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Manufacture Engineering Work Bench

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ABSTRACT

Booming technology automatically enforces the human to learn and adopt them by mesmerizing its capabilities. It magnifies on its best utilization; the basic adoption and utilization theory of technology stands on automation of work at every single level. Industrial automation plays an important role in its prime delivery of products and its cost effectiveness in the production. Concentrating on this theory a research made on designing and build a system which integrates different department of the industry to single work bench by applying some computer aided software engineering techniques, computer aided manufacturing ideas and tools to enhance the real-time OEM industries to achieve time response mechanism, increase its production, prototyping and fixturing the production along with improving problem solving techniques.

Keywords: Computer integrated manufacturing, Computer aided software engineering, Integrated work Bench, Industrial Automation, Real time system.

I. INTRODUCTION

An Original Equipment Manufacturer (OEM) is a company that makes a part or subsystem that is used in another company's end product. They manufacture the product as required by the customer's requirement mentioned. OEM is widely used in the fields like automotive parts, computer software industries. The overall idea of this Research work is to make the OEM industry adopt themselves to the emerging trends of technology and reinforce its

manufacturing techniques by integrating its various dimensions of work environment to single automated manufacturing engineering work bench to plan, design and produce the best product to the market. Any industry must be capable of maintain its quality of production, stands external pressure, compete with the new technology and ideas. To achieve the best outcome its necessary for them to have their own knowledge base system, re-engineering plan, previous production details integrated with the overall departments in them.

II. SYSTEM MODEL

The implementation of this work bench, firstly requires the approval of the production from the management level. Once the production is approved four-plan idea of manufacturing is made where the evaluation of the cost, materials and the manufacturing flow is planned. After the basic plan the computer aided software at OEM industry works as in the figure.1.

Integration and automation of different working environment to central work place is constructed, so that the information is made available to every individual at the same place which enhances the real-time approach and knowledge based manufacturing. As automation is concerned with every individual the approach which is made to use the technology must be easy and accessible to all the levels of employees. General architecture of this work bench looks like in fig1.1.

