Injection moulding

What is injection moulding?

Injection moulding is a highly automated technique for producing large quantities of identical plastic items at speed.

Production costs are high due to the tooling required. For example, considerable time is spent designing and testing the mould to ensure that it can be completely filled and that the product does not get trapped inside or broken upon its removal; the metal mould is itself very expensive to manufacture. To justify this initial investment, output needs to be high: through mass production the end product can be sold cheaply.

How does the process work?

- Plastic pellets are fed into a heated cylinder.
- A turning screw pushes the pellets forward - they compact and melt into liquid form.
- The liquid plastic is injected (forced) into a metal mould where it cures (hardens).
- Once cool, the mould is opened and the product removed.

What plastics materials can be used?

Commonly all thermoplastics such as polyethylene, polystyrene, polyvinyl chloride, polymethyl methacrylate and polyamide.

What are the clues?

The plastic enters the mould through a ‘sprue’ which, when broken off, leaves behind a rough circular mark known as a gate.

Marks can also be left by the ejector pins which apply a force to push the part out of the mould.

When was the process first introduced?

First used successfully with cellulose acetate after 1928. Since 1946 it has been the most widely used method of manufacturing thermoplastics. From the 1960s it has also been used for processing some thermosets.

Advantages:

- Very complex 3D shapes can be produced.
- Large numbers of products can be made with consistent quality.
- Very fast process compared to other techniques.
- Labour costs are relatively low in production.
- Wastage can be controlled and limited.
- Metal inserts and threads can be moulded-in.

Disadvantages:

- High initial set-up costs: design, tooling.
- Moulds are expensive.
- Some finishing of the shapes may be required eg. removing the injection gates.

Uses:

Precision technique capable of complicated shapes: e.g. medical components; Airfix kits; cheap products produced in very large numbers: Lego; plastic cutlery; machine housings; washing-up bowls.

Find objects with injection moulded elements in the MoDiP collection. View the animation to see how the process works.

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