

# 3D printing

## What is 3D printing?

**3D printing describes a number of processes which use computer technology instead of a mould.**

Processes include: Selective Laser Sintering where tiny particles of material are fused together by heat from a high-power laser to form a solid object; Stereolithography where liquid plastic material is converted into 3D objects, layer by layer, using polymerisation, a process by which light causes chains of molecules to link, forming polymers; Fused Deposition Modelling, a process in which an object or part is produced by extruding small flattened strings of molten material to form layers; Multi-jet Modelling, where an object is layered by a print head with several linearly arranged nozzles producing small droplets of material.

This page is looking at SLS (Selective Laser Sintering).

## How does the process work?

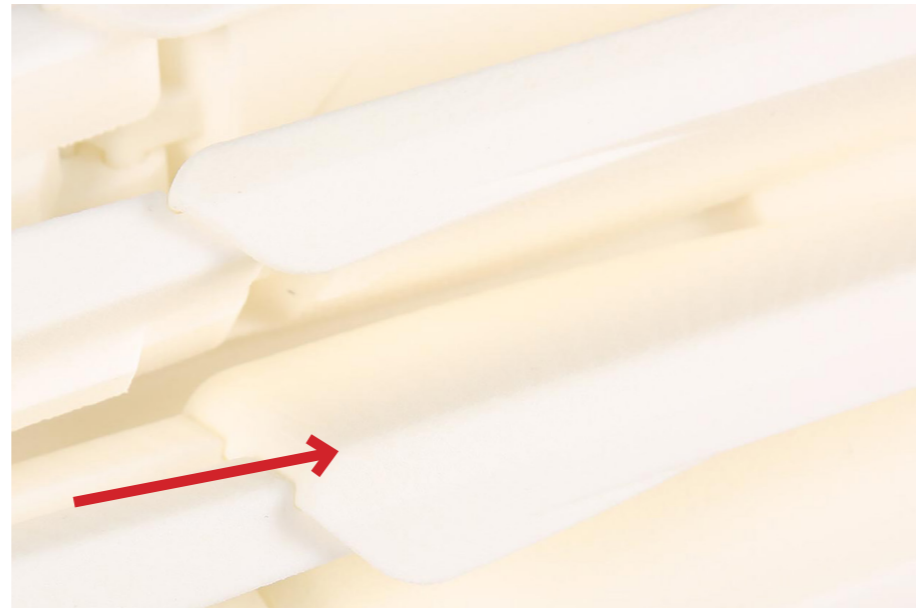
- Plastics powder is placed within the SLS printer, on a platform inside the build chamber.
- A laser, controlled by computer programme, traces a cross-section of the object onto the plastics powder. The laser heats the powder to just below its boiling point (sintering), fusing the particles into solid form. The unfused powder supports the part during printing.
- A new layer of powder is added.
- The process repeats until the object is fully formed. It is left to cool before being removed and finished.

## What plastics materials can be used?

Acrylonitrile butadiene styrene, acrylonitrile styrene acrylate, polyamide, polycarbonate, polyethylene terephthalate, polylactic acid, polypropylene, soluble butenediol vinyl alcohol co-polymer, soluble high impact polystyrene, soluble polyvinyl acetate, thermoplastic elastomer, thermoplastic polyurethane.

Find objects with [3D printed](#) elements in the MoDiP collection. View the [animation](#) to see how the process works.

## What are the clues?



Depends on the process; sintering lines can be seen unless there has been significant hand finishing.

## When was the process first introduced?

1980s.

## Advantages:

- SLS machines can print objects in a variety of materials such as plastics, glass and metal making it a popular process for creating both prototypes as well as final products.
- SLS is useful for printing small quantities of objects and can be easily customised for one offs.
- Produces highly complex or particularly delicate objects.

## Disadvantages:

- Programming costs are high.
- Low production volume due to the time it takes to print, cool and finish pieces.
- It can take many hours to print, and then the same again to fully cool an object.

## Uses:

3D printing has many applications of small runs of objects including: rapid prototyping and product development, clothing, apparel and jewellery, customised objects and bespoke pieces, soluble and non-soluble medical applications, automotive and aeronautical applications.