Production Line Simulation In Vise Using The Flexsim Application

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Abstract. The quality of a factory is not only determined by the level of expertise of workers owned, quality facilities and supporting infrastructure is also determined by the queuing system that occurs during the production process. If the input and output on the machines are not balanced will cause the accumulation of goodsand allows the material used is damaged and production is not optimal. As for the production of this vise has 7 types of machines and consists of 8 parts. In this study, the simulation is carried out in the production process in the manufacture of vise. The general objective of the study is to find out whether the vise production process time with the number of production targets can be met and is effective.

1. Introduction

A good company is a company that is able to plan its production process realistically and with integrity, especially in determining the production time with production targets. The target market for sales of vise products in 2020 is assumed to be 1% so that integration between the production plan and the capacity requirements are needed. Forecasting results show a total sales of 340,458 units and 7 types of machines used with the number of parts in the vise as many as 8. If the production process will not meet the production target of course this becomes a problem in the vise production process. Problems that will occur such as the buildup at work stations, delays in the distribution process, as well as unfulfilled market demand. So to solve this problem, the method used in this study is to do a simulation.

Simulation is an activity that mimics the behavior of a real system. From this clone, various things are learned in the real system so that information about the real system is obtained. Mimicking the real system is done by developing it in the form of a computer program. Computer simulation is the discipline of designing actual or theoretical physical system models, implementing models on digital computers, and analyzing the output of execution [1].

At the design stage, the computer can provide assistance in the selection of machine tools and cutting tools appropriate to the parts to be manufactured; while, simulation can be performed to study the optimal machining conditions and tool management strategies. Further the computer is able to aid the selection of the appropriate and compatible handling and storage equipment, followed by simulation to investigate the effects of employing varying traffic control and transporter scheduling strategies. When the equipment requirements have been determined, simulation can be employed to

synthesize the system configuration and layout best satisfying the work flow patterns and system performance [2].

The general objective of the study is to find out whether the vise production process time with the number of production targets can be met and is effective. The simulation in this study was conducted on the production system in vise. Simulation results are expected to show the real situation on the production floor and to know the level of performance of each machine. Also, it is expected to help the management to take the right strategy in adding workers in accordance with existing conditions on the production floor. The purpose of this study is to look at the conditions in the production process and the performance of each machine that is affected by the length of waiting time based on FLEXSIM software.

2. Theoritical Background

The model is an approach or abstraction of a system developed for the purpose of study. The model contains things (variables) that are relevant to the existing real system. Observation in a system can be the basis in the formation of a model. The model consists of analog models and symbolic models. For analog models, real system modeling is done through behavior, while symbolic models are based on perspective, verbal, mathematical and logic thinking of the modeler [3].

Understanding the model can be seen from three types of words. As a noun, a model means description, representation or symbolism. So that the three meanings of this model are used in the modeling process, the model is designed as an ideal depiction of the operation of a real system in order to explain or demonstrate the importance associated with relationships. The purpose of modeling studies is to determine information that is considered important to be collected, so there is no unique model. A system can have various models, depending on the viewpoints and interests of the model maker point of view and the interests of the model makers. On the off chance that the consequences of QC tests can't satisfy the acknowledgment models, the aftereffects of examination of the entire arrangement of the estimations on that day must be eliminated or should be re-dissected, and an incomplete or full re-approval of the strategy considered [11].

Discrete Event Systems Specification (DEVS) is a modeling formalism. Just as arithmetic underlies addition, multiplication, and other calculations, so DEVS underlies simulation of discrete event models. DEVS Simulation is performed by a DEVS simulator or simulation engine that correctly implements an Abstract DEVS Simulator description that is technology agnostic. This is much like a calculator program executing an algorithm that describes the program operation in terms that abstract away the implementation details [4].

Simulations that are facilitated by several computer devices have the meaning of imitating a real system which is the object of study to find answers to the problems of the system. The basic principle of computer simulation is that by building mathematical models of real system problems, then the model can then be transformed into a computer program where the program can mimic the behavior of real systems that become models. Simulation offers alternatives to find solutions to complex problems that cannot be solved by analytic models [5].The following is an example of a description of how a discrete system simulation works that can be seen in Figure 1.

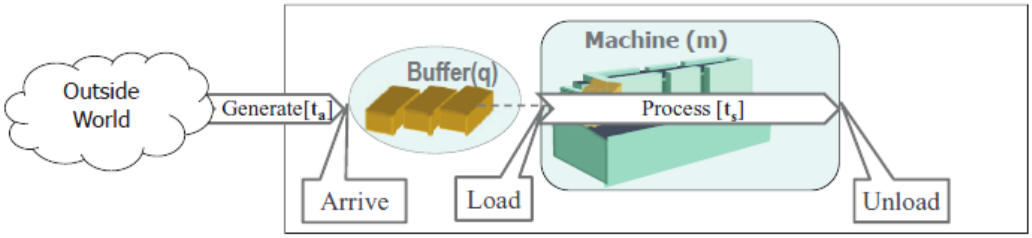

Figure 1. Single server system model

The dynamics of the single server system can be described in terms of the modeling components (*Job Creator*, *Machine*, *Buffer*, *Job*, *create*, *process*, *arrive*, *load*, *unload*) as follows: the Job Creator creates a new Job for a duration of ta minutes, which makes a new Job arrive every ta minutes; the new Job is loaded on the Machine if it is idle, otherwise the Job is stored in the Buffer; the loaded Job is processed by the Machine for ts minutes and then unloaded; the freed Machine loads another Job from the Buffer if it is not empty[6].