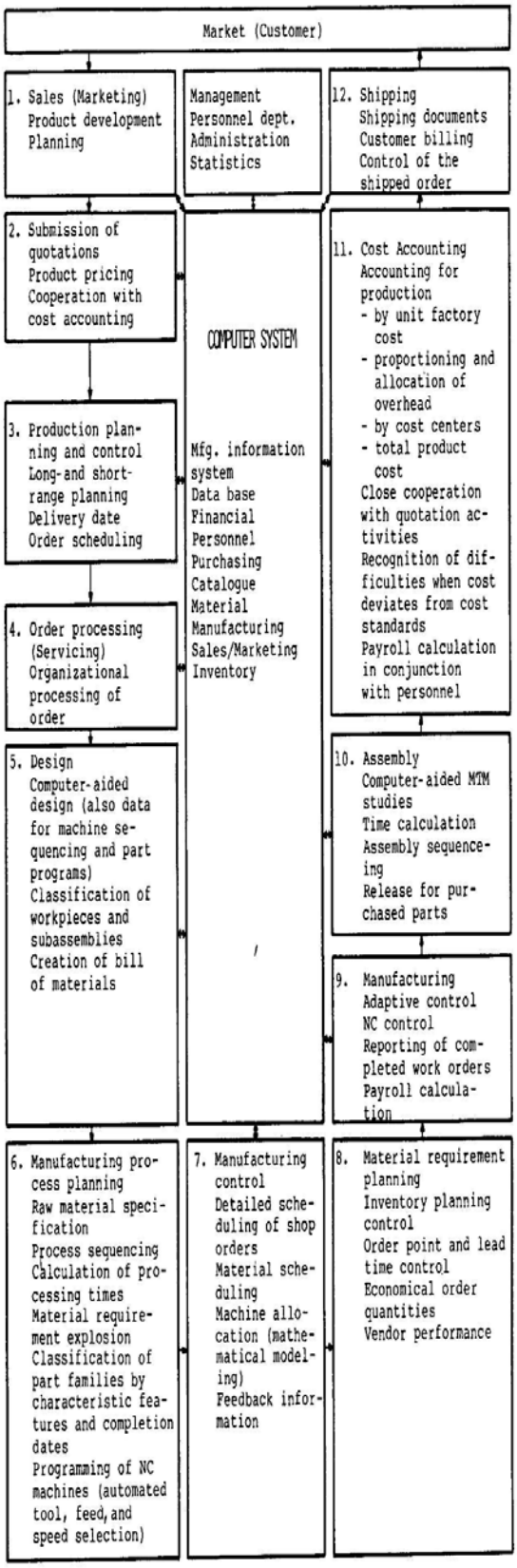

Fig.1. Computer Integrated System Work Flow During Manufacturing

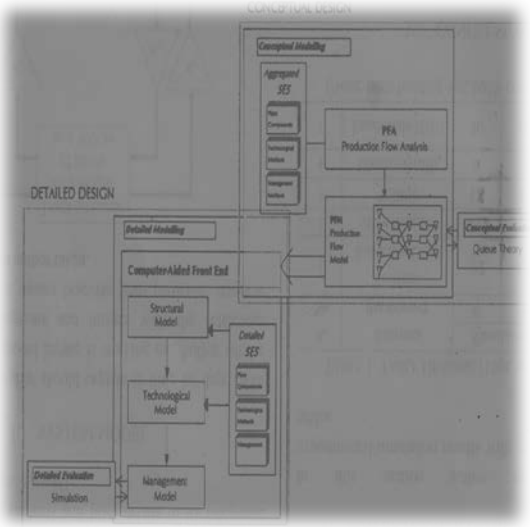

Fig.1.1 Architectural design of the Work Bench (Referred by General Concepts of a Manufacturing System Engineering Workbench as a Tool for the Re-engineering of Manufacturing Systems by Garetti M professor of Industrial Technology)

The architectural design gives the basic idea of the working process. The major and challenging work is the designing of the product parts using CAD/CAM and incorporating that to the computer. The designing involves prototyping of the product and fixturing before the actual manufacturing process starts. Once the designing is approved as per the CAD/CAM designs, integrating that design to computer and its processing steps like the tools, its measurements, positioning the raw materials in the machines, fining steps machine undergoes to modify the product must be loaded to the computer. The information loaded can be knowledge base or new ideal design that is loaded to the computer aided software, so that the steps and procedures machine must undergo to fixture a product can be viewed once inputting the requirement to front end. This process is named here as ballooning and routing. Ballooning phase involves the below step mentioned in the fig.1.2. Once the ballooning process is stored or viewed choosing the best among the numerous ballooning process and its

linearity of execution is determined by the step called routing. These both steps play important role in finishing the product.

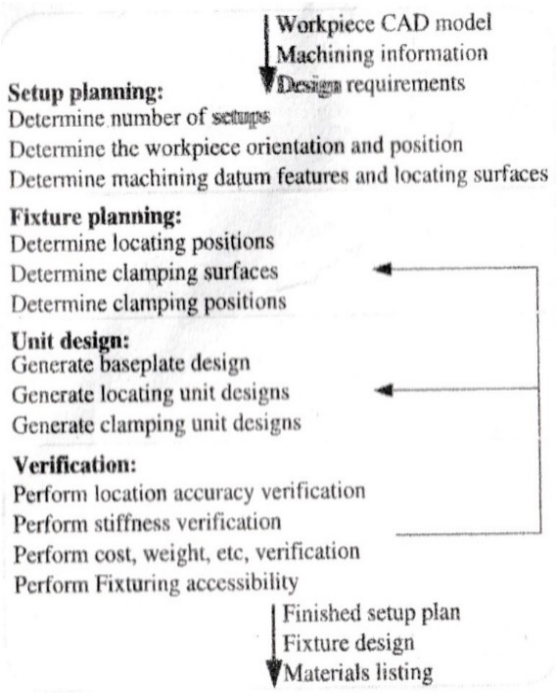

Fig.1.2 Ballooning process involved in designing.

