



NEED OF CAD AND CAM SOFTWARE INTEGRATION TO OPTIMIZE PRODUCTION CYCLE IN MANUFACTURING INDUSTRY

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Abstract— In today's competitive world, we thrive on the processes that are fast and accurate. The approach manufacturing industry was using in 80's fell behind because of the slowness of the process and the complications in the design. That is why manufacturing industry adopted CAD tools to generate the design and models of the products and the whole process became a lot less complicated and fast. But in today's world if we are using the CAD tools to design the product and then writing the NC codes manually then we are losing a considerable amount of time. This is why if we start using the CAM softwares to generate NC codes along with the CAD softwares then we can save the excess time and the manufacturing process will be more efficient.

Index terms: CAD, CAM, integration, NC code, CNC machines.

I. INTRODUCTION

The manufacturing industry has grown a lot from its early days where the design were done on drawing boards and then used by the production department for machining. Since its inception, the CAD tools have become immensely popular in the manufacturing industry because, it eliminated the need to draw the diagrams on the drawing board so that task of creating the design for the product became fast and less complicated. Also, it eliminated the need to store those design sheets in case the work is repetitive and sheets are needed again. CAD models can be saved easily on the hard drives

and can be used anytime.

The industry used this approach for designing the product and started using NC, CNC machine for their production. Writing the NC code is tough task, you need expert person for that work. Manually writing the codes can be difficult and small mistake in NC code can destroy the complete product. Nowadays advanced CNC machines allow user to see the path their NC code is going to generate. This process reduced the overall time required for the production cycle.

Now, with the evolution of the CAM softwares like Delcam, CAMWorks, SolidCAM etc. which generate the NC code from the solid model itself, this whole production process can be optimized. CAM softwares can be linked with the CAD softwares like SolidWorks, Creo, Pro-E, Catia etc. By doing so, the manufacturer can get the NC code for the product at the time of the design of the product.

The basic flowchart of the combination of the two software is given below.

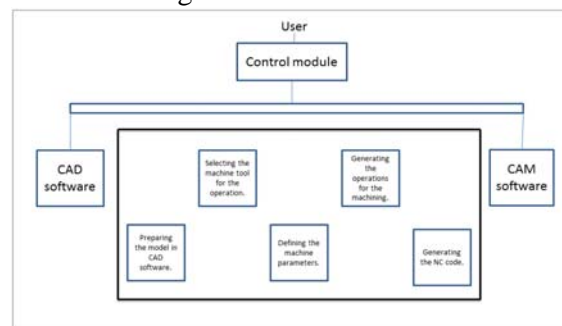


Fig. 1 Flow of integration of CAD/CAM software.

The main pillars of the integration of the CAD and CAM softwares are shown in above flowchart. The brief information about them is given below.

1] Preparing the model in CAD software:

The first step includes preparing the model on the CAD software just like the current system.

2] Selecting the machine tool:

After that there is a process to select the machine tools from the available machine tools in the CAM software. The machine tools such as Mill machine, turn machine, Mill-Turn machine etc. are available in current CAM softwares.

3] Defining the machine parameters:

After selecting the machine tool, its parameters have to be defined. The parameters such as spindle speed, feed, coolant, coolant flow rate etc. are defined.

4] Generating the operations for the machining:

The CAM software recognises the features that are present on the CAD model. Holes, thread, cut, chamfer etc. are the examples of features. For respective features the CAM software generates operations for the machine tool that can be done on the actual model.

5] Generating the NC code:

The NC code generation is the last step in CAM software. According to the operation plan generated in the previous stage, the CAM software generates the NC code. This NC code is validated by the experienced NC programmer and then it is forwarded to the CNC machine.

These are the main parameters of this system. After generating the NC codes these codes are transferred to the actual CNC machine and the machining is done on the raw material to get the finished product.

II. NEED OF INTEGRATION OF TWO SOFTWARES

The current industry makes use of the CAD softwares in abundance. But the use of the CAM softwares is very limited. More often than not the CAM softwares come as an add-in to the CAD software which in turn increases the total cost of the package. In current scenario, the

industry needs just that. When the two softwares are available at the design level itself, it is far easier for the industry to allocate the available resources to the various processes. The whole production planning is simplified. If the softwares are not combined together then the production department has to decide the various operations that are required to perform the final product and after that the NC programmer has to write the NC code according to the operations mentioned in the planning.

The various needs of the integrating CAD and CAM softwares are summarized below:

- To facilitate the overall production planning of the industry.
- To reduce the time that is lost after the design completion on CAD software to the actual generation of the NC code.
- To reduce the overall cost for the industry by reducing the manpower required as there won't be need of many people for the production planning and one NC programmer who has enough experience is sufficient to review the code generate from the CAM software.
- Single operator can perform both the work. i.e. He can create model of the product on the CAD tool and soon after that he can generate the NC code for the same on the CAM software.

