

AS LEVEL Section A

FACT FILES

Technology & Design

For first teaching from September 2011

For first award in Summer 2012

Manufacturing Systems
and Production Part 1



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design



Learning Outcomes

Students should be able to:

- demonstrate knowledge and understanding of:
 - scales of production to include: continuous production; mass production, batch production and one off production;
 - the way manufacturing is organised to include cell production, flexible manufacturing systems (FMS), just in-time (JIT) and concurrent engineering;

products manufactured with this system include everyday use products like drinks bottles, screws, DVDs, and other products which don't change from year to year.



Course Content

Scales of Production

In order for a product to be manufactured efficiently in response to consumer demand, a system of production must be used. The type of production system depends on a number of factors such as cost, materials, manufacturing techniques and labour skill.

Each type of production system outlined below have been developed primarily to meet the needs of consumer demand and as demand for a product increases so does the scale of production.



Continuous Production uses a highly automated manufacturing system to meet the demands of a worldwide market. Machinery and production lines are continuous, sometimes for 24 hours a day. The set up and running costs are high but economies of scale offsets these costs. Typical

Mass Production (sometimes known as High volume or line production) involves the manufacture of 1000's of products using semi automated and fully automated manufacturing processes. It is often set out in long lines on the factory floor with workers and machines placed in order of production. The use of standard components in production can reduce costs. Products manufactured with this system include washing machines, computers and furniture.



Batch Production involves shorter runs than mass production, usually 100 to 1000 products. It requires more skilled labour on the factory floor. A key feature is that a manufacturer can produce variations of the same item, for example, a laptop computers in a range of different colours, or memorabilia for a World Cup or the Olympics where the product is the same but the logos or slogans would change. Often batch production may require processes to be stopped before making changes, this can cause delays and be costly for the manufacturer.

One-Off production, often described as job production, enables a manufacturer to produce products tailored to their customers requirements. It requires highly skilled labour, producing specialised or highly customised products. However it can be slower due to the labour techniques and the unit costs are higher than other production systems. Workers can be more motivated as they will find their work rewarding.

Cell Production

This production system requires the workflow to be divided into teams or cells, it is a more efficient way to work as each cell has a specific task and within each task there are a range of different jobs. This allows a rotation of jobs between workers which develops their skills and improves motivation.

In cell production teams are responsible for their own quality control and communicate with other cells in the factory when passing on completed work for the next stage in production.

Flexible Manufacture Systems (FMS)

Flexible manufacturing allows manufacturers to adapt to changing technologies and meet the demands of customers more quickly and efficiently.

Flexibility can be in the manufacturing processes:

- the ability to quickly change tooling in machines without major disruption to workflow.
- changing components or parts to update a product or bring in a new model.
- flexibility in the system:
- the ability to increase the volume of production easily.
- adding or developing processes to improve the production system.

Due to the investment in production processes flexible manufacturing systems are expensive to set up, however, the quality of product is usually high due to the high level of automated manufacturing in the process.



Just In-Time (JIT)

Just In-Time allows manufacturers to keep their factory stock to a minimum whilst being able to respond to consumer demand quickly.



JIT allows manufacturers to increase their productivity and quality of product with reduced costs.

In order for JIT manufacturing to be successful, the manufacturer needs to employ a good ICT system to keep track of stock, materials and equipment.

The use of ICT ensures that raw materials and standard components are delivered on time in sufficient quantity and quality.

JIT system means the manufacturer does not have to store large amounts of stock, therefore reducing the need for large warehouses of excess materials and finished products.

Concurrent Engineering

This requires a manufacturer to develop all aspects of design and production at the same time (concurrently). This saves time and allows designers to be more involved in the production of a new product.

CAD plays an important role in the whole process as CAD files can be easily transferred between the relevant teams involved. CAD files can be used to make foam models, virtually test parts of a design and manufacture actual parts.





Revision questions

1. Outline **two** key differences between continuous production and one-off production. [2]
2. Batch Production allows a manufacturer to be more flexible in the manufacturing process. Describe **two** other key features of this production system. [2]
3. Describe **two** ways in which Flexible manufacturing systems can provide better quality products. [2]
4. Explain what is meant by concurrent engineering. [2]
5. Cell production and just-in-time (JIT) are two systems used to organise manufacturing. Describe **two** main characteristics associated with cell production. [2]
 - (i) Describe **two** main characteristics associated with just-in-time (JIT). [2]
 - (ii) One-off, batch and mass are terms associated with manufacturing production.
6. Briefly compare the level of skill required by the workforce for one-off and mass production. [1]
 - (i) Outline **one** main characteristic other than the skill level of the workforce associated with one-off, batch and mass. [4]

