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# Review on Productivity Improvement and Facility Layout Planning with Simulation Tool

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**Abstract -** *Simulation is the most effective tool in conducting a study of productivity improvement and facilities layout planning as well as line balancing. By using a simulation software, we can view the results very quickly which helps in taking the big decisions. The bottlenecks of the system can be easily identified with simulation. This study focuses to meet the targeted throughput for the maximum demand of customer. A simulation tool is used to carry out the analysis of the current system and improvements are suggested by conducting various experiments. The aim is to productivity improvement and facilities layout planning as well as balance the line by reducing the losses or to suggest the alternate ways to achieve the targeted throughput of the system. A small-scale industry is selected where the customer demands for peak requirement are not met. The study is conducted by using a simulation software which is widely use. In simulation, the study of bottle-necks present in the system are identified and solutions are given to minimize them as possible. The bottle necks are identified by studying machine utilization statistics, Queue parts statistics. System throughput is monitored for every experiment.*

***Key Words:*** *Simulation, Throughput, Bottle-neck, Statistics*

## 1. INTRODUCTION

Simulation is computer-based modeling of a real system or process. Staffing requirements, processing equipment, material handling equipment, work-in-process, storage space, floor plan design, and various policies and procedures can be created or altered in the model to evaluate their impact on the efficiency and effectiveness of the process. Users may test any and all options, not just for their impact on the system, but to and the best combination of operational characteristics to optimize performance and reduce costs. Contemporary production is characterized by a wide selection of products, reduction of the product's life cycle, production costs and the time span between designing and launching products (Weiss, 1998). A constantly shortened cycle of the product's life caused by strong competition and changing requirements of customers, forces producers to identify weak points of production processes and implement changes aimed at improving their operation. It can be stated with high probability that every production process allows for some limitations to the manufacturing capacity of the enterprise since the existence of a bottleneck is the main factor affecting the efficiency of the production line and management (Liu & Lin, Actions 1994; Chiang et al., 2001). Every enterprise can face constraints limiting the obtained revenue. The Theory of Constraints (TOC) assumes that every system has one basic limitation that influences the efficiency of the system in a given period (Chlebus, 2000; Goldratt et al., 2004). Localizing bottlenecks is a key issue of production systems. Studying production bottlenecks is also a regular subject matter of scientific research. Production bottlenecks lead to various consequences. They can cause two major problems in a production process. Firstly, if the capacity of the assembly line does not suffice to meet the demand, an enterprise may lose its customers. Secondly, if the surplus of stocks is accumulated before the workstations of the bottleneck, this breeds additional costs connected with storing. The development of computer science and the enormous computing power boost the increasing popularity of simulations that use appropriate software to project changes on real objects and situations before making any changes. The advancing computer simulation technology is gaining importance and becoming one of the most significant elements of production management. The reason behind this development is the necessity for companies to solve increasingly complex production problems as soon as possible. The development of programs for the simulation of processes makes it possible to use them in any enterprise, regardless of the profile. This software is used e.g. in the cells of the design, management and storage.

### 1.1 Need of simulation :-

1. Simulation enables the study of, and experimentation with, the internal interactions of a complex system or of a subsystem within a complex system.

2. Informational, organizational, and environmental changes can be simulated, and the effect of these alterations on the model's behavior can be observed.

3. The knowledge gained during the designing of a simulation model could be of great value toward suggesting improvement in the system under investigation.

4, Changing simulation inputs and observing the resulting outputs can produce valuable insight into which variables are the most important and into how variables interact.

5. Simulation can be used as a pedagogical device to reinforce analytic solution methodologies.

6. Simulation can be used to experiment with new designs or policies before implementation, so as to prepare for what might happen.

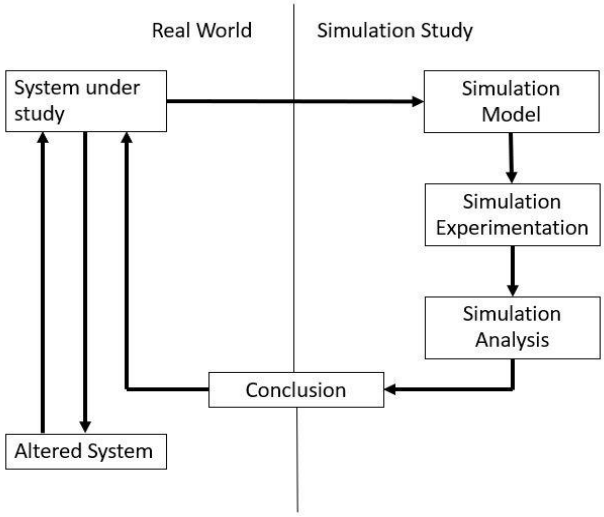


Figure 1. Simulation study schematics

### 1.2 Advantages of Simulation :-

- New policies, operating procedures, information flows and so on can be explored without disrupting ongoing operation of the real system.
- New hardware designs, physical layouts, transportation systems and can be tested without committing resources for their acquisition.
- Time can be compressed or expanded to allow for a speed-up or slow-down of the phenomenon (clock is self-control).
- Insight can be obtained about interaction of variables and important variables to the performance.
- Bottleneck analysis can be performed to discover where work in process, the system is delayed.
- A simulation study can help in understanding how the system operates.
- "What if" questions can be answered.

