Rapid prototyping

**Gegven door docent:**

**-(3D) Frezen** → Veel materiaalverlies, duur (5-assige machine).

Sterke / grote onderdelen , metalen delen.

**-SLA stereolithografie** → Thermoharder (UV-licht) ; bros ,

nauwkeurig, hard, (vaak) doorzichtig.

**-SLS selective laser sintering** → Poeder/korrels die versmelten.

Snelle methode, enigzins flexibele delen.

**-FDM Fused Deposition Modeling** → Dunne kunststof filament.

**-LOM Laminated Object Modeling** → Materiaal-lagen (vaak papier)

op elkaar plakken.

**-Vacuumcasting** → Siliconen matrijzen ; kleine series afgieten.

**Meerdere vormen:**

**BASF Ultrafuse316LX Stainless steel (FDM)** → Polymer and 316L stainless steel composite filament,

**Properties of Ultrafuse® 316L**

* Produces parts of stainless-steel type 316L
* Easy handling
* Uniform particle distribution enhancing mechanical properties
* OSHA-friendly processing
* High flexibility allows funneling through complex idler pulleys and guide-roller filament transportation systems in any printer
* Compatible with both Bowden and direct drive extruders through the use of a non-slip outer surface
* Shrinkage during sintering requires adjustment during part design
* [Ballistic particle manufacturing](https://en.wikipedia.org/w/index.php?title=Ballistic_particle_manufacturing&action=edit&redlink=1) (BPM)

**Ballistic particle manufacturing** (**BPM**) ... The **BPM** utilized ink jet or droplet based **manufacturing** techniques, where it builds the models by firing micro-droplets of molten wax material from a moving nozzle or jet onto a stationary platform, the platform then lowers and the process is repeated for each layer of the model.

* [Directed light fabrication](https://en.wikipedia.org/w/index.php?title=Directed_light_fabrication&action=edit&redlink=1) (DLF)

Directed Light Fabrication (DLF) is a rapid prototyping process being developed at Los Alamos National Laboratory to fabricate metal components. This is done by fusing gas delivered metal powder particles in the focal zone of a laser beam that is programmed to move along or across the part cross section. Fully dense metal is built up a layer at a time to form the desired part represented by a 3 dimensional solid model from CAD software. Machine “tool paths” are created from the solid model that command the movement and processing parameters specific to the DLF process so that the part can be built one layer at a time. The result is a fully dense, near net shape metal part that solidifies under rapid solidification conditions.

* [Direct-shell production casting](https://en.wikipedia.org/w/index.php?title=Direct-shell_production_casting&action=edit&redlink=1) (DSPC)

**Direct Shell Production Casting** (**DSPC**): Ceramic molds rather than 3D models are made by **DSPC** in a layering process similar to other RP methods. Ceramic powder is spread by roller over the surface of a movable piston that is recessed to the depth of a single layer.

* [Laminated resin printing](https://en.wikipedia.org/w/index.php?title=Laminated_resin_printing&action=edit&redlink=1) (LRP)

**Laminated Resin Printing** (**LRP**) is a new type of **3D printing** technology that enables cost-effective rapid prototyping of microstructures. Unlike existing **3D printing** methods, **LRP** is based on microfabrication processes and materials, using modern dry film photoresists imaged by fast UV projection.

* [Shape deposition manufacturing](https://en.wikipedia.org/w/index.php?title=Shape_deposition_manufacturing&action=edit&redlink=1) (SDM) (and [Mold SDM](https://en.wikipedia.org/w/index.php?title=Mold_SDM&action=edit&redlink=1))

SDM is a solid freeform fabrication process which means it is built from start to finish rather than by removing excess materials from a given object.  It does this by layering support material and the desired finished material.

* [Solid ground curing](https://en.wikipedia.org/wiki/Solid_ground_curing) (SGC)
* **[Solid ground curing](https://en.wikipedia.org/wiki/Solid_ground_curing)** [(](https://en.wikipedia.org/wiki/Solid_ground_curing)**[SGC](https://en.wikipedia.org/wiki/Solid_ground_curing)**[) is a photo-polymer-based additive manufacturing technology used for producing models, prototypes, patterns, and production parts, in which the production of the layer geometry is carried out by means of a high-powered UV lamp through a mask. As the basis of solid ground curing is the exposure of each layer of the model by means of a lamp through a mask, the processing time for the generation of a layer is independent of the complexity of the layer. SGC was developed and commercialized by Cubital Ltd. of Israel in 1986 in the alternative name of](https://en.wikipedia.org/wiki/Solid_ground_curing) **[Solider System](https://en.wikipedia.org/wiki/Solid_ground_curing)**[. While the method offered good accuracy and a very high fabrication rate, it suffered from high acquisition and operating costs due to system complexity. This led to poor market acceptance. While the company still exists, systems are no longer being sold. Nevertheless, it's still an interesting example of the many technologies other than stereolithography, its predeceasing rapid prototyping process that also utilizes photo-polymer materials. Though Objet Geometries Ltd. of Israel retains intellectual property of the process after the closure of Cubital Ltd. in 2002, the technology is no longer being produced.](https://en.wikipedia.org/wiki/Solid_ground_curing)
* [Selective laser melting](https://en.wikipedia.org/wiki/Selective_laser_melting) (SLM)

**Selective laser melting** (**SLM**), also known as **direct metal laser melting** (**DMLM**) or **laser powder bed fusion** (**LPBF**), is a rapid prototyping, [3D printing](https://en.wikipedia.org/wiki/3D_printing), or [additive manufacturing](https://en.wikipedia.org/wiki/Additive_manufacturing) ([AM](https://en.wikipedia.org/wiki/Additive_Manufacturing)) technique designed to use a high power-density [laser](https://en.wikipedia.org/wiki/Laser) to melt and fuse metallic powders together.[[1]](https://en.wikipedia.org/wiki/Selective_laser_melting#cite_note-1)[[2]](https://en.wikipedia.org/wiki/Selective_laser_melting#cite_note-2) To many SLM is considered to be a subcategory of [selective laser sintering](https://en.wikipedia.org/wiki/Selective_laser_sintering) ([SLS](https://en.wikipedia.org/wiki/Selective_laser_sintering)). The SLM process has the ability to fully melt the metal material into a solid three-dimensional part unlike SLS.

* [Multi Jet Fusion](https://en.wikipedia.org/w/index.php?title=Multi_Jet_Fusion&action=edit&redlink=1) (MJF)

Multi Jet Fusion uses a fine-grained PA 12 material that allows for ultra-thin layers of 80 microns. This leads to parts with high density and low porosity, compared to PA 12 parts produced with Laser Sintering. It also leads to an exceptionally smooth surface straight out of the printer, and functional parts need minimal post-production finishing. That means short lead times, ideal for functional prototypes and small series of end-parts.