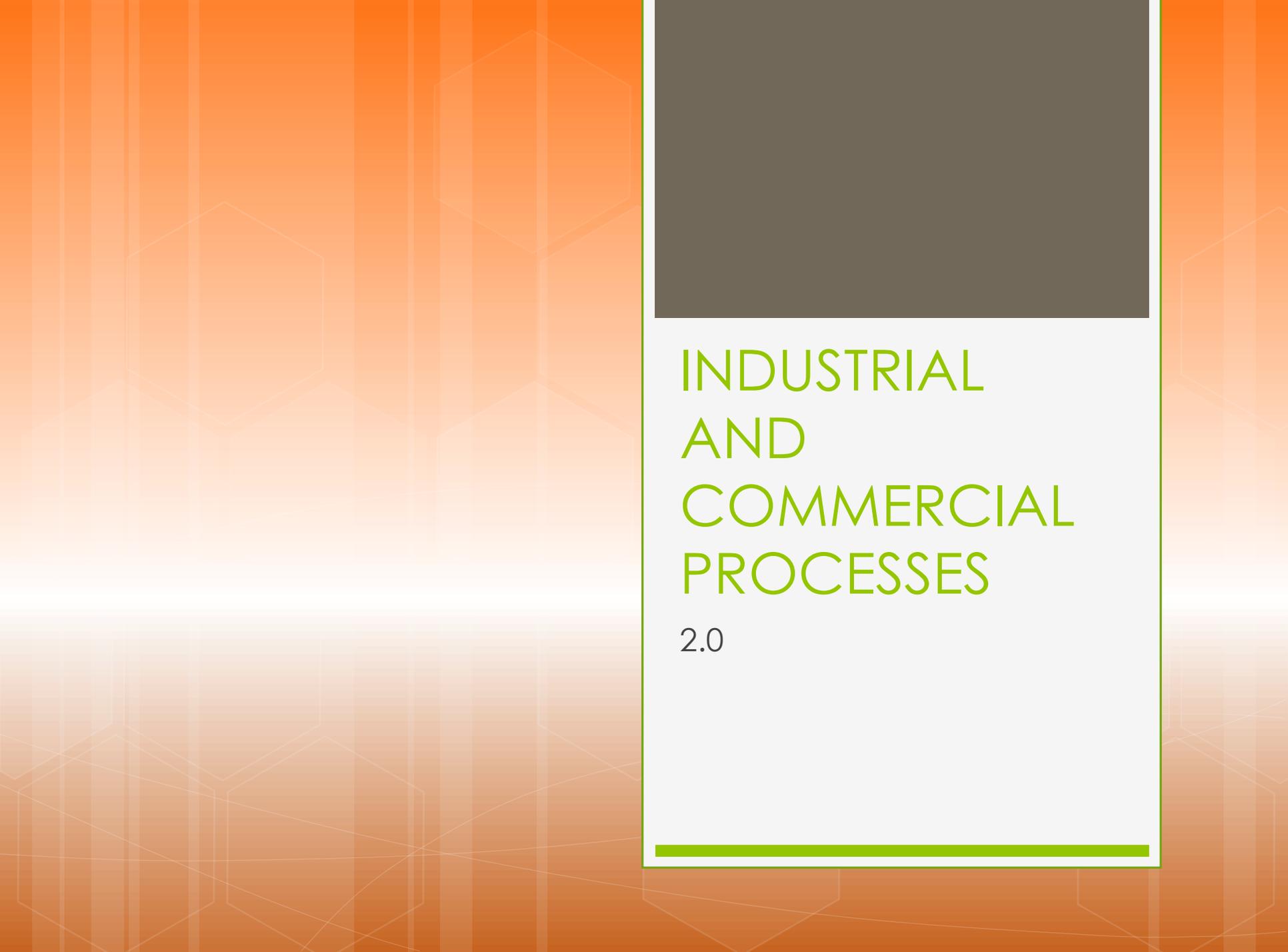


Graphic Products

February Half Term Revision

Checklist

<u>TOPIC</u>		<u>UNDERSTANDING</u>		
		RED ☹	AMBER ☺	GREEN ☺
INDUSTRIAL AND COMMERCIAL PROCESSES	STEREOLITHOGRAPHY			
	3D PRINTING			
	BLOW MOULDING			
	DOVE MOULDING			
	INJECTION MOULDING			
	VACUUM FORMING			
	LINE BENDING			



INDUSTRIAL AND COMMERCIAL PROCESSES

2.0

Rapid prototyping (RPT)

Used as a method of cutting down time and costs involved with developing a new product.

When modelling using blocks you cut away waste, which is not efficient. When rapid prototyping you use a computer controlled process that builds up the model from scratch rather than taking materials away from a block.

Advantages

Fast entry to market due to reduction in lead time (time between initial ideas and the product being sold).

Reduced development time (**saves money**).

Produces complex, intricate shapes accurately from CAD data.

More accurate testing as materials are closer to the final product, i.e. production of an actual polystyrene casing rather than a MDF or styrofoam block model of one.

