

INTELLIGENT MANUFACTURING SYSTEM

Vaibhav D. Bhoj¹, Shubham S. Abhang², Gunvant S. Bhangale³

^{1,2,3}Department of Mechanical Engineering, Sandip Foundation's,

Sandip Institute of Technology and Research Centre, SavitribaiPhule Pune University, (India)

ABSTRACT

The paper gives a framework of the different techniques for the design of the governing and planning components, implementation, Evolution and tools of an intelligent manufacturing system. The architecture of a modern manufacturing industry is presented, which makes possible to create specific manufacturing system for a specific tasks, depending on the self-operated analysis of its essential characteristics. The manufacturing industry of concept helps in the integration of an intelligence and in order to increase flexibility at the maximum level of the manufacturing system as well as at the minimum level of the particular type of machine. This concept is implemented and demonstrated in the automobile and aeronautical industries, but can be simply by applied to nearly all manufacturing industries. Implementation of manufacturing techniques in the industries helps to forecast and to fulfill the rapidly varying customer requirements, to produce high quality products in sufficient quantities with reduction in costs. The Modern Intelligence Technologies are also presented in this paper. Also tools used are mentioned.

Keywords: Design, Tool, Implementation, Intelligent Manufacturing System (Ims) And Components

I. INTRODUCTION

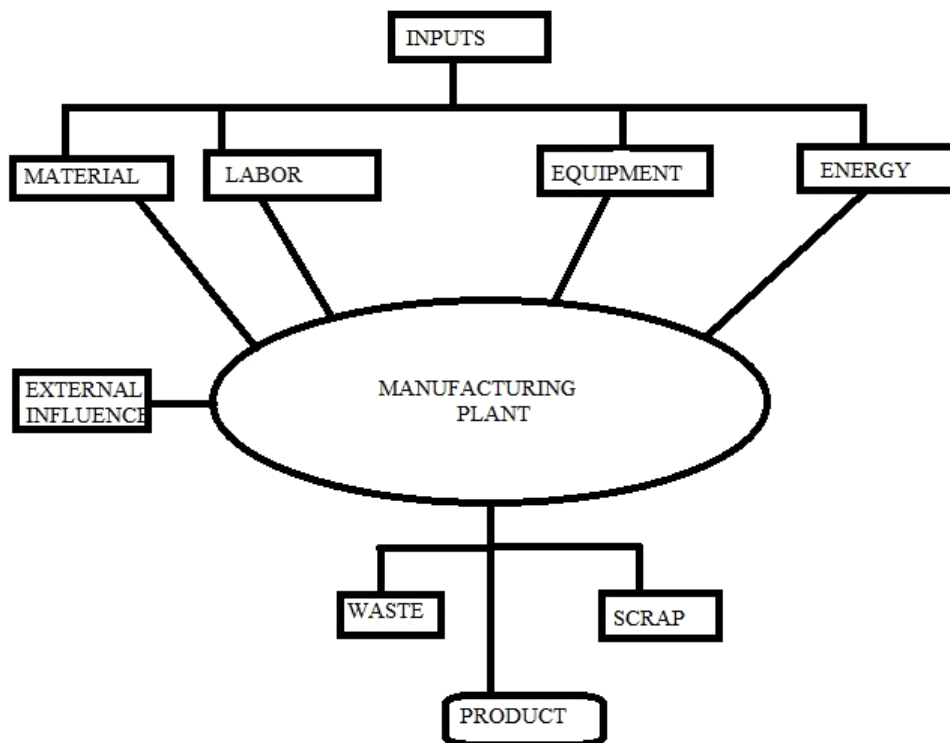
The goal of intelligent manufacturing system is to any normal manufacturing system to satisfying customer needs at the most efficient level for lowest possible cost. The involvement of computers as in the computer-integrated manufacturing has been for more than 20 years; the incorporation of computer technology does not necessarily result in intelligent manufacturing system. It is the introduction of human like decisions making capabilities into the manufacturing system that makes it indeed intelligent. In particular knowledge base systems have dominated the manufacturing landscape of late 1990's CIM was all rage in 1980s, FMS in 1970s.

Manufacturing technology will play an important role in future human developments if it is based on new knowledge based applications. The impact of knowledge-based system on manufacturers is already in front and all of us to see and experience. Any organization must make full advantage of the knowledge at its disposal.

