Rewarding Learning

A2 LEVEL Section C

# FACT FILES

## Technology & Design

For first teaching from September 2011

For first award in Summer 2013

## ICT in Manufacture


technology and design

# FACT FILE

## 3.16 ICT in Manufacture

technology and design

## Learning Outcomes

**Students should be able to:**

- Employ CAD and Cam systems and other ICT systems where appropriate in the design and manufacture of products;
- Demonstrate knowledge of CAD/CAM systems.

## Course Content

### Computer Aided Design (CAD)

CAD is a system which is used to help people, by the use of computer, to design ideas, build models and prototypes. It was originally used to help people with technical drawings but it has now been adapted for a number of other functions for example to help with the design and manufacture of products in industry and in schools.

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### Computer Aided Manufacture (CAM)

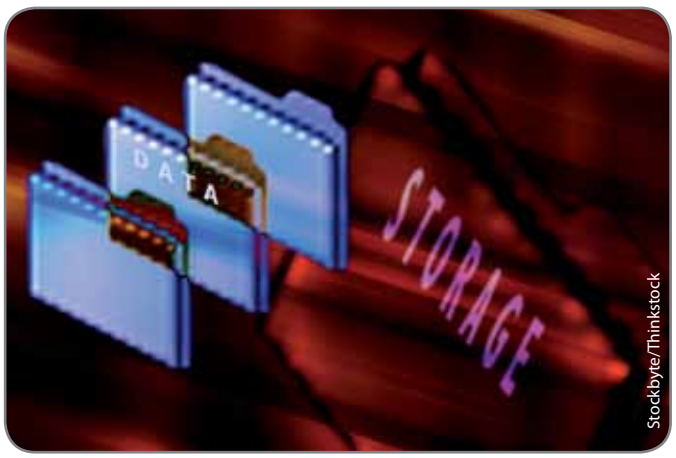
Since the beginning of the industrial revolution the manufacture of products has developed significantly. One of the most dramatic changes was the introduction of Computer Aided Manufacture (CAM). A system were a computer is used to control and assist with the manufacture of products.

Since this introduction industry's have been able to set up factories which are highly automated through the use of robotics. Through the use of CAM, products can be manufactured to a very high degree of precision and accuracy for example car assembly lines.

iStockphoto/Thinkstock

Advantages of using CAD/CAM systems:

- Easier data storage and retrieval;
- Repeatability;
- Flexibility;
- Quick changes/set-ups;
- Reduce labour costs;
- Full automation capability.




Stockbyte/Thinkstock

Disadvantages of using CAD/CAM systems:

- Security of data;
- Risk of data corruption is high;
- The initial investment – plant and training.


## Computer Numerical Control (CNC)

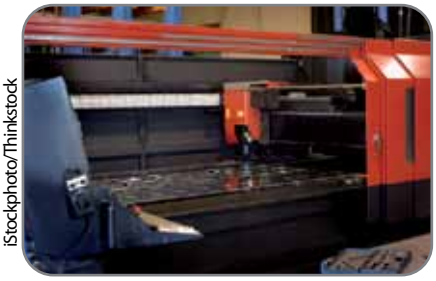
CNC machine tools are programmable, automated means of machining components. They are a development of a numerical control technique that first appeared in the 1950's which controls the actions of machines by the input of instructions in the form of a code.

CNC machining has developed through a process of evolution and a need to meet product manufacturer's needs. There are now many specialised applications for this technology which covers all manufacturing processes:

- **Drilling Machines** for drilling and other related operations such as tapping.
- **Printers and Vinyl Cutters** for producing graphics for products and prototypes.
- **Lathes** for all turning and cylindrical contouring operations.
- **Milling Machines**. This includes some of the most versatile operations for creating a wide range of complex contours as well as internal and external profiles
- **Profile cutters** which use a range of cutting operations such as flames, lasers, and pressure abrasives to cut out a range of shapes on a wide range of materials, from sheet metals to paper and fabrics.
- **Routers and engravers** for normally light work, producing groves and profiles.
- **Pressing, blanking and punching machines** for sheet materials.
- **Chemical and electrical discharge machines** able to produce complex contours, pockets and holes using chemical etching and spark erosion technology.
- **Laser Cutters** for engraving and cutting sheet materials.

