A Review of Computer Applications in Manufacturing Operation

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Abstract—The use of computers in the manufacturing sector has increased in recent years due to various reasons. One of the main reasons for this is the high demand for manufactured products and the requirement of on time delivery of quality products. Most of the manufacturers have turned to either Computer Integrated Manufacturing (CIM) or Computer Aided Manufacturing (CAM) to improve efficiency, quality and reduce cost, lead and process time of the product. Computers are today applied in all the aspects of manufacturing operations which includes planning, control, scheduling, designing, distribution, processing, marketing, production etc. This paper reviews the application of computers in major manufacturing businesses and discusses the features and importance by using various journal papers on the subject.

Keywords—Computer applications, Designing, Integrated manufacturing system, Scheduling.

I. INTRODUCTION

There are several types of manufacturing companies worldwide that uses computers in their businesses. Most of the industrial companies concentrate on some sort of manufacturing as their primary function. The main aim of each of these manufacturing companies is to provide timely and quality products or service to their customers. Customers are the kings in the modern business and much attention is given to keep them satisfied and happy. Hence all the manufacturing facilities turn to computer aided manufacturing or automated production to improve the speed and efficiency of the operation. Computers play a huge role in making this a reality. Hence starting from the planning up to the distribution and gaining customer feedback, computers are involved in each of the outlined processes.

Computers when applied in the production system, aids by increasing the production volume, improving the quality of the product and helping to identify errors and in troubleshooting to name a few. Hence industries involved with mass production greatly invest in developing a computer integrated system in their workplace [1].

Computer Integrated Manufacturing as a methodology serves to enhance the execution of a manufacturing or assembling process by incorporating different financial zones of processing, both regarding material and data flow by using computer applications. To gain more insight into the significance of CIM, an endeavor has been made in this paper to survey the literature available on the execution of CIM with a goal to gather more understanding into the combination and versatility issues [2].

The rest of the paper discusses the background, issues, literature review and application of computers in different types of manufacturing. The paper is concluded with writers’ opinion on the subject.

II. BACKGROUND

The essential target of manufacturing business is to convert raw materials into quality products that are sought out in the business sector and which can be sold at fixed costs that make profit for the organization. Lead time or time to market has been for the most part agreed upon to be a standout amongst the most critical keys for accomplishment in the manufacturing sector [3].

All the manufacturing associations face a dilemma on several occasions in trying to deliver their product on time and to keep up with the rising demand for the product. To tackle these issues, organizations have created a PC Integrated Manufacturing system to coordinate all sectors in a manufacturing factory that needs to coordinate properly in a timely manner. This includes production planning, distribution and production. The structure will gauge and screen and incorporate machine, instrument, and work-in-advancement following, dispatching and recording, stock, material etc. to ensure unhindered production and distribution of the product [4].

An applied model has been produced to represent the key issues of incorporation and versatility of CIM. The model has been clarified by reviewed perceptions [5]. It is the utilization of computer innovation to coordinate the capacities of a manufacturing venture that is on the rise today.
CIM brings about robotization of the data stream and gives immediate interfaces to the physical and HR of the endeavor. In spite of the fact that computer application is the normally utilized term for such a framework, it might be all the more accurately called a Computer Integrated Enterprise [6].

III. MAJOR ISSUES FACED WITH COMPUTER APPLICATIONS IN MANUFACTURING

Today's manufacturing firms are compelled to work as open operational frameworks. In such frameworks, propelled operational manufacturing technologies are mixed with current data and communication technologies to incorporate and direct operational assets, procedures, and exercises in order to create a profitable business. The problem to address is to come up with proper computer integrated manufacturing that is affordable and does not cause product price to hike and of course a system that can be trusted. Nevertheless, to make the computer application fully effective, it needs full collaboration between all functions of the enterprise, top executives, staff and all authorities [7].

Another major issue companies face in becoming computer integrated includes the greater investment costs involved in the transformation. Hence a thorough analysis must be conducted before transforming into a fully computer integrated manufacturing system to minimize loss and multiply profit in a sustainable manner. Cost analysis is considered as one of the most critical issues in Computer Integrated Manufacturing system [8].

Apart from investment cost, the complexity of the manufacturing process that arises by the greater application of computers in a firm is also considered as a major issue to deal with. Continuous training, creating awareness and better understanding of the complex system in terms of technical know-how is important in overcoming these hurdles [9].

IV. LITERATURE REVIEW

This section of the document is a review of recent literature which will serve as references for the study. It will explore the overview of computer applications in manufacturing operations, some of the areas it is being applied to, and the benefits of its usage in manufacturing operations.

V. OVERVIEW OF COMPUTER APPLICATIONS IN MANUFACTURING

Computerization hopes to increase quality cycle opportunities by combining data and computerization headways. This will build up the association’s capacities and develop overall collaboration by giving unending access to information. To accomplish this obliges phenomenal keenness with respect to the calling change of motorization specialists, more impact of existing mechanized workplaces and associates, and progression of best practices in movement and upkeep [10].

European Computer Integrated Manufacturing Architecture launched the computer coordinated assembling open framework building design (CIMOSA) ideas. As examined by Serrar, the propelled data innovation (AIT) guide for the European fabricating industry activity was dispatched by Daimler Benz, for mechanical incorporation through the advancement of combination stages, and the use of bland arranged undertaking (re)engineering techniques [11].

Since advanced computers are discrete gadgets that screen a procedure by taking examples at discrete cases of time, the utilization of computer innovation in the control capacity required a control hypothesis in light of the inspecting of input data. This hypothesis started to emerge amid World War II, when researchers were chipping away at radar frameworks. A radar framework is a characteristically tested framework in view of the time lag between progressive identification of article position. The first imperative hypothetical deal with examined frameworks started to show up around this time [12].