This goal translates into the effective use of knowledge ranging from design to production and maintenance. To this end, the knowledge captured in disparate modules in the organization must be liberated and directed synergistically to support integrated systems for engineering and fabrication. There is a lack of awareness of tools and techniques to be used among manufacturers. Manufacturer's often use existing tools rather than investigate benefits of modern intelligent manufacturing techniques. Intelligent system vendors can help the situation by improving their shells to fit defined requirements for successful manufacturing applications.

II. CONCEPT

Manufacturing is defined as process of producing product with help of paramotors like material, manpower, energy and appliances. the product produce by above parameters having a larger value than the total amount of material used. The fig. shows sequence of operation in which input is shown as material, manpower, energy and appliances. last input i.e. appliances or equipment and facility required for combining the material, labor and energy. The output consist of product with some undesirable output, waste and scrap. Also fig. shows external influences that should not get ignored. External influences can include govermentaction, naturaloccurance and of course competition. The of manufacturing in broad way are



- 1)Production
- 2)Productivity
- 3)Flexibility
- 4)Quality
- 5)Flexibility
- 6)Profit

The production is first and most important objective of manufacturing function. At minimum production cost the higher productivity is achieved, its second objection of manufacturing. The product quality should be highest one in third objective of manufacturing. The fourth objective is to achieve profit and last one is flexibility, it insures that large product with good quality and productivity. To attain these inherent objectives, a number of operational

factor have to consider

- Totaly combination of incorporated software and classical hardware method within an scheme.
- The communication medium should be competent and effectual and teamwork in department within an enterprise.Fast against fleet changing orders and unexpected disturbances from internal and external manufacturing environment.

Inorder to detect and minimize failure impact on workcycle,the system and sub-system should fully tolerate

III. DESIGN

An Intelligent manufacturing system has the ability to self regulate or self control to manufacture the product within design specification. An integrated concept withfactories or future,where product are produced in an artificial life environment adds values to this .The researches working on implementation of expert system adds value to this concept of adding intelligence.The working assumptions of design and implementation made on basis of computer integrated manufacturing open system architecture.

Intelligent Manufacturing System can be achieved in three basic steps:

- Existing manufacturing processes can become intelligent by monitoring and controlling the state of manufacturing machine.
- Existing processes can be made intelligent by adding sensors to monitor and control the state of product being processed.
- New processes can bemade intelligently designed to produce parts of desired quality without the need of sensing and control of product.

IV. COMPONENTS OF INTELLIGENT MANUFACTURING SYSTEM

- Intelligent Design
- Intelligent Control
- Intelligent Quality Management
- Imtelligent Process Planning
- Intelligent Analysis
- Intelligent Maintainace

V. TOOLS USED FOR INTELLIGENT MANUFACTURING

Following are the tools generally used in intelligent manufacturing:

- . Fuzzy logic
- . Genetic Algorithms
- . Neural Net Works
- . Case tools
- . Simulation Algorithms.
- . AI

A) Scheduling with Neural Network

Artificial Neural Networks aimed towards the modeling of networks of real neurons (i.e. animate brains) motivated by their robustness, fault tolerance, flexibility and the learning ability of the biological brains, the building blocks of the ANN variously called as neurons, processing elements etc. do have striking similarities with their biological counterpart.

An interactive tool for short term production scheduling with system features and graphical interface that allows operator to interactively control the schedule generation and see influence on key parameter.

A constraint management subsystem checks that the current schedule agrees with the restriction imposed from the production environments and if not, the reason for conflict is identified and presented to planner for rectification. This knowledge base system is able to effectively react to unexpected events or delays. Neural network techniques come into play, repairing an inconsistent schedule towards a consistent and optimal schedule.

B) Case Based Reasoning

This is extensively used as a tool to interpret the process parameters. Human experts need to be consulted to interpret analytical results of the process. Providing an opportunity to improve on the procedure with an expert system. Case based reasoning represent knowledge as 'cases' i.e. examples of past problems and solutions.

C) Intelligent Design and Analysis Software

The expert system produces optimal design parameters without violating any material or machine constraints. This is actually an extension of CBR (case based reasoning)

D) Fuzzy Logic

Fuzzy logic system provides a means of expressing the linguistic variable in suitable form for processing using a Computer Fuzzy logic Control of processes offer flexibility by which process states and control actions can be described directly from the experience and advice of the human operators, thus making it possible to apply practical operational experience in the computerized control of complex multi-variant process. It provides a mathematical framework to capture the uncertainties associated with human cognitive systems such as thinking and reasoning. The control rule is formulated as linguistic expressions involving every words like High medium, low etc.

