SOFTWARE INTEGRATION TYPE CAD-CAM-CAE IN PRODUCT LIFECYCLE MANAGEMENT

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Abstract: Using the CAD-CAM-CAE type programs, case studies can be carried out to analyze some industrial tasks that may occur in the realization, manufacture, and operation of certain industrial components, before they are manufactured and put into operation under normal conditions. operation. Computer programs that perform a virtual modeling and an analysis of them based on the finite element method, help reduce launch and production times, control, and review of industrial products, before making the physical model. All this information resulting from simulations with specialized programs will be analyzed in detail, and the design team within the company can take the right measures to improve the final product.

Keywords: management, product, lifecycle, simulation, industry

1. INTRODUCTION

As it is known that industrial products require high quality and its maintenance over time, as well as their quality deterioration can generate very high costs, it is therefore necessary to achieve the various engineering objectives, as well as a proper management through systematic detection [1].

Usually, a certain sector of industrial activity usually includes the selection of machine tools that are used for the processing of the final product with the fulfillment of the exact technological specifications. It is also important to arrange these machines inside the factories to respect the correct technological flow. We then move on to the optimal selection of tools and the selection of other resources necessary for verification operations, assembly by optimizing the flow of spare parts needed to perform these operations [2].

The integration of computer production systems for product lifecycle management with the help of specialized programs allow a more complete analysis of the problems that may occur in the product, some problems can be corrected from the prototype stage or in other words from the virtual prototype phase [2, 3].

A common practice is to integrate several product life cycle management systems into one, it has advantages along with simplifying existing systems, catching the update of each system, thus achieving an integrated system efficiency. by an optimization of the resources used, which leads to a reduction of costs, these costs being higher if the maintenance of several management systems in parallel is desired [4].

The production of industrial machines and equipment presents greater or lesser risks, and it is necessary for some of them to be assumed by those concerned, it must be considered the basic condition that the risks specific to the sector must be known, respectively identified, analyzed, and evaluated, then developing strategies to prevent their occurrence and consequences [5, 6].

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Late implementation of these measures will certainly lead to losses which will require additional efforts on the part of the entire business sector. Industrial risks for product lifecycle management can be grouped into several categories [7, 8]:
- *Statistical risks*, these are a consequence of the imperfection of the means of production, the company covering them financially through the provisions set up.
- *Manufacturing risks*, are based on the use of used or poorly calibrated equipment, insufficiently qualified labor, defects in the information system, etc.
- *Conjunctural risks*, are related to environmental changes over which the industrial sector has a small influence (exchange rate, environmental factors, competitors' strategy, etc.).
- *Risks of accidents*, these can be work accidents that are the object of occupational safety and security, insurance, and prevention measures.
- *Unforeseen risks,* being related to the difficulty of predicting the future, the forecast having the role of reducing the uncertainties that can be found in the industrial sector of activity.

To initiate the risk management process in the industry, the risk assessment is started, this is done by: risk identification, risk analysis, final risk assessment. After this risk assessment, it can be controlled by reducing the risk and accepting the risk. At the end of the risk management process in the industry, a risk review is performed through specific activities to review it [9-11].

The present paper is intended to be an analysis of how to integrate a CAD-CAM-CAE software in industry and a study of the manufacturing systems flexibility.

2. INTEGRATION OF CAD-CAM-CAE SOFTWARE IN INDUSTRY

The specific elements of the analyzed machine manufacturing industry must be known, identified, analyzed, and evaluated, then developing strategies to prevent their occurrence. One way to prevent these manufacturing problems is to use an integrated computer technology process simulation system using specialized CAD-CAM-CAE programs (Figure 1).

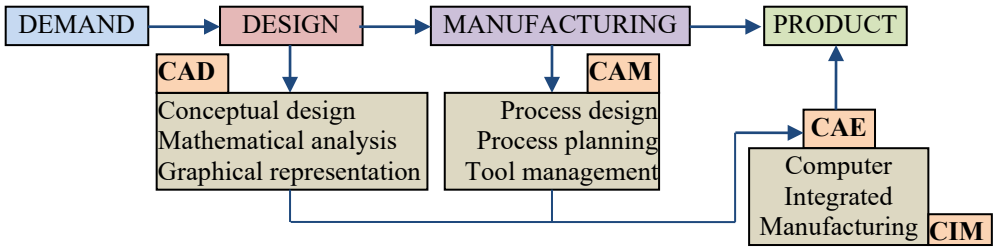

Fig. 1. The structure of CAD/CAM/CAE systems.

