

The Free Beginner's Guide

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03 - 3D Printing Technology

The starting point for any 3D printing process is a 3D digital model, which can be created using a variety of 3D software programmes – in industry this is 3D CAD, for Makers and Consumers there are simpler, more accessible programmes available – or scanned with a 3D scanner. The model is then 'sliced' into layers, thereby converting the design into a file readable by the 3D printer. The material processed by the 3D printer is then layered according to the design and the process. As stated, there are a number of different types of 3D printing technologies, which process different materials in different ways to create the final object. Functional plastics, metals, ceramics and sand are, now, all routinely used for industrial prototyping and production applications. Research is also being conducted for 3D printing bio materials and different types of food. Generally speaking though, at the entry level of the market, materials are much more limited. Plastic is currently the only widely used material – usually ABS or PLA, but there are a growing number of alternatives, including Nylon. There is also a growing number of entry level machines that have been adapted for foodstuffs, such as sugar and chocolate.

How it Works



Start with a 3D CAD file
either by creating the
3D model or scanned
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The different types of 3D printers [each employ a different technology](#) that processes [different materials](#) in different ways. It is important to understand that one of the most basic limitations of 3D printing – in terms of materials and applications – is that there is no ‘one solution fits all’. For example some 3D printers process powdered materials (nylon, plastic, ceramic, metal), which utilize a light/heat source to sinter/melt/fuse layers of the powder together in the defined shape. Others process polymer resin materials and again utilize a light/laser to solidify the resin in ultra thin layers. Jetting of fine droplets is another 3D printing process, reminiscent of 2D inkjet printing, but with superior materials to ink and a binder to fix the layers. Perhaps the most common and easily recognized process is deposition, and this is the process employed by the majority of entry-level 3D printers. This process extrudes plastics, commonly PLA or ABS, in filament form through a heated extruder to form layers and create the predetermined shape.

Because parts can be printed directly, it is possible to produce very detailed and intricate objects, often with functionality built in and negating the need for assembly.

However, another important point to stress is that none of the 3D printing processes come as plug and play options as of today. There are many steps prior to pressing print and more once the part comes off the printer – these are often overlooked. Apart from the realities of designing for 3D printing, which can be demanding, file preparation and conversion can also prove time-

consuming and complicated, particularly for parts that demand intricate supports during the build process. However there are continual updates and upgrades of software for these functions and the situation is improving. Furthermore, once off the printer, many parts will need to undergo finishing operations. Support removal is an obvious one for processes that demand support, but others include sanding, lacquer, paint or other types of traditional finishing touches, which all typically need to be done by hand and require skill and/or time and patience.