3. Research Methodology

The simulation approach with the help of FLEXSIM software in the study was carried out to make it easier for researchers to obtain optimal results of production time per unit per unit time.

To obtain the cycle time that will be included in the simulation, we must first generate data using Microsoft Excel by using the operation time for each process that is in each part. After generating the data, the distribution of observational data is then carried out using the FLEXSIM 2019 software.

Distribution Testing

Statistical hypotheses are statements or conjectures about one or more populations. True or false population will never be known with certainty, unless the entire population is examined. Of course in most situations this is not possible. Therefore, a random sample can be taken from the population and use the information contained in that example to decide whether the hypothesis is most likely true or false. Evidence from examples that are not consistent with the stated hypothesis certainly leads to the rejection of the hypothesis, whereas evidence that supports the hypothesis will lead to its acceptance [7].To test the fit of the distribution model or the goodness of fit of continuous data can use the Kolmogorov-Smirnov (K-S) test. The value obtained is then compared with the Kolmogorov-table. Smirnov. If the value of D_n is greater than the table value, then H_0 is rejected and H_1 is rejected received. Conversely, if the D_n value is smaller the table value then H_0 is accepted and H1 is rejected [8].

Simulation Model

A model that describes the cause and effect relationship (cause and effect relationship) in a computer capable model that describes the behavior that might occur in actual systems. Simulation models are used as a tool to find out what happens if (what if) one or more components or variables are changed. Like analytic models, simulation models also provide quantitative output.

An accurate simulator depends on having access to extensive, accurate data from the target system. However, this is often lamentably far from the case in simulation tasks: historical data often lacks required parameters, while real-world situations prove a challenge to measure. These issues can greatly affect a model's accuracy. In such cases of incomplete data (such that a model's parameters cannot be clearly estimated), it is necessary to use a process of calibration (or tuning) to arrive at appropriate values for uncertain parameters indirectly [9].

The simulation model requires idealistic assumptions and constraints about the system, while the data model does not. For example, when we perform a modeling of the controller in the automotive engine, the controller may be valid in a narrow range of operation because the models include some ideal behavior assumptions and the model parameters are generally calibrated using steady-state experimental data. This can be one of limitations of simulation modeling [10].

4. Result and Discussion

Primary data collection is done by generating data and testing the type of distribution selected in the process of making each part.

4.1. Making Fixed Resources

Entered fixed resources are used. In this simulation the source is used as raw material, queue, processor as the engine used and combiner for the assembly process. The final display of fixed resources that have been prepared for the runway process can be seen in Figure 2.

Figure 2. Result of fixed resource for base process

The final display of fixed resources that have been compiled for the entire process can be seen in Figure 3.

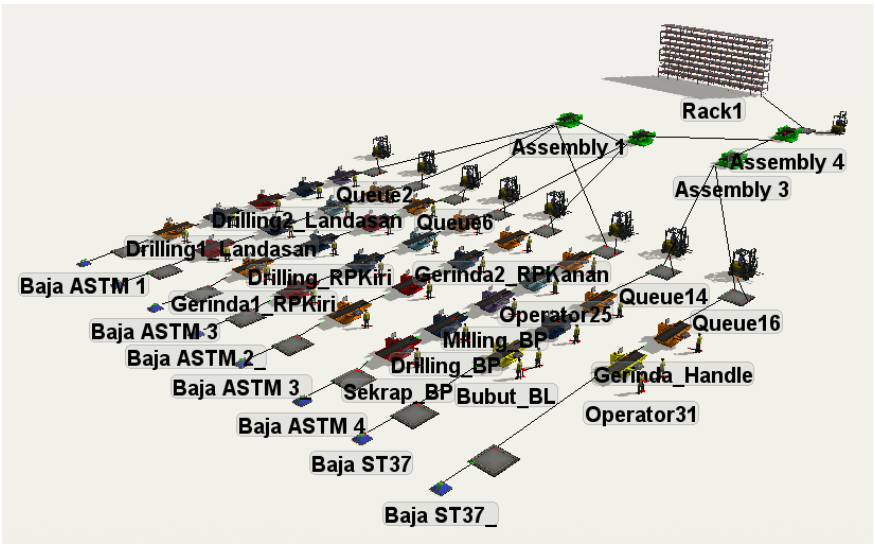

Figure 3. Final result of fixed resources vise production

4.2. Making Task Executor

Task executor is a form of material handling and for this process the operators and forklifts are used. The sum of the two resources is obtained from the results of data collection. It can be seen in Figure 4.

