COMPUTER AIDED PROCESS PLANNING: AN INTEGRATED APPROACH TOWARD MANUFACTURING SUSTAINABILITY

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ABSTRACT: *Computer-aided process planning (CAPP) is a link between design and discrete manufacturing schemes in a computer integrated manufacturing (CIM) environment. In order to optimize projected variables such as cost, lead times, equipment availability, production volumes, potential material substitution routings and testing requirement etc., CAPP is a key tool for engineers in the modern manufacturing industry. Distributed decision-making in planning comes out as a rigid hierarchical structure of tasks (size of the system matters); where the lowest levels are well-defined tasks, such as determination of machine and cutting parameters, while the top levels control, coordinate and manage the entire system. The CAPP system begins with examining a workpiece's surface, and identifies all possible machining processes for all facets, one at a time, and later specific production facilities were taken to the pool. Optimal machining plans are identified based on local production conditions, e.g., machine capabilities, delivery schedules, personnel, etc. It is found that the CAPP system is particularly useful in a concurrent engineering environment, where a large number of design changes are made on routine basis. LOCAM is commonly used as knowledge acquisition tool to meet diverse process planning in integrated fashion and minimum time. An integrated planning framework as a logical extension of current CAPP activities is of future interest and can be addressed by artificial intelligence (AI) based techniques to achieve higher business impact.*

Key words: Bacterial Diversity, Mining, Wastewater.

INTRODUCTION

Process planning reflects design information into the process steps and architected. Number of the computer-aided tools, computer-aided process planning (CAPP) suites has evolved to simplify and improve process planning for effective use of manufacturing resources. Process planning encompasses the activities like engineering drawings, specifications, parts or material lists, project plan and a forecast of demand. Planning results; a) routings which specify operations, operation sequences, work centers, standards, equipments, software's and fixtures, b) plans includes step-by-step work instructions, project plan, operational information, machining parameters, set-up instructions, and quality assurance checkpoints, etc., fabrication and assembly drawings to support manufacture as per detailed engineering drawings [1-3].

The essence of engineering modeling and planning is to capture the fundamental aspects of manufacturing. Planning models are therefore not judged by whether they are "true" or "false", but by how well they are suitable to lead the situation in question. It may therefore often be possible to devise several different plans of the same physical reality and one can choose among these depending on the desired model accuracy and on their ease of analysis. A drawback of process planning may be cited as the lack of this detailed interaction with the problem and it might act as a double edged sword. On one side it hides the complexities of a problem so you can concentrate on the real issues at hand and on other side it may also hide some important understanding of the problem as well. A number of Computer Aided Process Planning (CAPP) systems offer good geometric capability and intensified [4–7]. Process planning is predominantly an open ended problem that accepts multiple solutions based on experience and knowledge of the planner and needs support of artificial intelligence methods [8,9]. Most of the prototypes and commercially available CAPP systems are well inline with machining process with inspection.

In modern fast growing industry there is also a strong need to develop mechanisms and information structures to address dynamic market requirements regarding a product as early in the design cycle as possible. In addition to production considerations, this includes issues like assembly and disassembly of products, recyclability and assessment of their environmental impact. Therefore, the concept of planning should based on non-linear process plans to facilitate the integration between planning and scheduling. One of the most complex problems in the integrated design and manufacture of products is to meet desired specifications. However, majority of process planning integration schemes is based on the creation and detailed design and manufacturing requirements. The concept of time based process planning is vitally important in order to address planning issues effectively.

The core of Computer Aided Process Plans is a Knowledge Acquisition Tool which allows companies to capture their own unique and diverse manufacturing rules and data. Manual process planning is based on a manufacturing engineer's experience and knowledge of production facilities, equipment, their capabilities, processes and tooling. Process planning is very time-consuming and the results vary based on the person doing the planning. We analyze that companies can reduce their current process planning effort by up to 50-55% by adopting a generative computer aided process planning tool. Tangible savings can be made not only in the process planning effort, like savings on materials, less waste, save inventory, reduced process planning times, resulting in faster response to engineering changes, capacity utilization, etc.

