CAD

CAM
2 and 3 Dimensional CAD:
Using 2-dimensional CAD software, designers can create accurate, scaled drawings of parts and assemblies for designs. It can also be used to develop and firm up design ideas by concentrating on single views and using the range of geometric tools available.

Using 3-dimensional CAD software designers can create fully rendered 3D models of parts and whole assemblies for designs. Designs can be tested virtually before being made from costly materials.

3-dimensional CAD allows all of the parts of a design to be modelled in separate files and then assembled together into a final model. Each part can be modified at any time and changes will be applied to the final model also.

3D models can be viewed from any angle allowing complete visual testing. Assembly of the final model allows the designer to check for exact fit of the parts.
The advantages of CAD...

- Lessens the need for large numbers of expensive draftsmen in the designing of a product.
- Accurate 3D models can be visualised and tested before making in costly materials.
- Engineers, designers and technicians can share the design data in computerised manufacturing management systems.
- Accurate 3D models can be visualised and tested before making in costly materials.
- Models can be stored and retrieved easily.
- More accurate than traditional hand drawn drawings.
- Accurate, scaled and dimensioned engineering drawings can be generated directly from the model.
- Storage of large paper drawings is no longer an issue.
- Multiple copies can be stored, printed and shared electronically.
- Faster to produce and less labour intensive.
- Drawings can be automatically scaled and re-scaled as necessary.
- Models can be reworked and modified easily to aid product development, regeneration and continuous improvement processes in industry.

ADVANTAGES
The disadvantages of CAD...

- Industrial versions of the software can be very expensive to buy—especially the start up costs.
- Power cuts and viruses can be problematic.
- Traditional drafting skills will be lost as they become unnecessary.

Engineers, designers, and technicians may need expensive training in order to be able to use the software, again this can be time consuming and expensive.
2 and 3 Dimensional CAM:

Computer aided manufacturing is now a central element in many production systems. CAM machines enable a wide range of processes to be carried out automatically in both 2 & 3-dimensional formats: Cutting, milling, turning, routing, engraving, heat cutting and even printing in solid materials.

Most modern day CAM processes utilise data from either 2 or 3-dimensional CAD drawings which are converted into machining paths [G&M codes] by the CAM software.

In 2D CAM processes for cutting profiles or pocketing shapes into a material an offset allowance will be added drawings to take account of the radius of the cutter(s) being used. The offset lines will become the actual cutting profiles which the machine will follow the centre of the cutter.

Where multiple parts or batches are to be cut from a billet the production engineer must reduce material waste by careful positioning of the components.

What is CAM?

: Computer Aided Manufacture
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: Computer Aided Manufacture

2 and 3 Dimensional CAM:
Typically, most CAM production will follow a process similar to this:
A CAD drawing or 3D model is generated.
Necessary offset paths/colour coding for different cuts etc are added to 2D drawings.
3D models are exported as stereo-lithography[stl] files.
The data is converted into G&M machine codes which are actual paths that the machine cutter will follow either in 2 or 3D space. Cutter diameters, materials [speed/feeds], depths for cutting will need entering at this point for the correct G&M codes to be set.
At this point a virtual machining preview will be run on the computer to test the setup.
A billet of the correct size is fixed into the machine and set-ups are made regarding tooling [diameters and depth settings], actual material depth and sometimes feed and speed settings.
The machine is set to run with necessary guarding in place.
The finished piece is removed and cleaned ready for further processing or finishing.
The advantages of CAM...

- Manufacture is accurate and can be repeated consistently with large runs or batches.
- Manufacture is less labour intensive and will save on employment costs in the long run.
- Manufacture can take place with minimum supervision and can be done during unsocial work hours.
- Can release staff from mundane tapes of work to be used in more demanding / interesting parts of product manufacture.
- Machining routines and outcomes can be evaluated with virtual machining on screen.
- Machines can work continuously and with small margins of error.
- Prototype models can be made very quickly for detailed inspection prior to finalising designs for manufacture.
The disadvantages of CAM...

- Initial investment and start up costs are very high.
- Machine maintenance is often costly.
- May contribute to loss of a workforce with high level manual skill.
- Need highly trained operatives and technicians to ensure correct tooling and setup procedures are followed.
Examples of CAD/CAM work...

Janome Embroidery Package...
Examples of CAD/CAM work...

Camm 1 Cutter...
Examples of CAD/CAM work...

Laser Cutter...

Cutting Acrylic Plastic

Cutting into fabric

CAD

CAM

CAM

CAD
Examples of CAD/CAM work...

Creating Buttons

Laser Cutter...

CAM
Examples of CAD/CAM work...

Laser Cutter...

Creating Accessories