Hubert Roth, (2013), adds that, the coordination of computer and assembling process additionally started in the late 1940s. The primary business machines did not utilize the idea of input. They were modified utilizing a punched tape that contained guidelines for coordinating the movement of the engines driving the tomahawks of the machine instrument. Starting from a known enrollment point, the bed of a processing machine would be taken through different positions underneath the milling apparatus in accordance with the directions on the tape. There was no constant input of positional information; however a legitimate starting enlistment of the work piece, consolidated with right directions, would bring about the right part being produced. This methodology was termed 'numerical control' and it introduced a lot of interest about the potential control in fabrication process [13].
VI. TYPES OF COMPUTER AUTOMATION

Categorically there are three main types of computerization in the industry. Namely they are fixed, programmable and flexible automation. Fixed automation, also known as “hard automation,” refers to an automated production facility in which the sequence of processing operations is fixed by the equipment configuration [14]. In programmable automation, the generation hardware is outlined with the capacity to change the succession of operations to oblige diverse item designs. The operation succession is controlled by a system, which is a pool of guidelines coded so that the framework can read and translate them [15]. Flexible computerization is prepared to do delivering of a mixed bag of items with practically no time lost for changeovers from one item to the following. There is no creation time lost while reinventing the framework furthermore, altering the physical setup (tooling, installations, machine setting). Consequently, the framework can deliver various blend and timetables of items, rather than requiring that they made separate clusters [16].

VII. IMPLEMENTATION OF COMPUTER APPLICATION IN MANUFACTURING

Computers have been used in most of the manufacturing businesses. Below are the major players in the manufacturing sector that has been revolutionized by the application of computers in general.

A. Computer automation in food manufacturing industry

The food industry is facing escalating universal rivalry and consumer demands. These require new advancements and expanded mechanization in the business. This is due to the end of significantly repetitive and tasks, which causes tiresomeness and strain to laborers [17].

Computers enable better excellence mechanism required due to buyer complexity, monitoring tagging requests, and slim quality limits, the removal of disconnected quality regulator due to the need for more fast adjustment of deviations from procedure and quality standards/specifications, and the detection of foreign and toxin materials in the food [18].

Encounters, and potential commitment, and future advancement of CIM coordination encourages the correspondence between distinctive territories and also the imparting of assembling data information in the food industry.

Hence application of computers in this industry during manufacturing operation is vital in maintaining the quality of the product [19].

B. Use of computer advancements in Textile Industry

Material designs are the first works of the designers. Lowlife helps them to picture and see their creative outline in last structure without delivering any specimens watch. In some cases, the clients give thoughts for planning as indicated by their specific prerequisite. These are as painted craftsmanship or fabric tests and at times film negatives. The material planners, with the assistance of computer aided design (CAD), transform them into workable designs. For this, the example is checked with the assistance of either scanners or advancedcams and afterward they are altered to acquire the last design. Hence in textile industry, CAD is of vital importance in making the designs that attract customers [20].

C. Utilization of computer advances in Steel Industry

Steel is one of the fundamental building pieces of the advanced world. Autos, machines, extensions, oil pipelines, what’s more, structures, are all made with steel. While steel assembling has existed for a considerable length of time, the methodology for making steel keeps on advancing [21]. The application of computers in the steel industry in general has simplified very complex processes and made it easy and safe for the workers to deal with hazardous workplaces [22].

D. Use of computer innovations in Pharmaceutical Industry

The application of computers has aided one of the key difficulties confronting pharmaceutical organizations by decreasing the time to market and expense of merchandise of their items whilst keeping on agreeing and surpass stringent administrative conditions. Utilization of Computer Supported Design advances has made a turning point in the method for decreasing these difficulties for pharmaceutical and just in time manufacturing has been made possible by the application of computers in the manufacturing operation [23].

VIII. IMPORTANCE OF IMPLEMENTING COMPUTER APPLICATION IN MANUFACTURING

The use of computers in the manufacturing industry has revolutionized the industry by making automation and computer integrated and computer aided manufacturing a reality. It has a pervasive and significant impact on the industry [24].
It reduces the portion of unimportant activities, increase productivity through efficient contemplation of client desires, reduce variability, reduce the sequence time, streamline by lessening the amount of phases and fragments, increase productivity flexibility, raises process transparency, emphasize regulator on the comprehensive procedures, build nonstop enhancement into the process, stabilize flow progress with change enhancement, build persistent transformation into the process and reduce human labor and improve product quality and reduce process time [25].

IX. CONCLUSION

Having reviewed different articles on the application of computers in the manufacturing operation, it can be concluded that the advancements that we see in today’s developing world was made possible by the computer integrated manufacturing processes. Computers have revolutionized the manufacturing industry and made manufacturing approaches such as just in time manufacturing, flexible manufacturing, and other automated complex processes possible. Computer application has improved the efficiency of the processes, improved the quality and reduced the cycle time of the manufacturing process making customers happy and satisfied.

Although computer applications and high level automation and integration is costly, complex and requires high investment, manufacturing industries benefit from the high production volume, low production cost and timely delivery of products due to computer applications in the operation. Hence it can be concluded that in order to survive in the advancing world of manufacturing, one has to turn to computer integrated or computer aided manufacturing to have a prosperous future in the industry.

REFERENCES

[9] Computer integrated manufacturing issues (Luis G Occena , Columbia Missouri USA)
[18] (2009) A survey on the use of computer-integrated manufacturing m food processing companies Food Technology 43 3, pp 82-87