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Maximizing Labor Utilization in Garment Production Line Using the Simulation Technique

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Abstract

Line balancing problems are common in the various departments of the garment industry. Different kinds of line balancing algorithms have been applied, for many years, in the apparel industry to solve these problems. Many variables and constraints must be taken into account when designing a manufacturing facility, such as the assembly line balance. For this purpose, lots of data have been collected from actual production systems, as well as alternative ones, in order to find the best line balancing algorithm. Studying the factors affecting line balancing, to identify the bottlenecks and enhance production system performance, is of utmost importance.

Garment manufacturing firms, particularly those working on a small-lot and order basis, must respond rapidly to changes in clothing styles. For flexibility and fast response, the line manger must be aware of the current situation in his production system, in order to process orders on time. Furthermore, in order to increase productivity, it is essential for line managers to be able to understand the behavior of the production system and to generate alternative systems. Thus, the simulation model approach, developed for the garment industries, enables predictability and helps to increase total productivity.

The aim of this research is to simulate a production line producing several models at the same time, in order to find the maximum number of products in a product mix that can be manufactured, at high quality and without wasting time. Results show that it is possible to produce up to five different products simultaneously on the same line.

Keywords: Simulation; Layout Design; Bottlenecks; Labour skill level; Assembly Line Balancing

1 Introduction

Skilled operators were added for suitable operations in order to decrease the bottleneck in the assembly line. The reconfigured/redesigned models were developed in order to add skilled operators to the current system. However, the application of simulation technology today is not very widespread in the apparel industry; these models can be applied in a real system to Skilled

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operators were added for suitable operations in order to decrease the bottleneck in the assembly line. The reconfigured/redesigned models were developed in order to add skilled operators to the current system. However, the application of simulation technology today is not very widespread in the apparel industry; these models can be applied in a real system to analyst the system performance more efficiently and effectively. Thus, managers can prevent any unexpected situations by analysing results using the simulation model. It is essential to know the current situation of a system in order to process orders on time. In order to increase productivity, it is essential to describe the behaviour of a system and to generate alternative systems. For this purpose, by developing a suitable simulation program for an enterprise, the situation of the company in the short-term future can be predicted and productivity can be increased. Simulation also has important advantages in foreseeing the results of investment decisions during the phase a company is determining the investments it needs to make and in facilitating the decision-making process when a choice between two current situations is required. These advantages, associated to simulation, enable its use as a decision making tool, without running the risks that can arise from stopping the production line, in order to manufacture other products, which leads to financial loss analyses Managers can prevent any unexpected situations by analysing results using the simulation model. It is essential to know the current situation of a system in order to process orders on time. In order to increase productivity, it is essential to describe the behaviour of a system and to generate alternative systems. For this purpose, by developing a suitable simulation program for an enterprise, the situation of the company in the short-term future can be predicted and productivity can be increased. Simulation is an important tool to analyse the current situation and determine the necessary steps to balance a line. Simulation also has important advantages in foreseeing the results of investment decisions during the phase a company is determining the investments it needs to make and in facilitating the decision-making process when a choice between two current situations is required. These advantages, associated to simulation, enable its use as a decision making tool, without running the risks that can arise from stopping the production line, in order to manufacture other products, which leads to financial loss [3, 5, 8]. Arena simulation and statistical methods are used to solve balancing problems. The most important objective in garment production is high productivity with low production cost. For the previously mentioned reasons, several researches simulated the production of different products in order to assess the location of bottlenecks in the production line. The aim of simulation was to observe bottleneck points and queues during production. As a result, it was found that there were many such issues in current production lines, thus it is necessary to redesign these lines to prevent time loss and the formation of queues [1, 6, 9].

The planning manager uses a simulation-based optimization tool that helps to gather information, without disturbing the actual system, and to improve system performance, in order to increase the productivity of the company. This tool also enables the manager to test new production systems before implementation, without disturbing the actual one. The simulation model is useful in the management of production in the plant by gaining important insights regarding the use of resources (man-machine), and the resulting production. The content of the work done on the assembly line consists of many separate and distinct work elements. The line must operate at a specified production rate, which reduces to a required cycle time. Given these conditions, line balancing is concerned with assign in Individual work elements so that all workers have an equal amount of work. The two important concepts in balancing the line are the minimum element of rational action and the limitation of Constitutes the total work content [2].

Certain key steps are also taken to ensure the validity of the model. A process simulation