

Service – Rapid Prototyping & Rapid Tooling

From CAD File to Physical Part in less than 24 hours

Rapid Prototyping is defined as a process to quickly fabricate a physical part or assembly using a three-dimensional computer aided design (CAD) file. Rapid prototyping is an “additive” process, which forms geometry in layers to create a solid object, compared to most machining processes (milling, drilling, grinding), which are “subtractive” processes that selectively remove material from a solid block.

Because of the layer build process, complicated internal features can be created with rapid prototyping that can not be manufactured by other means, without any increased time or labor compared to more simple geometry. This opens the door for rapid fabrication of complex parts, assemblies, even combinations of parts that couldn’t otherwise be made, including direct manufacturing where actual rapid prototypes are used as end-use components.

Most rapid prototypes require from three to seventy-two hours to build, depending on the size of the object. Multiple direct-print rapid prototypes can be created in the same amount of time as just one, and multiple plastic and rubber-like prototypes can be made using RTV molding.

Benefits of Rapid Prototyping

Creating a part through rapid prototyping offers several benefits with quick turn around and low investment cost.

- Provides a cost effective number of variants of the design to be produced.
- Opportunity to eliminate unnecessary features, and improve your design early in the process.
- Allows you to test your part, and make modifications before investing in hard tooling, and without disrupting existing manufacturing processes. Making changes to your design in the prototype phase is the fastest and least costly manner possible.
- Provides a visual aid for focus groups, photography, new product launch, and debut at a trade show.

Spectrum Plastics Group offers several rapid prototyping methods, including Stereolithography (SLA), Laser Sintering (LS), Room Temperature Vulcanization (RTV) Rubber Molding and Urethane Casting, Computer Numerical Control (CNC) Machining, and PolyJet™.

Rapid Prototyping Methods

Stereolithography (SLA)

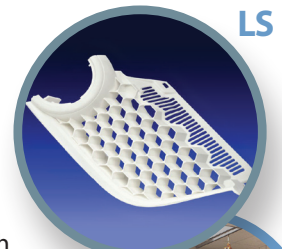
A 3-D CAD model is processed to create a file that can be interpreted by the stereolithography machine. This data is then mathematically processed to yield a series of cross sections (layers). Next, computer-controlled mirrors direct an ultraviolet beam across the surface of a vat of photo-curable liquid polymer. The laser traces the path of the cross section, changing the liquid into a solid, until a new layer is formed. This newly-formed layer is then lowered into the vat by an elevator, while a recoating and leveling system establishes the thickness for the next layer (from .002” to .006” thick depending on the SLA machine used). Successive cross sections are built layer by layer, one on top of another, each adhering to the last, until a three dimensional part is formed.



SLA

Laser Sintering (LS)

Laser Sintering is a process that uses a laser beam to selectively melt a heated powder. It is done layer by layer, in usually .006” (.150mm) layers. The process is analogous to Stereolithography, but instead of a vat of resin, there is an exchangeable frame filled with Nylon powder, yet in both processes the material is solidified using a laser beam.



LS

Room Temperature Vulcanization (RTV) Rubber Molding and Urethane Casting

RTV molding is the fastest, most accurate, and least expensive way to create 10 – 100 duplicates of a prototype part, with all of the small details of the original part.



RTV

The process begins with your CAD file, and the production of your master pattern. The master pattern, typically a Stereolithography or PolyJet part, is scaled to allow for shrink rate of the silicone mold and resin used. The master then receives a high level of finish with a specified custom texture, then a parting line is created and the master is suspended into a mold frame. Liquid silicone rubber is then poured over the master pattern, including the parting surface. After the rubber has solidified, the mold is cut open to remove the master pattern, producing a two piece rubber tool. Parts can then be cast from this tool using a variety of urethanes (clear, rigid, flex, etc) to meet the customer’s needs.