E) Genetic Algorithms

GA is powerful probabilistic heuristic procedure for global search and optimization in multi-parameter search spaces, based on the mechanics natural genetics. It is to exploit historical information to locate new points in the search space with expected improved performance.

This is also used as a tool for optimal assembly planning. Genetic algorithms referred to as an ADAPTIVE COMPUTATION are based on the evolutionary concept of natural selection and survival of fittest. In simple terms, genetic algorithm generates new rules to replace the least useful rules already in place. These software tools allow user to solve complex problems, such as scheduling large number of conflicting tasks, finding the shortest route that connect a number of location, or streamlining communications network. The genetic algorithms are used to optimize the search routine used in assembly planning with the goal of improving the assembly process of mechanical product thereby minimizing time and cost.

F) Artificial Intelligence

This tool is an attempt to increase the number of human characteristics, computer and computer-controlled systems. It is basically an ability to imitate the human intelligence. The sub tools used are. An algorithm is a computer program that solves selected problem within given time frame. Early vision Computer calculations that allow systems to see by providing lowlevel data. Higher level vision Computer calculation that allows systems to accomplish higherlevel such as smart improvement within an environment object recognition and reasoning about objects. Knowledge Engineering. A process by which knowledge is collected from experts

VI. IMPLEMENTATION OF AN INTELLIGENT MANUFACTURING SYSTEM

The implementation of Expert System approaches with this concept of intelligence addition. The Current development in feature based solid modeling techniques for design illustration and its applications have exposed a potential to deputy Expert Systems for some decisions presently operated by designers knowledge of design policy and practices [1].

Intelligent System of Manufacturing can be achieved in these three basic ways:

- By using of monitoring and controlling manufacturing conditions, existing manufacturing process become intelligent.
 - By adding the sensors to control and monitor the state of processed product, existing processes become intelligent.
 - By using the New Processes of intelligent designing, the desired quality of parts can be achieved.
- The Intelligent Manufacturing System (IMS),
- Uses the technologies which are fully automated, can minimize the use of human Brain,
 - Self-operated processes with automatic feedback mechanism,

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Automatic Monitoring and control of the manufacturing Processes,

- Self-Monitoring and controlling of the state of processed product.

The Steps for the implementation in an intelligent Manufacturing system are as follows:

- Select an already available software that will first enhance an expert system and then combine with task solution software, Collect trade values, heuristic policy, precedent experiences and suggestion from books, experts and standard codes,
- Categorize a whole set of rules leading this task, and illustrate them in a proper way suitable to a list processing software,
- Create a list of features and attributes of other part, called for in the rule set,
- Create significant data by extracting the features and other essential attributes of the part from the model information of an object,
- Categorize the rules leading this task into a information base,
- Implement an inference system as a analysis mechanism to come across the solution on the information base and the peripheral data,

- Integrate the results into the model and its illustration to get an absolute solution.

VII. CONCLUSION

In the work, a certain conception of designing intelligent systems for enterprise management was presented. Based on the conception, a methodology of creating the IMS is being developed based on the integration of artificial intelligence technologies with exact methods, well-known in the decision making theory, as well as with simulation modeling methods. The approach proposed will open up a possibility to build an IMS of open structure, combining existing information systems with the information sub-systems in production engineering using artificial intelligence technologies in order to create an integrated environment for comprehensive solving of decision making problems in the system of intelligent manufacturing.

Intelligent manufacturing is the most promising and future-oriented of production system developments aiming at further automatization, optimization and integration of manufacturing processes. Intelligent processing of data from different sources will enable the integration of the data as well as strategic analyses and correct decision making. Flexible analysis, diagnosis and reporting scenarios will make it possible to create a basis for evaluation of the current situation and to facilitate and accelerate decision processes at each stage of the enterprise functioning. Fully integrated intelligent manufacturing systems will, in the near future, enable enterprises to function effectively and reliably on the global market, complying with its rising requirements.

REFERENCES

- [1] "Intelligent Manufacturing Systems", B.I.T. Mesra, by Dr. Surender Kumar.
- [2] International paper of pawansharma and Dr.ManishBhargava Department of Mechanical Engineering Maharishi Arvind Institute of Engineering and Technology Sector-7, MadhyamMarg, Mansarovar, Jaipur, Rajasthan, India-302020.
- [3] Galina setlak and SlawomirPieczonka "Design concept of IMS."