Virtual Manufacturing Systems and its Applications

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DESCRIPTION

Virtual manufacturing (VM) The use of computers to model, simulate, and optimize important activities and entities in a production plant is known as Virtual Vanufacturing (VM). Virtual manufacturing began as a means of designing and testing machine tools, but has since expanded to include production processes and the goods themselves. Computer Aided Design (CAD), 3D modelling and simulation software, Product Lifecycle Management (PLM), virtual reality, high-speed networking, and fast prototyping are the major technologies utilized in VM. Virtual manufacturing allows a company to assess the manufacturability of a part or product, as well as review and validate production processes and machines and teach managers, operators, and technicians on production systems. Virtual manufacturing is divided into three major subcategories:

Design-centered VM: During the design phase, offers production information to the designer. In this case, virtual reality refers to the use of manufacturing-based simulations to optimize the design of products and processes for a specific manufacturing goal (DFA, quality, flexibility, etc.) or the use of process simulations to evaluate many production scenarios at various levels of fidelity and scope to inform design and production decisions.

Production-centered VM: It use simulation capacity in manufacturing processes to provide for low-cost, quick examination of different processing alternatives In this sense, virtual reality (VM) is the production-based counterpart to IPPD (Integrated Product Process Development) optimizes manufacturing processes and adds analytical production simulation to existing integration and analysis technologies to provide high confidence validation of new processes and paradigms..

Control-centered VM: It is the incorporation of simulations into control models and actual processes, allowing for continuous simulation for optimization within the manufacturing cycle.

APPLICATIONS OF VIRTUAL MANUFACTURING

VM's appealing applications include part and product manufacturability analysis, analyzing and confirming the feasibility of production and process plans, and optimizing the manufacturing process and system performance. Because a VM model is built on genuine manufacturing facilities and processes, it not only provides accurate information about the product and its manufacturing processes, but it also allows for their review and validation. Much iteration can be performed to find the best option. Because there is no actual conversion of materials to products, the modelling and simulation technologies in VM increase production flexibility and reduce fixed costs. Aside from these, VM can be used to predict business hazards, which would aid management in decision making and strategic management of an organization.

Typical applications of virtual manufacturing are as follows:

- VM can be used to assess the viability of a product design, validate a manufacturing plan, and optimize product design and procedures. These lower the cost of the product's life cycle.
- VM can be used to validate and test the accuracy of product and process designs. For instance, the viewpoint of a product design, dynamic features analysis and tool path checking during the machining process, programmes validation checking for collision problems in machining and assembly.
- It is possible to conduct training for operators, technicians, and management personnel on the use of manufacturing facilities using VM on the Internet in a distributed virtual environment. Thus, training and production costs can be lowered.
- As a knowledge acquisition vehicle, VM can be used to continually learn manufacturing know-how, traditional manufacturing processes, production data, and so on. This can help to improve the intelligence of a production system.