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REVIEW OF FLEXIBLE MANUFACTURING SYSTEM

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Abstract

The manufacturing world today requires output efficiency in order to meet the mission within the specified time interval. Therefore, the flexibility manufacturing system (FMS) is a significant matter that has contributed to the growth of flexible manufacturing system (FMS). This unique production system combines a range of components like machine tools for computer applications, automatic material handling systems, robotics, and testing systems and self-diagnostic equipment into one production system. FMSs are recognized by the replacement of computer control set up of the hard mechanization generally found in exchange lines. The high venture required for a FMS and the capability of FMS as a key aggressive device makes it alluring to take part in exploring around there. This paper presents a review related to the various aspects of FMS.

Keywords: *Flexible manufacturing, Modeling, Performance evaluation, Simulation, Materias.*

I. INTRODUCTION

The obstacle posed by manufacturing firms in global markets is technical advancement. Rapid technical development produces goods and processes with limited product life cycles, short lead times and rapidly evolving market preference and high uncertainties that require greater production flexibility not just for better efficiency, but also for survival. The higher versatility in production gives consumers more leisure time for a wider product selection and a wide range of possibilities. Flexibility in production can catch dynamic developments and competitive markets. Flexible manufacturing system (FMS) has received considerable attention in the literature over the last several decades. Therefore, a lot of written FMS literature literally remains. The future advantages of the FMS implementation are discussed in many reports. Moreover, there are several benefits of the FMS implementation. Effective introduction of FMS may result in decreased labor costs, greater versatility and choice of goods, better efficiency, increased reaction and increased usage of machinery [1].

II. LITERATURE REVIEW

Many analysts have carried out extensive research in the field of versatility in development and identified important demand drivers. Changed product life cycle; improved quality requirements; expanded product customization; fast technological development and increasing choices in materials and processes [2]. To achieve success in such an environment, manufacturing firms cannot rely on being successful in the cost and quality of their goods. In an uncertain environment, they must still achieve the optimum efficiency. Flexible Manufacturing System (FMS) could be the answer to such scenario.

Manufacturing organizations, to face the challenges imposed by today's volatile industry expectations, implement flexible manufacturing systems (FMSs). However, implementing FMSs is not a straightforward process. During execution, several challenges are faced in real-life situations. The essence and effect of these obstacles must be examined in such a way that managers can learn about certain methods to resolve them [3].

In the early stages, therefore, the pace of FMS diffusion in the developing countries such as the US, Japan, and Europe was already sluggish in 2000. Since the beginning of 1990 FMS have also been deployed particularly by Indian industries because the automotive and machine tool industries have been automated rapidly [4]. Deshmukh and K. Subbarao proposed structure analysis for FMS adoption in their research paper and also presented separate concerns relevant to the Indian manufacturing sectors for FMS adoption. Ajith et al Explores the effect on the Malaysian manufacturing sector of implementation of Flexible Manufacturing Technologies (FMT). And find enough data to infer that FMT's association with price margin is direct and reasonably significant [5].

M. Ali et al. analyzed the performance of a flexible manufacturing system in various production strategies. Manufacturing techniques are considered as versatility in manufacturing, lot size and machine task scheduling. And the results show that taking simultaneous decisions in relation to different manufacturing strategies can significantly improve the performance of flexible production systems [6]. The management and support decision maker, in the manufacturing preparation stage for his model, tackles several opposing goals and develops a computer-assisted decision-making model for flexible manufacturing systems (FMS) scenarios. Zubair, Faizul et al investigate the correlation between machine and device efficiency.

Ozden Bayazit use analytic hierarchy process (AHP) that is a multiple criteria decision-making methodology in evaluating flexible manufacturing systems (FMSs) and suggested 28 factors that were both qualitative and quantitative to assess the FMS implementation. Dixit et al identified different factors influencing the FMS installation productivity [7]. And he concluded that manufacturers, at times just by adopting rivals' manufacturing systems accounts without taking into account their own expertise or boundaries, take fast decisions on implementing emerging technology. New technology such as FMS is unstable in these situations. Robert H. Chenhall explores the role of efficient performance assessment to assess the performance of management for organizations implementing scalable development strategies. Proposals that the relationship between stability in manufacture and the implementation of output efficiency measures would be linked to improved performance [8].

A. **Modeling in Flexible Manufacturing System: -**

Many researchers conduct the FMS operations. They have been listed in the main as mathematical programming approach, a decision-making multiple parameters approach, a heuristics-oriented approach, a computational management approach, a simulation-based approach and an AI approach. The prominent outcomes from the literatures dealing with the each technique can be summarized as follows:

B. **Mathematical Programming Approach: -**

In the case of mathematical programming methods, empirical methods achieve greater outcomes than models of simulation. The setup and produce process for the FMS operation. They also outlined the configuration of the FMS preproduction. The full FMS configuration involves a collection component, system grouping problem, problem of output ratio, problem of allocation of resources, problem of loading. In situations where the pooled group sizes vary to reach optimal output speeds, Stecke and Solbers propose unbalancing the workload for each machine. Re-fixing and restricting use of equipment and creating a loading issue formulation [9]. The specialty of this strategy is that only a single computer may be delegated to an operation, which increases operational control stability. The number of instruments used during the process, which requires equipment and work for machinery to be allocated, has been optimized to minimize the amount of tool borrowing. Over the span of time, this approach to the mathematical model has become a focus of study that many scholars have discussed and developed.

C. **Multi criteria Decision making approach: -**

Since FMS deals with several parameters, few authors concentrated on this topic during the production of models. It has been proven that the model will function with increased precision as a better decision maker. In analogy, Ro and O'Grady and Menon addressed the several requirements in depth to have more practicable solutions. In recent years, Karsak used the FMS selection problem by using the furious hierarchy method. Rao also included FMS range diagram and matrix. The different FMS alternative solutions were ranked by Rao and Parnichkun Chatterjee using their FMS preference index matrix. In comparison, several approaches have been modeled around the use of the machine tool. The FMS scheduling problems have been overcome by integrating the Tabu scan and the simulated annealing process.

D. **Heuristics Oriented Approach: -**

In the above method, the use of statistical equations was found to be difficult. This lead to the introduction of an approach focused on heuristics. It normally takes the form of guidelines for dispatch. In a report, various facets of preparation and planning were discussed. In their analysis, they summarized that the outcomes of a dilemma are closely connected to the decisions taken from another problem. Stecke and Solberg also tested the use of the dispatch rules. They observed that the very unbalanced loading of machinery due to the goal of the component motion minimization continuously increased efficiency than the balanced load. Iwata dealt with the very popular rules of choice to take over the whole FMS. Find out more about the laws of dispatch in literature as well.

E. **Advantages of FMS: -**

FMS has some of the advantages: lowered fabrication costs, better work productivity, higher process speed, improved component quality, increased device stability, reduced inventory of components, reduced lead times and increased production speeds.

F. **Disadvantages of FMS: -**

On the other hand, some of the drawbacks of FMS are high start-up cost, more pre-planning problems, professional workers' needs and a more complex method.

III. CONCLUSION

In the past decade, research on FMS has been increasingly rapid. A full literature analysis of 73 papers written on FMS in the last two decades aims to improve research awareness. The latest literature review gives valuable insights into how FMS research has shaped, interpreted, and applied FMS in the past 20 years. The research on literature addressed can enable other researchers and practitioners to further study these problems.

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