With the help of CAD (Computer Aided Design) type programs, the virtual model can be made (Figure 2), at the scale of the industrial product to be made, with the help of this model the optimal geometry can be made with the help of mathematical analysis.

With the help of CAM (Computer Aided Manufacturing) programs, manufacturing technology can be controlled by using computer systems to plan, manage and control production operations using a computer interface, directly or indirectly connected to the plant's production resources.

CAE (Computer Aided Engineering) technology analyzes the use of specialized geometry software made by the CAD program, allowing the designer to simulate and study how the product will behave, so that its design can be improved and optimized from the design phase. design and thus many production problems to be eliminated.

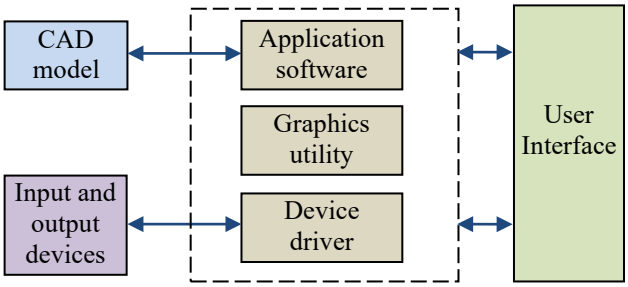

Fig. 2. The structure of computer aided design system.

Computer Integrated Manufacturing (CIM) is an integration of all these systems by using a common database on a computer system (Figure 3), being a way to run an entire management system per enterprise, which is much more efficient, having an impact on all sectors of the enterprise: accounting, planning, transport, as well as other management functions.

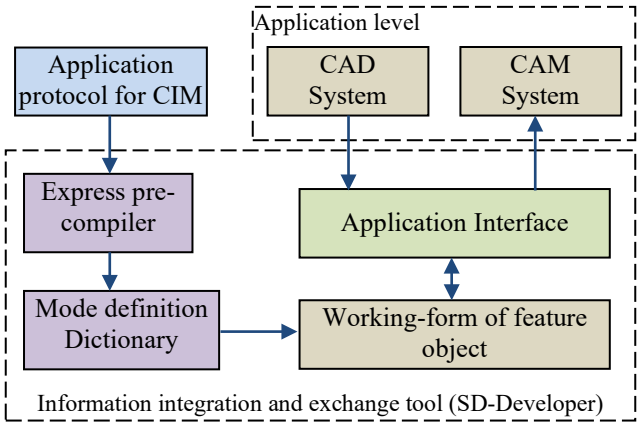

Fig. 3. Computer integrated manufacturing system.

An industrial system in general has five basic functions: research-development, production, commercial, financial-accounting, and human resources.

3. STUDY OF FLEXIBILITY OF MANUFACTURING SYSTEM

Production problems that a sector of industrial activity may face in the activity carried out must be addressed on the principle of the whole on the parts and its irreducibility to the sum of the components, which means that they can be incorporated in a risk management system rather than as independent risks, Figure 4.

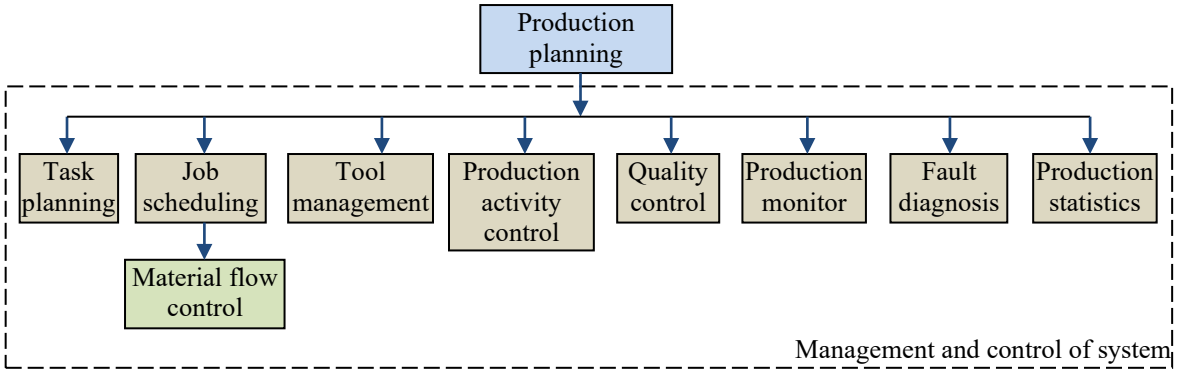

Fig. 4. Production planning and management and control of risk system.