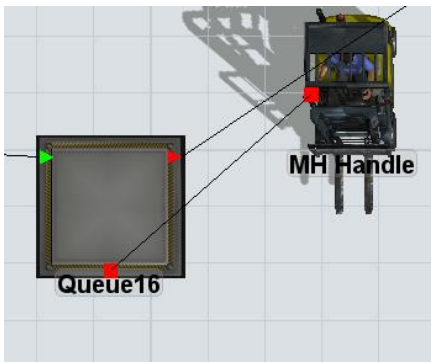

Figure 4. Result of task executor

4.3. Network

Network is used to connect one object to another object. Some types of networks are connect objects, connect center ports and extended connect. It can be seen in Figure 5.

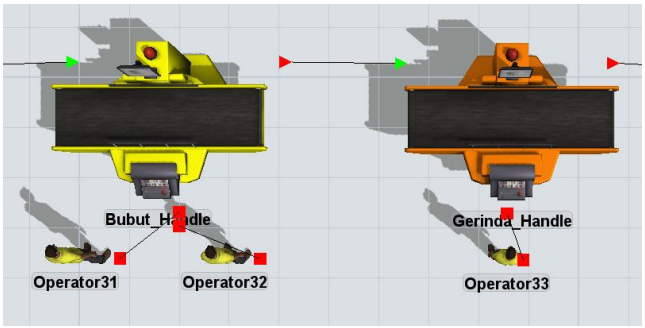

Figure 5. Result of network

4.4. Dashboard

In determining the dashboard data needed is the number of products available. Data on the number of available products is then processed using Dashboard tools. It also can be seen in Figure 6.

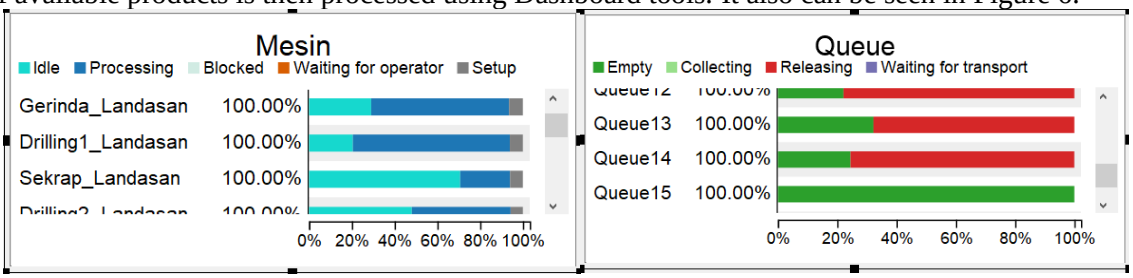

Figure 6. Dashboard of machines and queues

It can be seen in the picture above that the performance of the machine and also the queue in the vise production process show quite good results. There are no blocked events, waiting for operator or transport.

4.5. Simulation

Simulation is carried out to see the actual results of the system that was designed before. This function is to find out whether the design is correct or not. Following are the result of the simulation.

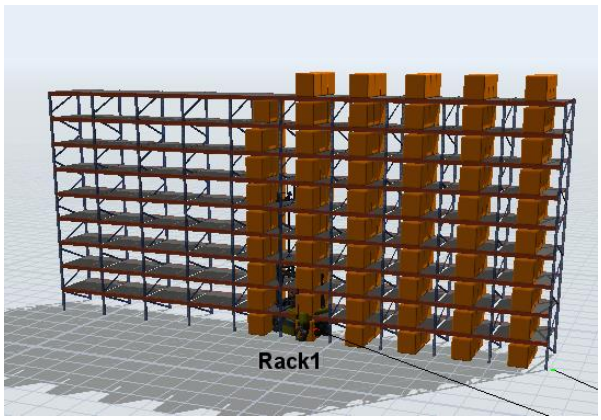

Figure 7. Result of the Simulation

The picture above is the result of a simulation of vise production when the final product is placed on a rack that has been available with the help of a forklift.

5. Conclusion

Based on research the conclusions that can be drawn as follows:

- The simulation model in this vise is a discrete system simulation. Every event occurs at a certain time in time and marks a change in the state of the system. Between sequential events, no changes in the system are considered to occur; thus the simulation time can jump directly to the time of the next event, which is called the development of the next event time.
- In the vise production process it uses 7 types of machines, namely drilling, milling, tap and dies, scrap, lathe, grinding and assembly also consisting of 8 compiler parts.
- Based on the results of the simulation using FLEXSIM the time required to complete a vise is 2.09 hours without long queues or stacking.

Acknowledgements

The Authors would like to thank XYZ company for providing the data in this research

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