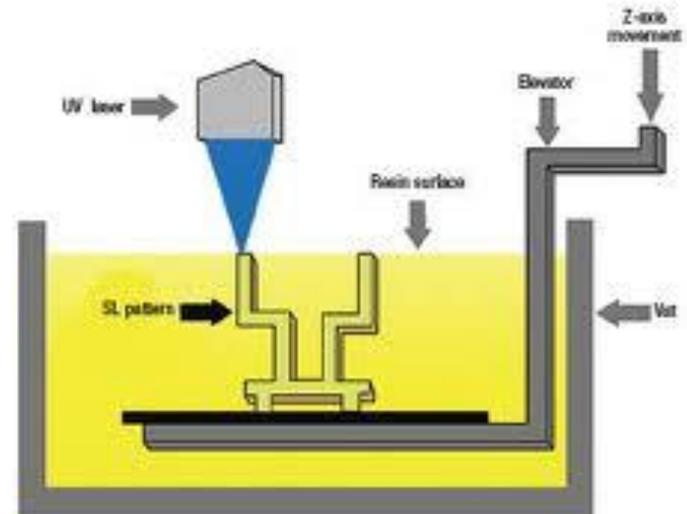
The two main RPT processes are...

RPT using stereolithography (SLA)

This is the creation of 3D objects using laser technology to solidify liquid polymers or resins. Specialist software can be used to convert 2D CAD drawings into 3D models.

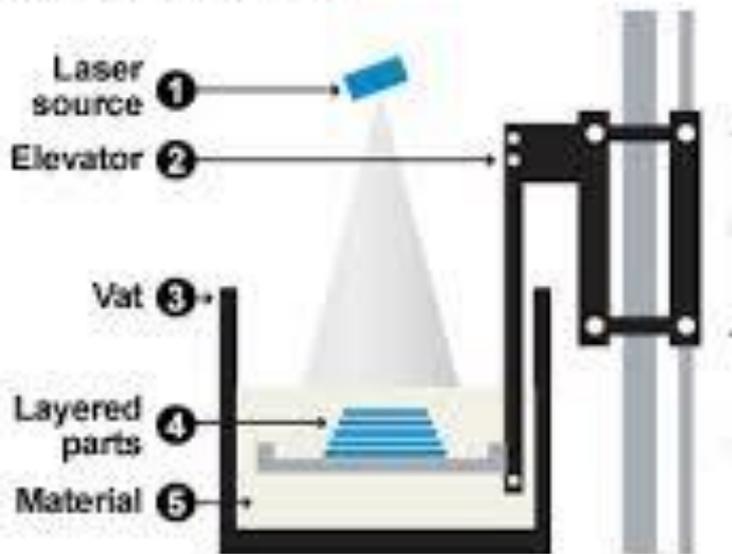
The computer 'slices' the 3D CAD model into hundreds of thin layers and transfers the data, a layer at a time, to the laser. The laser draws the first layer onto the surface of the resin, causing it to solidify. The layer is supported on a platform that is moved down so the next layer can be drawn. This process is repeated, one layer on top of the other, until the 3D model is complete.

Prototypes can be delivered in three to five days of receiving a clients data, saving time and development costs.



RPT using 3D printing (3DP)

3D Printing Process



3D printing brings RPT technology to the office, small and medium-sized businesses and even schools. It is cheaper and can produce 3D models in minutes.

Like stereolithography, 3D printing uses CAD software to send the image through to the machine where it is 'printed' layer by layer (a range of materials can be used).

Unlike stereolithography, 3D printers use a inkjet printhead to print an adhesive that is bonded with fine powder and printed onto a moving plate in the shape of the layers. As one layer is printed, the plate moves downwards allowing the next layer to be added.

Answer these questions...

1. Describe the processes of rapid prototyping using 3D printing (3 marks)

2. Explain the reasons for using rapid prototyping in the development of graphic products (2 marks)

3. Using notes and sketches, explain the process of producing a prototype using stereolithography (4 marks)

Forming Techniques

2.3

Thermoforming Products

Many products are batch and mass-produced using thermoforming techniques to mould and shape polymers.

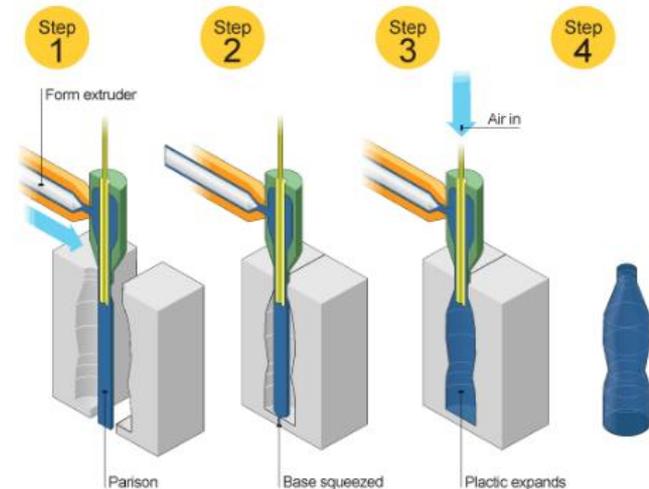
Thermoplastics are often used as they can be easily moulded and any waste can be recycled and used in the process again.