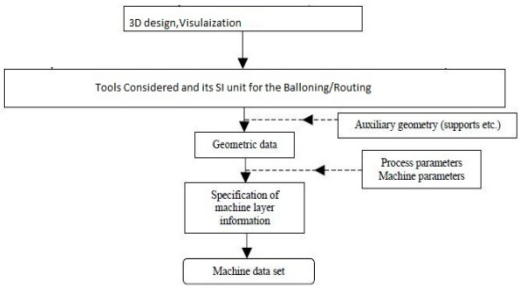

Fig. 1.3 Practical Ballooning and Routing Process (Reference taken by International Journal of Application or Innovation in Engineering & Management)

The machining property that needs to be added to the computer about ballooning and routing process involves the below mentioned fig.1.3.

III. PREVIOUS WORK

[1].Research work was published on the relevant domain by the author called Mr. Shrikant M. Chougule, Prof. D. B. Waghmare. Title of the Research work being *Design & Manufacturing of Components of Modified Bench Vise on Rapid Prototype Machine*, which was published on July 2015. Prototyping or model making is one of the important steps to finalize a product design. Traditional Rapid Prototyping (RP) is commonly referred to as layered manufacturing or solid free form fabrication. It is used for the physical modelling of a new product design directly from computer aided design (CAD) data without the use of any special tooling or significant process engineering. This rapid procedure reduces the lead time required to produce a prototype of a product by eliminating much or all of the process engineering time and tooling requirements. It helps in conceptualization of a design.

[2].*Methods and tools for manufacturing enterprise modelling and model enactment* was published by the author J.M. Edwards Dept. of Manuf. Eng., Loughborough Univ. of Technol., UK, I.S. Murgatroyd Dept. of Manuf. Eng., Loughborough Univ. of Technol., UK, P. Gilders Dept. of Manuf. Eng., Loughborough Univ. of Technol., UK. Published on September 1995. A prime deliverable of the work is a collection of CASE workbenches comprising software tools, models and infrastructural services which support system design and build. The Research work provides an overview of the life-cycle engineering methods conceived and developed. It introduces three separate workbenches which, via two different approaches to system build, formalise and realise a link between design models and real-world run-time systems. Each approach provides a means of enacting system models in a way which semi-

automates resource-consuming implementation processes. As a result, more effective and wider-scope integrated manufacturing systems can be realised for a given engineering investment. The Research work also identifies key issues which need to be considered when comparing and combining the two approaches. This consideration is important in respect of classifying potential application areas for each approach and identifying problems which need to be overcome before realising their full potential.

[3].*General Concepts of a Manufacturing System Engineering Workbench as a Tool for the Re-engineering of Manufacturing Systems* by Garetti M professor of Industrial Technology and Bartolotta A. Research fellow of the National Research Council (CNR). This Research work highlights the main aspects of a research program developed by the Dipartimento di Economia e Produzione of the Politecnico di Milano within the framework of a national research project on the Design and Management of Advanced Production Systems. The study aims at defining the general architecture of a workbench for the design of industrial production systems, identifYing appropriate problem-solving tools and developing a prototype-version of such a system. The approach followed by the authors is based on a general descriptive method for generic production system definition, drawn from Zeigler's system entity structure. Based on this general concept, a two-stage design approach is proposed for the design and redesign activities of manufacturing systems.

4. Computer aided fixture design: Recent research and trends by Hui Wanga,∗, Yiming (Kevin) Ronga,b, Hua Li b, Price Shaunb. In this Research work, a literature survey of computer aided fixture design and automation over the past decadeis proposed. First, an introduction is given on the fixture applications in industry. Then, significant works done in the CAFD field, including their approaches, requirements and working principles are discussed. Finally, some prospective research trends are also discussed.

[5]. A survey on industrial on the implementation of the real-time system for industrial automation system. By Vicent Rutagangibwa, PG student, E & C Engineering, GTU University. This Research work presents a survey of Implementing Real Time Systems for industrial automation applications. Recently, PLCs have dominated industrial automation implementations but however, they do present some challenges especially in meeting real time constraints due to its centralized control and cyclically scanned program execution mechanisms.

