An Overview of Disarray in Plant Layout Optimization using Simulation

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Abstract— In these paper overviews of various works are done. This paper tries to give an idea about the previous researches & their finding about study of simulation and optimization of plant layout and study related to time study and process study.

Key words: Optimization, Plant Layout, Simulation

I. INTRODUCTION

Organizations, businesses, or individuals worldwide search for ways to lower costs and optimize their use of critical resources. Doing this in a changing, integrated, and dynamic worldwide environment becomes a major challenge. In recent history quality circles brought people together to avoid waste and improve their products. Today organizations search for "lean" systems that simplify efforts. They prepare value stream maps to identify wasted time and effort. Optimization is considered a key to success. But in an ever increasing dynamic and integrated world, even these efforts can be out of date quickly or fall prey to unintended consequences. Success in the world economy is often viewed in terms of competition, risk, and innovation. Business success involves speed and leverage in making decisions. In a time dependent world it's critical to plan, execute, and work efficiently the first time, every time. The changing demand for goods and services are just one example of the need to make timely decisions.

In industry time is the most important parameter. Highly customized products, smaller batch size and varying market requirements make the profitable production very difficult. Plant layout decides the production capability of the plant. It has been observed that improper plant layout causes stacking, increase in work in processes inventory.
Simulation can directly identify areas of cost savings or efficiency as well as plying a major role in risk analysis. Simulation provides insight into risk analysis by providing increased knowledge of system dynamics and interactions. It also identifies possible scenarios resulting from various actions. Simulation may not be able to predict specific demands for future goods and services but it can be used to assess the impact of such demand variability on a system's ability to react.

Many conventional methods help to study the plat layout, but are time consuming. Modern techniques like computer simulation software helps in finding the bottle necks. Also simulations software provides the 3D model of the layout.

The role of simulation has been known for some time. However, it's only been since 1980 that simulation applications have reached a point where they are truly accessible to a wide range of users. Simulation starts with modeling and models. A model in this sense is defined as a physical or mathematical description of an object or event. It represents a single point or action in time. A simulation is then puts models in motion. An operating scale model of a piece of equipment is actually a physical simulation. Modern simulation applications are based on mathematical models but can look physical as well through three dimensional graphics.

II. MANUFACTURING FACILITY LAYOUT DESIGN AND OPTIMIZATION USING SIMULATION

S. M. Kadane and S. G. Bhatwadekar [1], published a paper Manufacturing Facility Layout Design and Optimization Using Simulation. The paper deals with the design of manufacturing facilities layout with the consideration of downtime of facilities and space utilization. Facility layout refers to the arrangement of physical facilities such as machines, equipment, tools, furniture etc. in such a manner so as to have quickest flow of material at the lowest cost and with the least amount of handling in processing the product from the receipt of raw material to the delivery of the final product.

III. SIMULATION AND OPTIMIZATION OF PRODUCTION LOGISTICS SYSTEM LAYOUT BASED ON FLEXSIM

JianliangPeng [2], have simulated and optimized production logistics system layout based on flexsim. A production logistics system is very complex and dynamic, optimizing its layout accurately and efficiently is difficult and even impossible based on the traditional mathematical method. This paper focus on finding the bottleneck issues in production logistics system and optimizing its layout based on Flexsim software. With an actual case of production logistics system, we can find the pivotal issues based Flexsim software. And then, we can't simulate continuously the production logistics system layout s with the equipment number or different layouts based on Flexsim, until the bottleneck disappears or is not so obvious. Finally we can obtain the improvement layout which meets with the requirement of enterprises' production plan preferably. The results prove that it is convenient and effective to simulate and optimize the production logistics system layout based on Flexsim.