Computer Numerical Control (CNC) Machining

Computer Numerical Control, or CNC, refers specifically to a computer “controller,” which reads G-code instructions to “drive” a machine tool used to fabricate components/parts by selectively removing material from a solid block of plastic or metal. G-code is the programming language for CNC. G-Codes are the codes that position the tool and do the actual work. This process produces material specific parts out of virtually any engineering plastic or metal.

PolyJet™

PolyJet™, or multi-jet modeling, is a printing process where photopolymers are jetted on to a build platform. The jetting heads provide extreme accuracy to build each layer at 600 dpi in X and Y, and 16 microns (0.0006 inches) thick in the Z axis (about 1/5 that of stereolithography layers). The jetting heads move back and forth placing resin droplets onto the build tray. Each layer is cured and hardened with UV bulbs, which are located next to the jetting heads, before the next layer is started. Two different materials are used to build the model; one material is used for the actual model, while the second, gel-like UV resin is used for support. After the build is complete layer by layer, the support material is removed by pressurized water. Since PolyJet™ builds with very thin layers, the model is very accurate and has a very smooth surface, making the rigid PolyJet™ parts ideal for most RTV master patterns. Another huge benefit to the PolyJet™ process is its ability to print in Shore A materials, allowing you to receive soft models directly from your CAD files.



CNC



PolyJet

Rapid Tooling

Rapid tooling is a standardized process for building both aluminum and steel injection molds to achieve an expedited delivery. The molds can be built as prototype tools or unit tools. Prototype tools are used when the customer is only concerned with the end product which is a part that meets their specifications. Unit tools are used when the customer requires a part that not only meets the required results, but also processes similar to a production tool.

Prototype tools are typically less expensive, faster to build and usually used when volumes are less than 10,000 parts, while unit tools are often used when volumes up to 50,000 or more are required. Unit tools are typically more complex but can usually be completed within 3 - 5 weeks. Depending on the application both types of tooling can be employed to meet low volume production needs as well.

The criteria to distinguish rapid tooling from conventional tooling include:

- Build time is much shorter
- Cost is lower
- Tool life is considerably less
- Tolerances are wider



Tooling

Which process is best for your project?

Contact one of Spectrum Plastics Group's rapid prototyping divisions to speak with a Rapid Prototyping expert, who will be happy to help you. Spectrum Plastics Group has two rapid prototyping facilities, Dynacept and Protogenic.

- **Dynacept**, located in Brewster, NY serves the Eastern US; Main Tel: 845.278.8500
- **Protogenic**, located in Westminster, CO serves the Western US; Main Tel: 303.252.0212

Have a project you'd like us to quote? Send your .stl files and an explanation to sales@dynacept.com or quotes@protogenic.com.



One Stop Partner
Spectrum Plastics Group
can take your plastic parts
from Prototyping through
Production with a wide range
of services in between.

- Design & Engineering
- Design for Manufacturability
- Rapid Prototyping
- Rapid Tooling
- Tool Design & Build
- Injection Molding Technologies
- Value-Added Services

Certifications

- ISO 9001:2000

SPECTRUM PLASTICS™ GROUP

Rapid Prototyping Divisions

Contract Manufacturing Facilities

Corporate Headquarters

7309 West 27th Street, Suite 2100
Minneapolis, MN 55426
Main Tel: 952.929.3312
Main Fax: 952.929.8404
www.spectrumplasticsgroup.com

New York (Eastern US)

2 International Blvd
Brewster, NY 10509
Main Tel: 845.278.8500
Main Fax: 845.278.8501
www.dynacept.com

Colorado (Western US)

7401 W. Church Ranch Blvd, Suite 206
Westminster, CO 80021
Main Tel: 303.252.0212
Main Fax: 303.252.0223
www.protogenic.com

California Facility

14600 South Main Street
Gardena, CA 90248
Main Tel: 310.768.3023
Main Fax: 310.768.3058

Connecticut Facility

401 Birmingham Blvd
Ansonia, CT 06401
Main Tel: 203.736.5200
Main Fax: 203.732.2075

Minnesota Facility

7309 West 27th Street
Minneapolis, MN 55426
Main Tel: 952.929.3312
Main Fax: 952.929.8404

