Additive Manufacturing

Everything You Need to Know About Nylon 3D Printing

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Before you get started with Nylon 3D Printing, Makerbot has compiled some of the basic information you'll need to know. Read on to learn the advantages, disadvantages, history and applications of Nylon 3D Printing.

When it comes to 3D printing materials, Nylon has to be mentioned as one of the most popular materials for professional users. This can be attributed in large part to its popularity outside of 3D printing. Nylon has a wide range of applications thanks to its unique properties and the benefits of 3D printing mean that parts can be made on the fly easily and inexpensively.

That said, desktop Fused Deposition Modeling (FDM) 3D printing technology, which is one of the most widely used types of 3D printing, can sometimes involve a lot of trial and error. Some ***materials*** are easy to print with while others have a comparatively bigger learning curve.

Through this article, Makerbot will share everything you should know about Nylon 3D printing. Nylon can be 3D printed using three different technologies, namely FDM, Selective Laser Sintering (SLS), and MultiJet Fusion (MJF). However, the scope of this article is focused around FDM 3D printing.

Nylon Filament and 3D Printed Gear

UNDERSTANDING NYLON AS A MATERIAL

Chemical Composition

Nylon was first synthesized by DuPont, the American chemical company, in 1935. It developed the material for commercial usage and since then Nylon has become a common feature in numerous industries.

Nylon refers to a group of plastics known as polyamides. They are mostly semi-crystalline and generally very tough materials. It is found in many variants but the most common ones are Nylon 6, Nylon 6-6, and Nylon 12. It is a thermoplastic material, i.e., it becomes soft on heating or liquid when heated beyond its melting point and hardens on cooling. This process of heating and cooling can be carried out multiple times without significantly affecting its inherent chemical or mechanical properties.

Nylons can be easily blended with numerous other plastics to form composites, enhancing their performance parameters. This is widely done in automotive industries and some common composites in 3D printing are glass-filled nylon and carbon-fiber-filled nylon. Nylon is a versatile material and is suitable for almost all types of manufacturing operations like injection molding, extrusion, and additive manufacturing (in FDM, SLS & MJF).

Professional Applications

Nylon is a popular material in traditional and additive manufacturing industries. The first-ever application for nylon was a toothbrush, but its use rapidly spread to other sectors due to its unique material properties.

Some of the most popular applications of nylon material are:

- In the textiles industry, nylon is used in the manufacturing of fishing lines, and food packaging.
- In the fashion industry, nylon is used as a fabric to manufacture products like hosiery, lingerie, raincoats, windbreakers, and athletic wear used in sports.
- In the electronics industry, nylon is used as insulators and switch housings.
- In the automotive industry, nylon is used in the production of parts such as intake manifolds, door handles, and radiator grills.
- In consumer products, nylon is used in sporting goods such as ski bindings and skateboard wheels.
- In manufacturing machinery for moving parts such as gears and rollers.

Learn more about 3D Printing: The Top 10 Advantages of 3D Printing

NYLON IN 3D PRINTING

In the same way that nylon has become a go-to material in traditional manufacturing, nylon has become a popular material to use with 3D printers. 3D printing provides the added benefits of unlimited geometries, iteration and customization, and low-volume affordability.

Nylon's flexibility and durability help in 3D printing parts with thin walls. Its low coefficient of friction with a high melting point makes it especially resistant to abrasion and enables it to be used in printing for parts such as functional interlocking gears.

Nylon exhibits mechanical properties comparable to ABS (another widely used material in traditional and additive manufacturing). ABS is defined by its strength but Nylon's resistance to wear and fatigue makes it superior for applications requiring such properties.

Apart from the advantages, nylon has one major drawback that can often hamper its printing performance – hygroscopicity, i.e., its moisture-absorption property. This property is detrimental in

delivering predictable performance. But this same property helps nylon in easy post-processing with fabric dyes and spray paints, thereby making it suitable for use in the printing of aesthetic (display) models.

There have been successful cases of a patient receiving a titanium pelvis implant, another getting a new titanium lower jaw. A motorcyclist patient whose face had been seriously injured in a road accident had it rebuilt with 3D printed parts.

Bioprinting allows for the 3D printing of artificial organs, helping solve organ failure issues in patients faster, important to both the patient and his/her family and to healthcare systems.

3D printed tissues have been developed for pharmaceutical testing as a cost-effective and ethical means of helping identify the side effects of drugs and validating safe dosages.

Pills can be produced, using the 3D printing process of Binder Jetting. The process allows the pills produced to be very porous, therefore enabling high dosages in a single pill that can be dissolved quickly and easily digested, useful for treating conditions such as epilepsy.

*To continue reading this article in its entirety and learn about the challenges with and solutions to Nylon 3D printing, click **here**.*

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