



***Higher
Design & Manufacture***

Manufacturing Systems

Learning Intention & Success Criteria

- Developing my understanding of production processes*
- I will work effectively and communicate clearly with my peers.*
- I will listen to what others have to say.*
- I can recognise different production methods.*
- I can suggest suitable production methods for a product.*
- I will write a report for a selected product.*
- I will discuss my product with my peers.*

Production Methods

- *Not all parts, components or products are made in the same way.*
- *Sometimes we have to select a production method that is best suited to our product.*



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Job Production

Job production

- *Used for one-offs, single items or very low volumes.*
- *Items produced to very specific customer specifications but cost is high.*
- *Production requires a highly skilled workforce and is labour intensive.*



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Batch Production

Batch Production

- *Large quantities are produced using this method.*
- *Each operation is completed for a batch before the next operation begins.*
- *Often used by small scale furniture manufacturers who have to produce 100 identical products.*



Line, Cell and Flow Production

Line Production

- *Products are made and assembled during a continuous process.*
- *Operations are performed sequentially and moved along the line.*

Cell Production

- *Operations are performed by a small, multi-skilled group or 'cell'.*
- *Each member of the cell can perform the tasks of the others.*
- *Each cell is responsible for the productivity and quality of their products.*

Flow Production

- *Very similar to line production but with very high volumes.*
- *Production is continuous, often 24hrs.*
- *Unit costs can be very low.*



Manufacturing Systems

- *Manufacturing systems are the different ways in which manufacturing can be carried out.*
- *Manufacturing systems have changed dramatically over the last century; now there are a **variety of systems**, each with **different running costs**.*
- *Choosing a systems depends on*
 - *Market demands for the product*
 - *Which in turn determines its **volume of production***
- *Also affecting the choice of system:*
 - *Tooling costs*
 - *Factory layout*
 - *Personnel required*

Small Batches

- *Small batches are one offs.*
- *Small batches are typically produced by **skilled craftsmen** in a traditional workshop environment.*
- *Small batch production is time consuming, expensive and labour intensive.*
- *However it does allow total flexibility and the opportunity to custom make.*



Assembly Lines

- ***Assembly Lines** became common in the 1930's. It involves hundreds of workers organised in a line to perform tasks in sequence.*
- *Workers were organised either **individually or in groups**, staying in the same place to perform the **same task all day**.*
- *These assembly lines were **inflexible**, workers were trained to do **one job** with no real concept of the overall product.*
- *This meant that if there was a **breakdown or hold up** everyone would have to stop. The first successfully produced product using this mass-production technique was the **'Model T Ford'***



Mechanisation

- *Over time, with the evolution of technology, assembly lines were **mechanised**.*
- *The use of hand operated machines made production processes **quicker and more accurate**.*
- *Assembly lines still exist today but they are either **Semi or Fully automated**.*
- *Automation depends on **computer controlled robots** and machines, programmed and controlled by skilled operators.*
- ***Efficiency** is much greater, as the **accuracy** and the overall **quality** of the product.*



Flexible Manufacturing

- *Technological developments have led to more Flexible Manufacturing systems of production.*
- *Flexible manufacturing brings together **computer controlled machine tools** as well as **robotic handling** and assembly of parts. Machines or manufacturing cells are linked together normally in a U shaped formation.*
- *Advantages:*
 - *Production lines can be changed quickly to produce different products.*
 - *Teamwork and productivity are improved as personnel are closer to each other.*
 - *Operator fatigue is reduced, eliminating human error.*
 - *Quality assurance and control is readily checked and monitored.*
 - *The product is assembled by a team of people or cell. All members of the team can do any job and all are responsible for quality assurance.*
 - *This method fits in with Concurrent Engineering.*



Total Quality Management

- *These major changes in manufacturing systems are now being driven by the concept of*
 - ***Total Quality Management (TQM).***
- *This involves the elimination of*
 - ***Costs of inspection***
 - ***Rectifying mistakes***
 - ***Preventing mistakes.***