IV. DETERMINATION OF BUFFER SIZE IN SINGLE AND MULTI ROW FLEXIBLE MANUFACTURING SYSTEMS THROUGH SIMULATION

Srinivas. C et.al [3], determined a buffer size in single and multi-row flexible manufacturing systems through simulation. This paper presents the determination of buffer size for machines in single and multi-row Flexible Manufacturing System (FMS) for the best layout obtained by genetic algorithm (GA) through simulation. To maximize the operating performance of FMS, many parameters must be considered, including the part types, sequencing, cost of transport between workstations, distance between machines

and buffer sizes. Of the various critical factors, following three are considered for analysis: (1) minimizing the buffer size (2) minimizing the blocking and (3) maximizing the machine utilization. Simulation enables more efficient planning of the whole FMS, easy modifications before implementation on the real system. The software package FLEXSIM is used to develop the simulation model. A model of a optimum layout FMS obtained by GA that may contain a number of machines, input and output buffers, capturing part types flow quantities, part routes, from the database and AGV's used as a means of transport, is built by FLEXSIM software. Analysis is done on the model to determine the optimum buffer size for the machines. Thus by performing simulation on the model optimum buffer size in the individual rows are established.

V. Optimization of Part Input Sequence in a Flexible Manufacturing System

Howe Chiat Cheng and David Yin Kai Chan [4], presented the work Simulation Optimization of Part Input Sequence in A Flexible Manufacturing System

This paper describes the development of a simulation model for production planning personnel to carry out optimization of part input sequence. The model simulates a flexible manufacturing system for the production of machined components. Using a custom built user interface, the planner imports production and demand data from an Excel spreadsheet into the model. The model optimizes part input sequence by simulating different combinations of part input sequences and determining the combination with the highest total slack time. Simulation conducted by the authors using this model shows that even a short, partial optimization run yields a schedule with improved slack. Presented in the paper are the steps involved in the development of the model and the benefits of the simulation-optimization model to the planner.

VI. Analysis and Optimization of Plant Layout Using Relative Allocation of Facilities Technique

Bobby John et al [5], published a paper on analysis and optimization of plant layout using relative allocation of facilities technique.

Factory layout involves the arrangement and selection of machines, material handling devices, material handling path, resulting in the reduction of cost and time involved in manufacturing a product. The facilities layout problem, which is an integral part of facilities design, aims to spatially locate the production units within a facility subject to some design criteria and area limitations, with one or multiple objectives. In this paper, a hybrid model that combines a facility allocation technique and a software analysis of the layout is done. Selecting the best block layout of the foundry section with the help of Computerized Relative Allocation of Facilities Technique (CRAFT). After selecting the best block layout detailed layout is constructed and this detailed layout is analyzed using ARENA. The installed utilization of the layout is checked. The utilization of the layout is increased by changing the position of the equipment's or by introducing a new machine into the layout. With the advent of software which allowed the user to build models and move them around the screen and analysis can be done. Re-layout can also be done until satisfactory result is obtained.

VII. Distribution Center Logistics Optimization Based on Simulation

ShiwangHou [6], presented the study on Distribution Center Logistics Optimization Based on Simulation.

In the present study, Consideration of the complexity of work flow in distribution center, system simulation has become an important tool for its design. Reasonable simulation goal, proper system modeling and correct simulation executing procedure is the precondition for reliable result. Taking a typical DC as an example, which purchases goods from many suppliers, stores them in its warehouse and delivers to their customers according to order, this study developed a simulation model with Flexsim software and then experimented with the model to observe the effect different scenarios may have on the behavior of the model. Based on the simulation statistical report data of model entities, the operation scheme, including the can be optimized with the goal of having the highest profit and the fittest inventory scale. The result illustrate that the highest profit is triple more than the lowest.

VIII. Conclusion

From the above literature one can say that use simulation in the study of the work flow and optimization of the layout can be helpful. It is necessary to study the layout of the plant before moving to simulation. For simulation the data should be collected. The data is sorted out and is used for simulation. It has be observed that adding new machines to the plant or introducing a new product may convert the actual layout to an inefficient one. Such cases may cause a significant increase in transportation of materials between machines that decreases the utilization rates of machines and operators as well as overall productivity. Before optimizing the armature manufacturing set up, we should understand the recent trends in manufacturing.

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