COMPUTER AIDED DESIGN

DEFINITION:

Definition: *Computer-Aided Design (CAD), also known as Computer-Aided Drafting, is the use of computer software and systems to design and create 2D and 3D virtual models of goods and products for the purposes of testing. It is also sometimes referred to as computer assisted drafting.*

ABOUT CAD:

CAD involves the designer's use of the computer as a versatile alternative to more traditional modes of drawing and modelling and is today an indispensable tool for graphic and product designers, engineers, interior designers, and architects. Its basic two-dimensional graphic origins lay in the United States Air Force's SAGE air defence system in the mid-1950s and was developed at the *Massachussets Institute of Technology's* (MIT) Lincoln Laboratory. In 1961 Ivan Sutherland, a doctoral student at MIT, first envisaged a computerized sketchpad that would replace traditional modes of design drawing and by the end of the decade the Computervision company had sold the first commercial CAD system for production drafting to Xerox. By this time attention had begun to turn to the possibilities of computer-aided three-dimensional modeling. However, in their early stages of development all CAD applications were phenomenally expensive, as were the large computers that powered them. As a result they were generally restricted to large automotive and aerospace corporations such as Chrysler, Ford, General Motors, and Lockheed. By the early 1970s General Motors had developed the first DAC (*Design Automated by Computer*) production interactive graphics manufacturing system and in 1975 Lockheed sold software equipment licences to *Avions Marcel Dassault* (AMD) for purchased CADAM (*Computer-Augmented Design and Manufacture*). The development of increasingly sophisticated and accessible systems was rapid and, by the 1980s, applications were developed for personal computers. By the late 20th century the dramatically increased speed, enhanced memory, and very much smaller size of computers, together with highly sophisticated and affordable software have meant that basic packages for two-dimensional and three-dimensional graphics became standard in design and architectural studios and education. They are also readily available to everyday consumers using personal computers who are able to use software for designing bathrooms, kitchens, etc. The huge advantage afforded by digital systems for drawing and modeling is that they allow designs to be seen from any angle as well as easily manipulated, whether in terms of choice of colours, textures, or revisions. Such digital designs can be stored electronically and speedily transmitted, with relevant data fed directly into the manufacturing process

computer-aided design (CAD) or computer-aided design and drafting (CADD), form of automation that helps designers prepare drawings, specifications, parts lists, and other design-related elements using special graphics- and calculations-intensive computer programs. The technology is used for a wide variety of products in such fields as architecture, electronics, and aerospace, naval, and automotive engineering. Although CAD systems originally merely

automated drafting, they now usually include three-dimensional modeling and computer-simulated operation of the model. Rather than having to build prototypes and change components to determine the effects of tolerance ranges, engineers can use computers to simulate operation to determine loads and stresses. For example, an automobile manufacturer might use CAD to calculate the wind drag on several new car-body designs without having to build physical models of each one. In as devices have become smaller and more complex, CAD has become an especially important technology. Among the benefits of such systems are lower product-development costs and a greatly shortened design cycle. While less expensive CAD systems running on personal computers have become available for do-it-yourself home remodeling and simple drafting, state-of-the-art CAD systems running on workstations and mainframe computers are increasingly integrated with computer aided manufacturing systems.

Benefits of Computer-Aided Design

In the field of product development there are often immense costs associated with the testing of new products. Every new product must undergo at least a small measure of physical testing – not only to ensure that it meets minimum safety standards but also to ensure that it will successfully operate under the range of conditions to which it can expect to be exposed. For instance, the wing of an aeroplane must undergo stress tests to ensure that it will retain its integrity even under the most gruelling weather and turbulence conditions before it is approved for use.

Unfortunately, this testing can be ruinously time-consuming and expensive. If an aeronautical company has to physically build dozens of wings in the course of testing a new design then the final cost and time scale of the project can be far higher than projected.

Fortunately, there is no need to physically test all of these designs. Instead, developers can run virtual stress tests using computer-aided design, substituting a wind tunnel for a CAD application that can simulate the same conditions.

The benefits of virtual simulations are obvious. In addition to a reduction in the cost of product development and the time required to run tests there is also the advantage that conceptual designs can be modified instantly as the tests progress.

Business Applications for CAD

While Computer-Aided Design can be an excellent tool for performing stress tests on conceptual products there are still more potential uses.

* Idea Generation

With the limiting factor of prototype manufacture removed, CAD allows the process of idea generation to become much more flexible. Enterprises can afford to be more open to new ideas and suggestions than in the past – from both employees and potential customers. Suggestions for new products can be quickly tested at a much lower cost than in the past.

* Augmentation

CAD opens up the possibility to make slight improvements on new product designs instantly. While this can be of great benefit in the design of a new product it can also be extremely useful for investigating possible improvements to existing products – or even reverse engineering and augmenting the products of competitors.

* Market Testing

Through designing new products using CAD it becomes possible to begin the process of market testing much earlier than in the past. Focus groups can be presented with virtual mock-ups of new products more quickly than would be possible with physical prototypes, and alterations can be made based on their feedback almost instantly. Since modifications can be made simply by entering new data into the CAD software, updated virtual mock-ups can be presented to the same audience for further feedback during the same session.

HISTORY OF CAD SOFTWARE:

The earliest work on software development for the forging industry was probably that of Knight and Biswas[1] who described a CAD method for axisymmetric forging dies in 1974, although Biswas and Rook[2] had used a simple computer simulation technique to estimate load and energy by 1972.

In 1975 a software for preform design for long shaped forgings was proposed by Biswas and Knight[3] and subsequently a program for the design of roll passes for reducer rolling was produced by Mullineux and Knight[4]. In 1979, Chan and Knight described a means for describing forged shapes and hence die cavities using geometric primitives[5]. This system, called `MODCON' for modular construction, formed the basis of some subsequent developments described below. Much of the work at this time was developed on computers in batch mode, using punched card input. The installation of computers with keyboards and VDU's enabled interactive CAD programs to be written, which sped-up the realisation of die designs and allowed the user to modify design rules or program decisions in an ad hoc manner, if this was necessary to suit particular process conditions. Three CAD programs were produced in this manner; CIRCON which was desk-top software for cost estimation and CAD/CAM of dies for axisymmetric forging dies, Interactive MODCON which provided the same facility for a variety of die shapes and UPSETDIE for design and manufacture of dies for horizontal forging machines. In 1982 a series of hands-on seminars were held at Birmingham University for the forging industry in which the power of the CAD/CAM programs were demonstrated. They served to build the confidence of forgers in the value of computer but not in the programs themselves. There were too sophisticated and required too big a step in the advance of design techniques. By about the middle 1980s management software was being used on PC's by a large number of forging companies. Once computers became a common tool for administration it was an easy decision to adopt them for technical activities. The number of computers used in industry for this purpose has grown fairly rapidly over the past years. In most cases CAD amounts to computer-aided drafting using proprietary software. Some companies download designs to NC machines for manufacture of EDM electrodes or patterns. To the author's knowledge no programme with inbuilt...

Advantages:

1.You can use two standard components and combine them to create a whole new design.

2.The machines can be used non stop.

3.It's faster than hands or any other relevant form of creating or molding plastic.

4.It's more accurate than a hand drawn design.

Disadvantages:

1.Must train people to use it.

2.It's expensive