There are five thermoforming processes you need to know about...

Blow Moulding

A hollow thermoplastic tube (parison) is extruded into a split two-piece mould and clamped at either end. Hot air is blown through the parison and this causes it to expand to the shape of the mould, including all details.

Once cooled and solidified the product is ejected by opening the split mould.



Dome Moulding

This is the process of forming domes, spheres and oval shapes, usually out of acrylic.

The acrylic is softened in an oven, transferred to a dome-blowing machine, clamped under a circular ring. Air pressure is applied, which blows the material upwards into a perfect dome shape.

Can produce domes up to a maximum of two meters in diameter and is used to produce signage and point-of-sale displays.

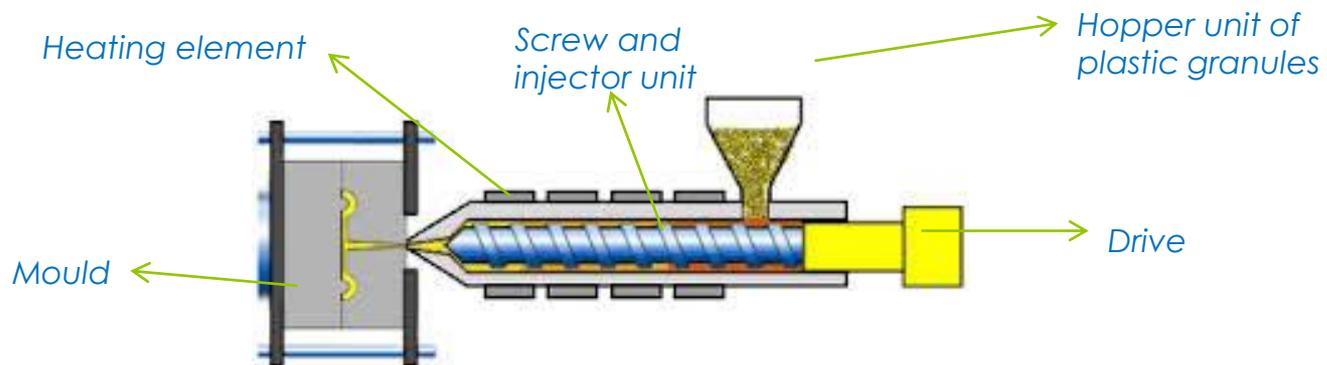


Injection Moulding

An expensive mould is injected with a liquid polymer, made by heating thermoplastic granules.

Once the polymer cools and solidifies, the formed product is ejected.

Injection moulding is good for complex shapes with holes, screw fittings and internal hinges.



Quality control (QC) inspection and testing

Because thermoforming techniques **are used for high batch or mass produced products**, it's important each product is **identical in quality**. Imperfect products can (mostly) be **recycled** but it still costs the company **time** and **money** to produce. Machines are used to inspect batches at different stages of their production to check quality.

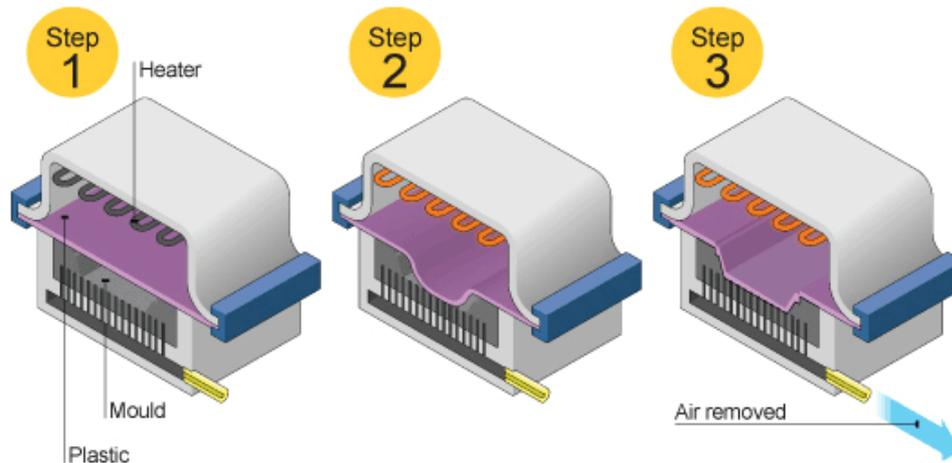
Laser measurement – a series of laser are used to measure the **outside dimensions** of a product as it moves down a conveyor belt. **Fast, accurate and repeatable**. Computer controlled and data is available immediately.

Ultrasonic testing – used to check the **wall thickness of a hollow product** by sending high-frequency sound waves at the product as it moves down a conveyor belt. Computers calculate the time it takes for the sound waves to bounce back to accurately calculate the wall thickness of a product.

Vacuum Forming



A thermoplastic sheet is clamped, heated, blown and stretched. Air is sucked out of the machine, forcing the softened sheet around a mould pushed up from below.



Line bending

The process of heating a thermoplastic sheet (i.e. acrylic) over a strip heater, along a narrowly defined line, until it becomes soft and pliable. It's then usually bent over a former.

