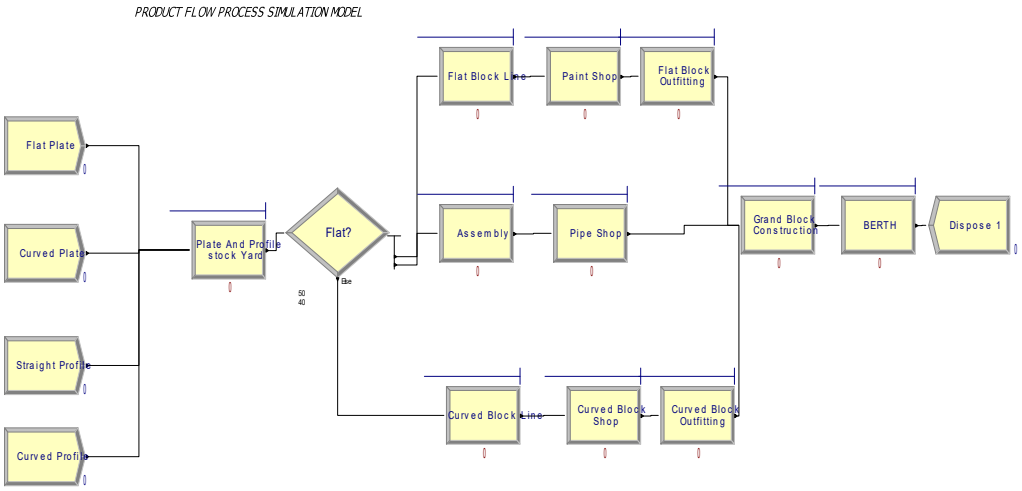

Figure 2. shows the product flow simulation model

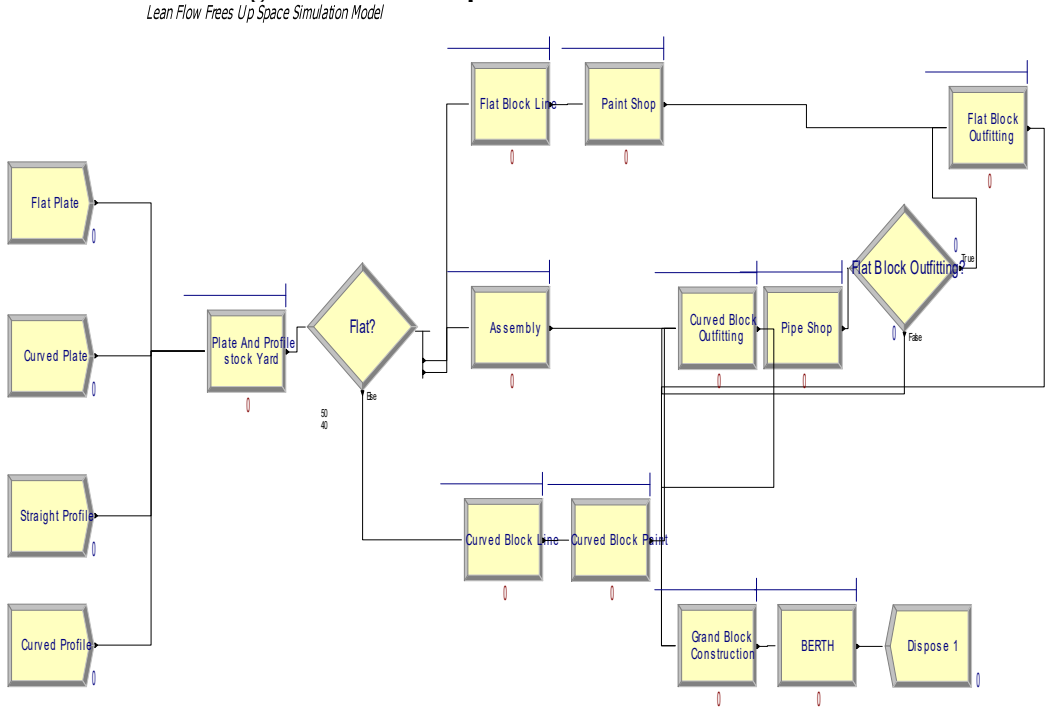

Figure 3. Lean Flow Frees Up Space

CONCLUSION

Based on three alternative ship production systems such as functional process, production flow, and lean productin system, it can be concluded that lean production system is a production system that minimizes waste workshop such as mean workin process 1.2 tons, meanflow time 1.5 years, and mean waiting time 7 months. Based on this matter Madura shipyard should adopt lean production system in its production system

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