Co-funded by the
Erasmus+ Programme
of the European Union

Additive Manufacturing

What is Additive manufacturing?

Traditional manufacturing typically involved the removal of material from stock; material removed by machining operations (swarf) has no utility and will require recycling.

Here, we create physical 3D parts from digital files, created with CAD applications such as AutoCAD, Inventor and so on and there is significantly reduced waste. Some parts may have already been designed or created; there is a thriving community of “makers” who upload their work onto the internet; freely available to download.

Thin layers of material are added to create complete parts.

Complex shapes which cannot be produced by 'traditional' techniques such as casting, forging and machining.

.

This project has been funded with support from the European Commission.
This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Co-funded by the
Erasmus+ Programme
of the European Union

Fused deposition modelling:

Ultimaker, which we have over at The Learning Lab at Gardyne is one of the most common examples of this technology. These printers melt a plastic filament and deposit the plastic in layers until it fills up the model. There are two types of plastic, ABS, which is sturdy and made from oil-based resources, and PLA, which is biodegradable and made from plant-based resources. We have some simple examples, including a failure – so it's important to use the 3D printing pre-processor (or layering app – we use Cura) to get the skin thicknesses, infill (density, pattern & etc), orientation and any supports right.

After the patent on this technology expired in the 1990s a large open-source development community developed and both commercial and DIY variants utilizing this type of 3D printer appeared. As a result, the price of this technology has dropped by ***two orders of magnitude*** since its creation, and it has become the ***most common form*** of 3D printing

Stereolithography

These machines use a laser (or lasers) to cure a vat of resin and build the prototype one layer at a time. UV lasers cure the plastic then the part is lifted a small amount. The next layer is cured and so on until the part is complete [Ember video]

This project has been funded with support from the European Commission.
This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

Co-funded by the
Erasmus+ Programme
of the European Union

Selective laser sintering

Lasers are used to sinter ***powdered metal***, binding the powder together to create a solid structure. After each layer is sintered together, the structure drops and the next layer is built on top of it.

[Video – shows 3D printing in progress on Renishaw machine – fuel tank prototype]

Costs and Benefits

Cost and time savings – particularly for prototypes and small batches – no laborious machine set up so parts can be in the hands of designers and clients within a matter of hours (often the lead time on an injection moulding die alone can be weeks).

Improved design decisions as several prototypes can be 3D printed for assessment, verification and development of ideas

Single step manufacturing (compared to fabrication AND welding AND polishing AND drilling AND sand blasting AND priming AND painting) custom jigs may also be required to ensure accuracy and alignment.

Reverse engineering – parts without drawings can be 3D scanned and printed – a detailed scan of the cracked engine block in this car was used as a sand mould for recasting

This project has been funded with support from the European Commission.
This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.