III. PROBLEMS FACED BY CURRENT SYSTEM

The current scenario for the manufacturing of any product is discussed in detail above. The real problems faced by this system are explained below. The current system is better than the tradition way of manufacturing but as they say why settle for less when you can have more. CAD tools are used to model the product and according to that the process planning is done and after planning the actual machining is done. So, the process of generating NC codes for machining comes after all the planning has been done.

Now, if the problem arises in process of generating the NC codes then the whole planning is scraped and the complete procedure has to be repeated. This process results in loss of the company and loss occurred in this stage of production results in more loss to the company as compared to the loss suffered at the design

stage.

So, it is better if such problems are to be appeared then they must be solved in the stage of the design itself. So, the use of the CAM softwares solve this problem and the whole planning can be done after this stage. Apart from that, the cost of the expert personal required to write the NC codes is generally very high. This cost can be saved by the use of the integration of the CAD and CAM softwares.

IV. ADVANTAGES OF INTEGRATING CAD AND CAM SOFTWARES

The biggest advantage of integrating CAD and CAM softwares lies in time saving which is the main requirement of the industry. Apart from time saving there are numerous advantages of CAD CAM software integration, they are discussed below.

- **Cost Reduction:**

Another main advantage of this system is overall cost reduction. As cost is the main parameter to run any industry, the reduction in cost is always welcome. This system insures the problems that might be faced in production stage are faced in design stage only and they are taken care in design stage, as the cost incurred for the problems in production stage are significantly greater than the cost for design stage.

- **Manpower reduction:**

The technician required to write the NC codes are no longer required, as the CAM software takes care of the NC code generation itself. So, this will reduce the human error factor in the process and it will insure consistency in the system.

- **Time saving:**

There is always the time constraint on the delivery of the product. So, the time required to write NC code is saved as the NC code is generate by the software itself. Apart from that two separate departments were doing those processes of generating the model and generating its NC code. So, the time required for the communication between those two is also saved.

- **Increase in efficiency:**

Time saving, cost cutting are the major reasons the productivity of the plant is increased and the increased productivity results into increase in the efficiency of the plant.

- **Consistency in design:**

As the model generation and the NC code generation are done by the softwares, the chances of error occurrence are reduced significantly. Apart from that, the human error factor is also eliminated. This results in a consistent system.

Apart from above mentioned advantages, there are numerous advantages of integrating CAD and Cam softwares; they are shown in the following flowchart below

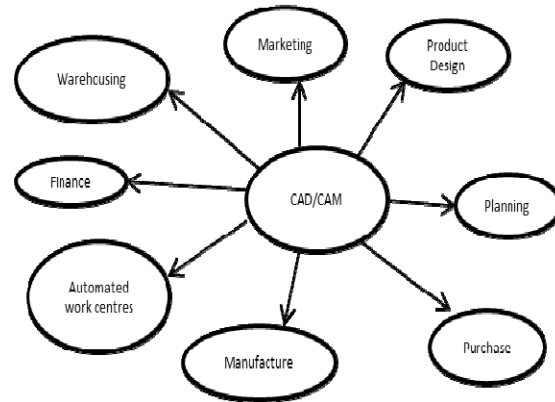


Fig.2 CAD/CAM Database

As the above flowchart shows, CAD and CAM softwares usage is not for design only but, it has become generalised in today's environment. The above flowchart clearly indicates that when those two i.e. CAD and CAM are combined together then their range of use can be increased vastly. When combined together, they are useful in various areas such as finance, purchase, marketing, planning, warehousing apart from the conventional use of CAD and CAM like design and Manufacturing.

V. CHARACTERSTICS OF THIS TECHNOLOGY

There are many characteristics of integrating the CAD and CAM softwares such as shown below:

- Rapid new product development
- Short lead times, cycle times
- Use of superior CAD/CAM
- Modular design and technology
- highly flexible machines and equipment

- Short and fast order processing
- Fast supplier deliveries
- Very Short time to market
- Short guide times and short cycle times
- Highly flexible and responsive processes
- Modular assembly
- Use of Solids model

VI. CONCLUSION

This paper concluded the results of a study relating to the integration of the two softwares i.e. CAD and CAM regarding the manufacturing industry. This paper presented the present procedure followed by manufacturing industry and the future procedure that industry could adopt to optimize the production cycle. Apart from that the problems faced because of the current method adopted by industry are discussed along with advantages of the integration of the CAD CAM softwares.

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