How sustainable can 3D printing be?

Introduction

3D printing is not sustainable per se. The technology of 3D printing of plastics can be significantly more resource-efficient than conventional manufacturing technologies, for example because only as much material is used as is required for the component to be manufactured. Also, components are only printed for the actual need, which is a significant advantage, especially in the production of spare parts.

On the other hand, the initially obvious sustainability of 3D printing is significantly influenced by the materials used. The sustainability of the laser sintering process is quickly nullified if the surrounding powder in the construction space cannot be reused or can only be partially reused. The use of materials based on recyclates is also much less common than in injection molding. The reason for this lies in the perception that 3D printing technology is sensitive and only requires the use of virgin materials. The sustainability of 3D printing is completely lost if the design possibilities of 3D printing are used in fast fashion for marketing reasons alone.

It is therefore important to use 3D printing technology sensibly in the plastics industry to save material and energy and ultimately costs. The process shows advantages where small quantities with different geometries must be manufactured - such as special components within series production in the automotive industry or for spare parts in the white goods sector. Compared to machining processes, less raw material is used, compared to injection molding processes, individual components can easily be manufactured with little energy consumption, down to a quantity of 1.

As a developer and supplier of 3D printing materials, the LEHVOSS Group is concentrating on such industrial applications and is striving to improve the advantages of 3D printing on the material side by using materials with high performance and low carbon footprint. The LEHVOSS Group has been developing

and manufacturing high-performance plastic compounds for the injection molding of components for demanding applications for almost decades. From the very beginning, we have dedicated ourselves to continuously improving the sustainability of our products through the use of recyclates and the careful use of resources.

Our portfolio of 3D printing materials for FGF, FFF and PBF has been pursuing exactly the same objectives in terms of areas of application and sustainability from the very beginning.

With the LUVOSINT® and LUVOCOM® 3F materials, the LEHVOSS Group offers optimized materials for industrial 3D printing. These materials enable the quality-assured production of additively manufactured components while at the same time contributing to more sustainability in the production of plastic parts. In the following, we will introduce you to various LUVOSINT and LUVOCOM 3F materials and their possible uses in practice.

3D printing materials based on recycled raw materials

To further improve the sustainability of the portfolio, the LEHVOSS Group has developed LUVOCOM 3F eco PET. The material consists of 90% recycled PET. You can use LUVOCOM 3F eco PET for the FFF (Fused Filament Fabrication) and FGF (Fused Granulate Fabrication) processes. Like all products from the LUVOCOM 3F line, the material impresses with its very good workability and many other product properties. Possible areas of application are functional prototypes and series parts for numerous industries. These include above all mechanical engineering, automotive engineering and medical technology.

LUVOCOM 3F eco PET 50291 BK is an unreinforced, black type with an excellent surface finish. With a temperature resistance of up to 125 °C and low water absorption, the material offers clear advantages over the PETG otherwise used in the 3D printing market.

With LUVOCOM 3F eco PA 50347 NT, the LEHVOSS Group has launched a circular PA6 material that is made from ECONYL® and renewable raw materials and can itself be recycled into new raw materials at the end of its useful life. This new circular material consists of more than 85% ECONYL (regenerated polyamide 6), which is chemically recycled by Aquafil. The remaining part is supplemented with other polyamides from renewable sources with almost no additives. This connection enables 100% chemically recyclable filaments and products.

A major challenge is the return of old material. Therefore, LEHVOSS started with a pilot project in the DACH region (Germany, Austria, Switzerland), which benefits from Aquafil's extensive experience on this topic and from our distributors, to set up a take-back logistics system for used parts in order to collect them at the end of their life cycle to regenerate chemically during service life.

LUVOSINT - Fully recyclable sinter powders

The LUVOSINT materials are powders that were developed for the laser sintering process and other powder bed-based 3D printing processes. LUVOSINT materials, which are based on PP, PA12 and PA6, are suitable for the requirements of the automotive industry, among other things. The manufacturing process results in a high reuse rate of used construction space powder. This significantly improves the buy-to-fly

factor. This factor describes the ratio of the actual material required to produce one kilogram of manufactured component. Based on PA12 powders, which have long been used in prototype construction, the ratio can be 8:1 for unfavorable geometries, such as housing components! LUVOSINT materials for the automotive sector are already colored completely black. This also saves the additional dyeing process.

At LEHVOSS, however, sustainability does not only concern the avoidance of waste powder. Due to its high stability, it is possible, for example, to produce with LUVOSINT PA6.13 9711 CF with higher oxygen contents compared to conventional PA6 materials in laser sintering machines, thereby saving a lot of nitrogen.

Materials for sustainable mold making

Not only the development of sustainable materials is becoming increasingly important. The reduction of the carbon footprint must also be considered holistically. The creation of cost and handling-optimized laminating molds or laminating tools for the production of components made of GRP and CFRP laminates is still carried out using thermoset PU molded foams. Large amounts of waste are generated during milling and when the molds are later disposed of.

LEHVOSS offers a range of materials for direct printing (FGF) of such shapes that are cost effective and fully recyclable. The recyclability not only affects the chips produced during the manufacture of the mold, but also the mold itself, which can be completely shredded and recycled at the end of its useful life.

An easy-to-process, high-performance and cost-effective material that can be used as an "all-rounder" in mold making is LUVOTECH eco PC/ABS GF 1614 BK, which itself is made from 100% recyclate and can be completely returned to the cycle.

Creation of closed loops

The LEHVOSS Group has been dealing with the continuous improvement of the sustainability of its products for a very long time. A key element here is the use of recyclates and the establishment of closed cycles with our customers. In 3D printing, too, it is possible to collect recyclable plastic parts and leftovers separately and to send them to technical plastics recycling. The creation of new granules, filaments and powder is possible after grinding the components and new compounding. With the establishment of such a process, closed cycles can be implemented. Nothing stands in the way of complete recycling of plastics.

About us:

The LEHVOSS Group develops, produces and sells special chemical and mineral products worldwide. Founded in 1894 as a trading house in Hamburg, the LEHVOSS Group has built up an international reputation in its 125-year success story and operates production sites in Europe, the USA and Asia.

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From the initial idea to the finished product, the Customized Polymer Materials business unit has been setting outstanding records in the industry since 1983. The specialty of the agile unit is the development of specialized materials that show performances well above the usual market standards. The interdisciplinary development team uses a wide range of polymers, reinforcing materials and additives, the latest laboratory and application technology and a huge pool of experience, intuition and passion for the perfect solution.

www.luvocom.com

Europe and Head Office
Lehmann&Voss&Co. KG
Alsterufer 19
20354 Hamburg
Germany
Tel +49 40 44 197 499
E-mail luvocom@lehvoss.de

North America
LEHVOSS North America, LLC
185 South Broad Street
Pawcatuck, CT 06379
USA
Tel +1 855 681 3226
E-mail info@lehvoss.com

Asia
LEHVOSS (Shanghai) Chemical Trading Co., Ltd.
Unit 4805 Maxdo Centre
8 Xingyi Road, Changning District
Shanghai 200336
China
Tel +86 21 6278 5186
E-mail info@lehvoss.cn

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