IV. PROPOSED METHODOLOGY

The whole process of the production of product in OEM industry involves few major steps:

- Requirement collection from the other company, quote the rates and then get approve for the production.
- Plan and design the product.
- Purchase of the raw materials, tools for the production to the own store.
- Keeping record of the products and tools sent for the production from the store.
- Part details to be automated in the integrated system which is collected from customer.
- Ballooning of the product involves the numerous steps, tools, measurements to be considered for its final size, shape, weight.

- Routing is a step which involves the selection of the appropriate ballooning process at the right time.

Above mentioned process along with the integration of features like communication between the department, individual account, internal messenger, task maintenance/track back, scheduling the events makes the system more efficient and robust.

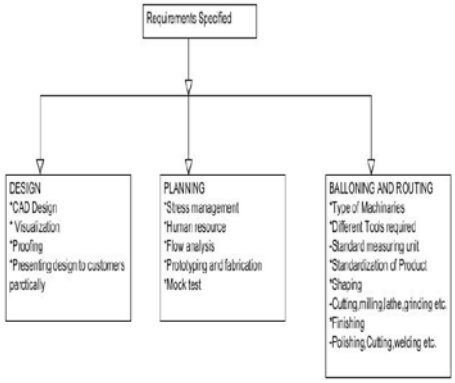

Fig.2.1. the OEM Working Process (Reference taken by International Journal of Application or Innovation in Engineering & Management).

The below mentioned figure represents the flow of actions that needs to be done in the ballooning and routing process. The ballooning and routing process need to be build using multi layered aspects. Those aspects are modelling, shaping/designing, technical, and administrative. These aspects are explained below.

The modelling involves deciding on the material to be used, the standardization of material, analysing of the resource available, prototyping of the product, time required for the production.

The technical issues involve detailing the working procedure of machineries and its tools, explaining the user how the machine works on raw materials. It informs the minimum and maximum time machine run, the positing of the raw material, the tools gauge, number of times the machine must run. These information can be newly added or fetched from the knowledge based.

The administrative aspect decides the cost, time, human resource to be assigned for the manufacturing. They even involve in the decisions of rejecting and approving of the product.

The overall flow of the product production life cycle is indicated in the activity diagram fig.2.2

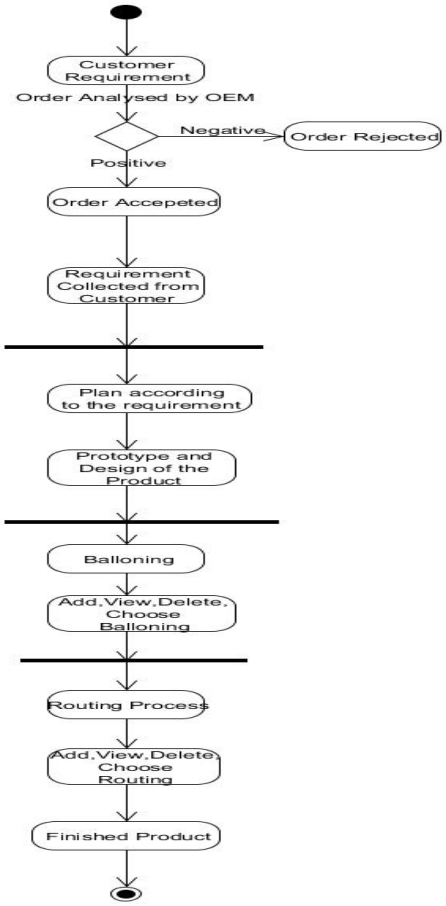

Fig.2.2. Activity Diagram

V. CONCLUSION

The Research work enables the OEM industry to adopt to the current technologies and trends by automating the production life cycle. As the communication is established between every individual process becomes more transparent and reduces the overhead. Tracking back on the fault process and correcting them is easy as the whole process is stored on a database. Scheduling of the meetings, production date, and ideas is easily communicated between the departments of industry. Individuals and the team can schedule task and see the progress of it accordingly. The system is easy to implement and more reliable and robust.

VI. FUTURE SCOPE

The Research work is more concentred on the automation of the design phase and the procedures to design the product. The same idea can be applied to the complete automation of the machineries used in the industry to decide on the product design with the help of machine learning, natural language processing along with the robotics which complete reduces the human work of the designing and planning process.

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