Some Examples of CAD/CAM Systems are illustrated below:

Laser Cutter




Printer


CNC Lathe


Vinyl Cutter


Routers

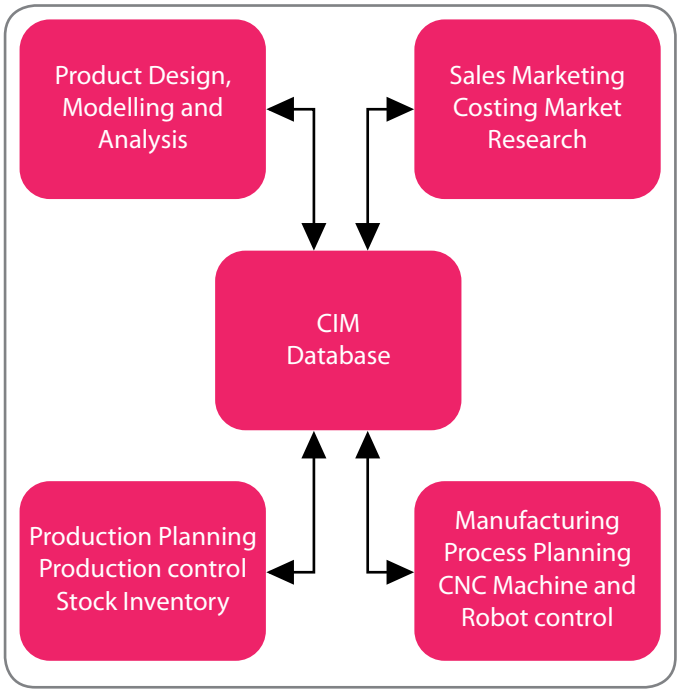
## Computer Integrated Manufacture (CIM)

CIM uses computer technology to join together various functions of a manufacturing company. The process of producing even a simple product such as a ball point pen requires a number of people, the majority of who are not involved directly with the manufacture of the product. The diagram below shows the different functions that contribute to the finished product. This can apply to a very simple product such as a pen or something more complex such as a car engine.


All of the functions are connected through a network and any change in any function can be seen on the central computer. This allows all of the functions to interact so nothing is done in isolation.

For example: If there were changes made to the CAD program then the CNC program will automatically make its changes to suit the new CAD program.

From the diagram below you can also see that ICT in Manufacture does not stop with CAD, CAM and CNC systems. ICT goes much deeper from designing the product to marketing and selling the product. All of the areas below are covered and controlled using ICT systems.




Other examples of ICT in Manufacture include:

### Just in Time (JIT)

A computerised system that organises workflow, allowing for rapid, high quality and flexible production from raw material to product, thus minimising waste and stock levels.

### Stock Management

A computerised system that controls the holding of stock, telling you about how many products are left, how many have been ordered, if the company needs any more of the product to fit the demand of production.

### Order Management

Helps to control the manufacturing process, from ordering raw materials to production and delivery of the goods. This system is designed to bring together suppliers and delivery.


### Robots

These are most commonly used in car production where the computer controls the mechanics of a robotic arm to perform a task. Robots, however, are now used in a number of different tasks which would be dangerous or impracticable for a person to perform.

# Revision questions

1. (i) Explain what a CNC machine is and its capabilities.
   (ii) Name **four** examples of CNC machines and what they are used for.

2. (i) Explain what is meant by the term CIM.
   (ii) Describe **three** main advantages of using CIM.

3. Computers are widely used in the design and manufacture of products.
   (i) Briefly outline **two** main advantages associated with the use of Computer Aided Design (CAD).
   (ii) Briefly outline **two** main advantages associated with the use of Computer Aided Manufacture (CAM).
   (iii) Briefly explain what is meant by the term Computer Integrated Manufacture (CIM).



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