Computer Aided Design / Computer Aided Manufacturing
CAD / CAM

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UNIT

1

CAD Definition

OVERVIEW

This chapter deals with the technology of CAD and its reason for implementing of CAD. Comparison of manual design process and CAD design process. The benefits of CAD against the others.

1.1 INTRODUCTION

The use of the computers into the product design and development process has benefitted engineering industry in several years. Three are many advantages in using computers for design and analysis. The most important factor is that the computer can store and manager large amount of engineering data as well as mathematical data which can be used in the various stages of design, devleopment and manufacture like conceptual design, analysis, component design, documentation, process planning and manufacturing. The approach of product development using the computer aided design (CAD) and computer aided manufacturing (CAM) results in better and consistently good quality products invariably of a lower cost, with the benefits of faster development of different varieties of the product or models.

Table 1.1 Comparison between the relative advantages of human designers and computer design

Computer are good at	*Human designers are good at*
1. Carryout long and complex calculations. 2. Store and fetch large data-base. 3. Provide several alternatives for design solutions. 4. Simulate the design for optimi-zation. 5. Aids in modelling, drafting and documentation.	• Identifying design needs • Drawing up specifications • Selecting design variants • Optimizing design solutions • Selecting the best data • Learning from experience.

1.2 REASONS FOR ACCEPTANCE

The reason behind the acceptance and applicationof computers in engineering industry, is mainly due to the following developments during the past few years.

(*i*) Development of analysis software and interactive graphic which prompts the user with the queries and information on the video display units and guides for the user to solve the problems. It eliminates the need for processing in-depth knowledge in high level programming languages.

(*ii*) Developments of graphic workstations with powerful graphic facilities.

(*iii*) Availability of computers with the faste rcomputing speed and enhanced memory at affordable prices.

(*iv*) Reduction inproduct life cycle due to better design.

(*v*) Increasing product complexity.

1.3 CAD TECHNOLOGY

It makes the use of the computer to creat drawings of parts and asemblies on computer which can be further analysed and optimised also. The functional, aesthetic and ergonomic features of the product can be evaluated on the computers. This is possible through the use of the design workstations or CAD terminals, graphics and analytic softwares which help the designer to create a modela nd analyze objects or components. CAd can be used for a variety of uses, some of those are listed below:

(*i*) Creates conceptual product model.

(*ii*) To improve aesthetics, ergonomics and performance, we can edit or refine the model.

(*iii*) Display the product in several colours for good appearance to customes.

(*iv*) Rotate and view the objects from various sides and directions.

(*v*) Create and display all inner details of the part or assembly.

(*vi*) Check the inteference or clearance between mating parts in static to dynamic conditions.

(*vii*) Observe functional aspects of relative moments of various elements or assemblies.

(*viii*) Stress analysis, static deflection and dynamic behaviour for different mechanical and thermal loading configurations and carry out quickly any necessary modification in design to rectify deficiencies in the design.

(*ix*) Study the product from various aspects such as material requirements, cost, manufacturing processes, standardization, variety reduction, life, lubrication, servicing and maintenance aspects etc.

(*x*) Detailed component drawing gives a full detail of dimentions, tolerances, surface finish requirements, functional specifications etc.

(*xi*) Prepare assembly drawings showing the orientation of components, assembly procedures and requirements and incorporation as required.

(*xii*) Prepare detailed view of the assemblies for service and maintenance manuals. It provides better visibility and improved comprehension of the design.

(*xiii*) Pint the drawing stoed in the computer with the help of different media.

(*xiv*) Store the data of the object part or drawing in a magnetic disc or tape for etrieval at a later date for use in some other design or for modification of existing design.

1.4 ELEMENTS OF CAD

CAD consists of thee stages (Drafting, modelling, and Analysis) and the two main factor *i.e.* machine and the human factor woking together to achieve the optimum design. Stages are shown in Fig. (1.1).

The design activity can be enhanced with the help of computer systems and various informations which is available in the database.

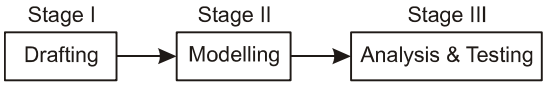

Fig. 1.1 Stages of CAD

1.4.1 Human Factor

This is the key factor in the success of CAD system. It involves the following factors:

- Computer aided analysis
- Computer-aided visualization
- Computer aided synthesis

1.4.2 System Factor (Machine Factor)

CAD system consists of two components namely, hardware and software. These are as followings:

- CAD workstation
- Display devices
- Interactive devices
- Output devices
- Storage devices
- Software for analytical, grpahical etc. representations.

A typical diagram shown in Fig. (1.2) shows the different elements of CAD and their inter-connectivity within the CAD system.

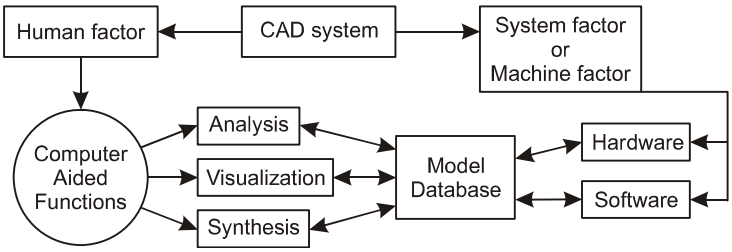

Fig. 1.2 Elements of CAD

1.5 REASONS FOR IMPLEMENTING CAD

There are many reasons to implement CAD and Dafting system in design system.

1.5.1 To increase the productivity

With the help of CAD, it is quickly visualized for a product and its component subassemblies and parts. This reduces the time required to synthesize, analyse and document the design. The result is not only lowers the cost but also improves the productivity.

1.5.2 Improved quality of design

CAD system permits a thorough engineering analysis within a short time using softwares and thus a large number of design alternatives can be investigated. These factors lead to improve the quality and accuracy of a design.

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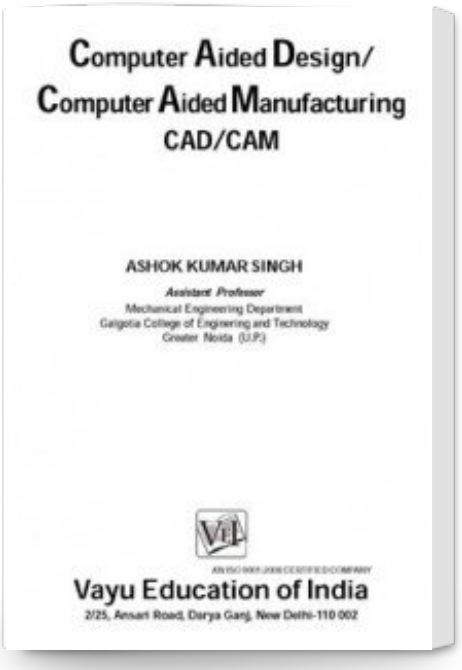

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