Thus, a management team is required at the level of the activity sector with competences in different fields of activity of the company (strategic, financial, operational, IT, etc.) having the obligation to identify and evaluate

specific problems as well as to undertake those actions to place and to keep these risks within acceptable cost-benefit limits of such actions.

Specific manufacturing tasks are performed on established steps and can be simulated through applications on modern computing systems by identifying different types of risk, identifying the best development opportunities, identifying factors that can create value in the long run and finally developing risk prevention (minimization or transfer) strategy.

By virtually manufacturing a product that constantly meets the specifications with the help of the integrated CIM system, it is possible to track that product in operation and subjected to external forces but using minimal resources, as there is no need to make the physical product in the first phase, Figure 5.

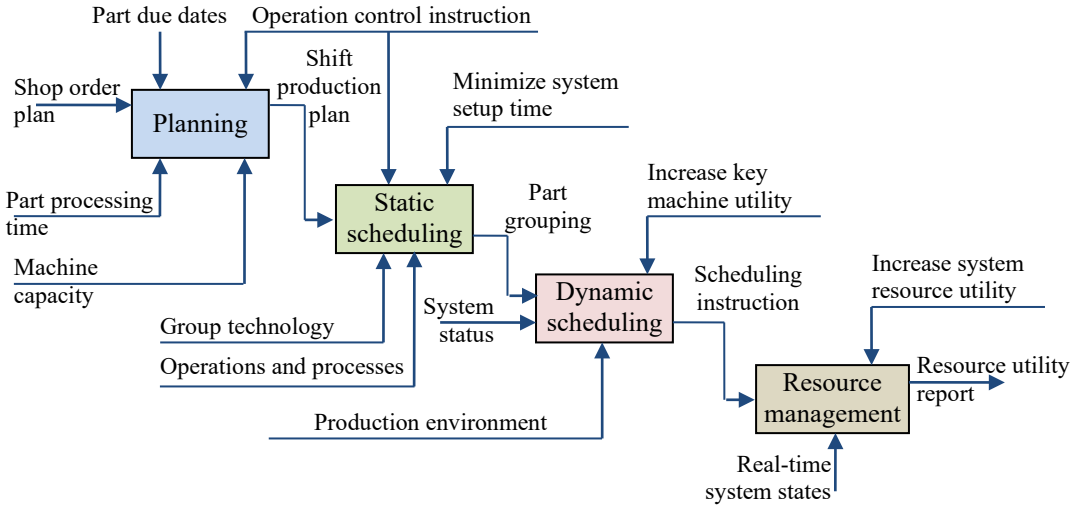

Fig. 5. Planning model of a virtual fabrication.

Virtual manufacturing is an approach that involves people, processes, practices, and technology that uses the information provided by specialized software to plan, design and build the first instance of a prototype, to organize the factory to optimize production, and manufacturing, monitoring, capturing other aspects of the life cycle for the rest of the production.

A good planning and scheduling risk system will improve the production operations efficiency and get high economic benefits. The general production optimization is maximizing the productivity at certain period, minimizing the time difference between the start and finish of a sequence of jobs or tasks for a group of parts, minimizing the cost for part manufacturing, maximizing the utility for main manufacturing devices, minimizing processing in progress, minimizing the production time for certain parts, and satisfying the due dates of parts.

4. CONCLUSIONS

To achieve a better analysis of the product management system and of the life cycle of an industrial product, several production management systems can be integrated in the respective industrial sector.

As we have previously stated, an integrated management system comprising several product management systems has specific advantages that lead to the simplification of these systems while increasing the benefits due to the reduction of maintenance costs that would have occurred if more parallel systems were used. product management.

An integrated system of an industrial activity sector includes several things, from the selection of the machine tools necessary for this product to be processed, their arrangement in this factory corresponding to the technological flow, a selection, and an optimization at the same time of the processing tools. At the end, various verification operations are performed, the establishment of the flows of parts for assembly and finally the realization of the proper assembly operation.

The integration of computer production systems and the analysis of the product life cycle with the help of specialized programs allow a more complete analysis of the factors and problems related to the design of different products, most of these factors can be corrected from the design phase of its prototype. in other words, from the virtual prototype phase.

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