PROCESS PLANNING

This manuscript computer aided process planning (CAPP) can be done and benefitted. Number of approaches used to integrate cost analysis with CAPP was available in open literature [10]. The criticality is to utilize methods focused on optimizing process plans on the basis of time CAPP systems automate manufacturing and drastically reduce planning time. CAPP software's and optimization techniques

benefits can result from the implementation. Other benefits include the standardization of manufacturing process, increased productivity and better interfaces.

Traditional CAPP systems were generally classified as either variant or generative. I a variant system similar parts require similar plans, so this needs continuous human supervision. On the other hand, in generative process plans utilize decision logic, mathematical formulas, manufacturing rules and geometric data to determine the processes required to convert the raw material into a finished part. This type of system can develops a new plan for specific part. CAPP technology is continuously evolving and merging with areas of Computer Integrated Manufacturing (CIM), including business automation, cost control, resource allocation and internet based product development, is static. In dynamic CAPP systems, functionality based design and manufacturing, determination of cutting conditions and automatic selection of machining strategies were introduced.

Generalize process planning architecture has been in engineering practice from many years. The generalized structure of the PP architecture is shown in Fig. 1 [9]. The main feature of this architecture is clustering of functions according to aggregate and detailed manufacturing operation with time line execution. The starting level of planning activities complies with the manufacturing cycle from embodiment design and/or conceptual design. In line cost control and product development time is potentially the most important level of process planning. The idea of generic and aggregate process and facility modeling in CAPP will improve manufacturing process.

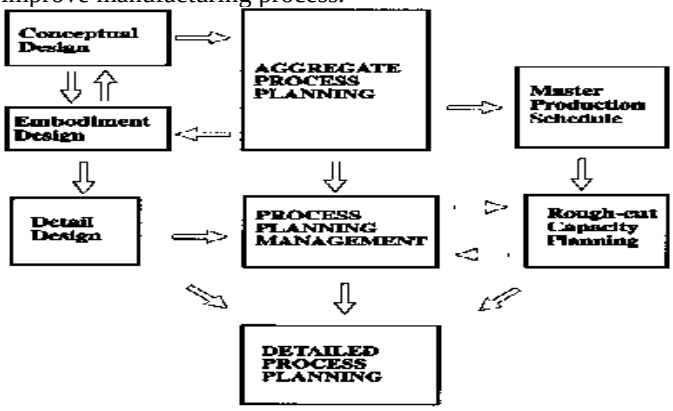

Fig. 1. A generalized process planning architecture

The input level includes assemblies and aggregate production plans were considered in CAPP. The planning opportunities and skills were assessed by considering their effect on shop floor capacity as predicted by rough-cut capacity methods using master production/designed schedule and manageable at this level. The bottom level of planning is concerned with the control of each process step and justifies CAPP systems functionality by considering tool selection, paths and detailed process parameters, etc. It is believed that the predictive modules of process planning could optimize by sophisticated controls and monitoring. In overall science, process planning refers to the conversion of initial designs into rough-cut manufacturing plan with production route options. The objective is to get readymade and instant information about production and planning flaws, then the rapid evaluation of alternative designs, process options and production routes and finally the performance, quality, cost, etc. The essential principles for CAPP methodology are:

a) detailed process models with predictive controls.
b) characteristic trends within minimum information.
c) manufacturing process knowledge.

The conceptual design is the identification of production requirements for manufacturing. The CAPP tool-kit is designed to integrated manufacturing process by specific knowledge input. A number of CAPP models have been developed for machining, fabrication and planning purpose while the simplest one is more useful. CAPP helps in business objectives management, target, time cycle, cost, and production route selection. The planning steps includes: process selection, sequencing and machine selection.

CONCLUSION

Computer aided process planning (CAPP) systems have a wide spread applications in integrating business functions and product manufacturing due to product market volatility. There is a need for reconfigurable and reconcile manufacturing fundamentals in CAPP better manufacturing management and cost control. The generalized process planning system presented herein satisfies the industrial needs for product based manufacturing and process planning. Ultimately it's the traditional process planning scheme with additional functions at aggregate level which are designed to operate using limited product and process data. The future work will develop additional modeling methods and dynamicity to improve manufacturing performance and planning. CAPP is suitable to optimize processes selection, equipment choice, production routes, quality of parts, manufacturing cost and time. This capability builds confidence in industrial and manufacturing engineering team in day-to-day operations.

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