### 1.3 Disadvantages of Simulation :-

- Model building requires special training and skill set.
- Simulation results can be difficult to interpret.
- Simulation modelling and analysis can be time consuming and expensive.

## 2. LITERATURE SURVRY

Subodh Kumar1, Arun Kumar2 and Amit Kumar3

The focus of this research is on the analysis of serial production lines which are characterized by capacitated buffers, stochastic processing times, unreliable machines, rework loops, maintenance and operator issues. This constitutes a complex manufacturing system for which we have adopted discrete event simulation as a tool to predict the performance metrics. As a part of this thesis, a VBA project was undertaken in an effort to automate the process of building a simulation model in Arena 7.01 from an Excel template. We have also developed an algorithm which will automatically detect the bottleneck in a serial production system and suggest appropriate changes to the analyst with an objective of increasing the throughput of the system. These techniques are embedded in a ten step methodology presented in this thesis.[1]

Mateusz Kikolski

The major objective of the paper is to identify the possibility of applying selected simulation tool while analysing production bottlenecks. An additional purpose is to illustrate the subjects of production bottlenecks and creating simulation models. The problem analysis involved the application of the software Tecnomatix Plant Simulation by Siemens. The basic methods of research used in the study were literature studies and computer simulation.[2]

Yu-Cheng Hsiao a, _, YiLin b,c, Yun-KueiHuang b

Bottleneck appears in a serial supply chain if the minimum production rate at all stages is smaller than the demand rate. Operation manager must focus on keeping the bottleneck stage fully utilized and forcing the other stages to produce in synch with the bottleneck. This study applies the lot size division method, the recursive tightening method, and the drum-buffer-rope strategy. A pull and reverse pull algorithm is designed to solve the multi-stage logistic and inventory problem with a production bottleneck in a serial supply chain. A numerical example is included to illustrate the algorithm procedures. [3]

X. Zhu1, R. Zhang*2, F. Chu3, Z. He4 and J. Li5 With people's increasing concern about food safety, cold-chain logistics distribution centre is playing an important role in preventing food from going bad. Now cold-chain logistics distribution centres have the problems of too much transportation, low degree of automation, unreasonable layout planning, complex distribution process etc. It is important to solve these problems in order to achieve efficient distribution. Firstly the modeling and simulation for the operation process of a fruits and vegetables cold-chain logistics distribution centre by using Flexsim software is realized. Then the paper analyses the preliminary output data and finds out the bottleneck and idle resources. Finally this paper makes adjustments for the system to get a better result which hopes to give a reference for the modelling and simulation for the operation process of other cold-chain logistics distribution centres.[4]

U. Sravan Kumar1, Y. Shivraj Narayan2

Improving the quality of products being manufactured and enhancing the productivity is of utmost importance in today's global competition. This could be achieved by addressing the bottlenecks present in the manufacturing process as well as in the layout. This project aims at optimizing the layout of Upvc windows manufacturing unit of M/s. GenX windoors Private Limited Hyderabad. It is done by carrying out a detailed study to find out the bottlenecks in the existing layout and suggest corrective measures to them. Various tools like Statistical Quality Control, Flow Process charts, Flexsim software are used. The layout is optimized by first building and validating the simulation model of existing layout, followed by creating proposed layouts based on the various alternatives found for the bottlenecks and validating them. Alternatives or corrective measures are decided by making use of statistical tools like brainstorming and flowchart. Simulated results are then compared with the existing results so as to find the optimized layout. It is also intended to carry out the cost analysis so as to know the economic impact of implementation of the proposed changes in the windows manufacturing unit.[5]

## 3. CONCLUSIONS

By observing above all facts from resources it can concluded on following discussion-

1. Manpower and Time Balancing – It has been noted by the management that idle time of workers is significantly large due to no work load leading to their belief that there is scope for manpower optimization.
2. In process rejection – Currently industry is facing small loss on internal rejection, which is a constraint in continuous supply.
3. Supply issues: Currently industry is able to fulfil 100% demand of its existing customer but the time required is more than planned time.
4. Improper procurement and planning: From the existing supply and demand data, there is planning but the material is not produced and procured all as per plan.

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