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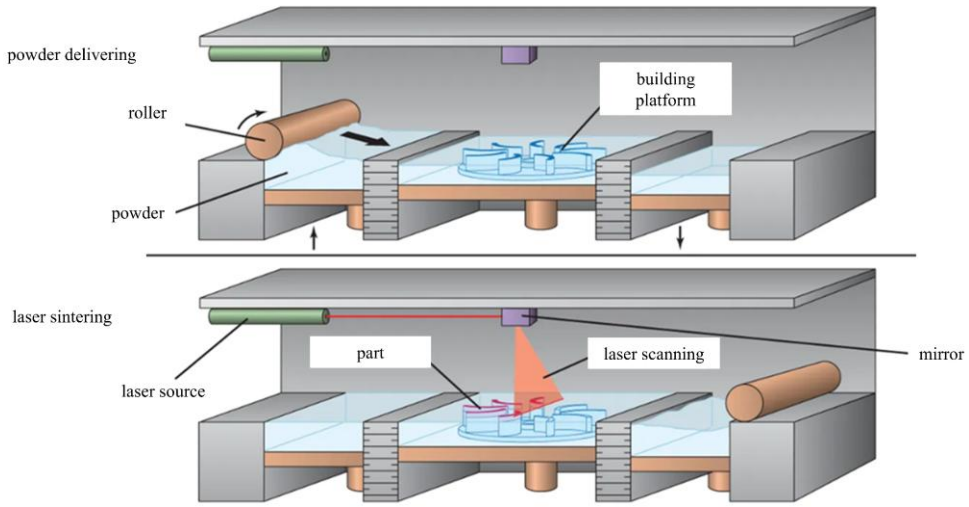
Presentation of Selective Laser Sintering (SLS) technology for manufacturing high-performance components

1. DESCRIPTION OF THE TECHNOLOGY

In a world of advanced technology development, Selective Laser Sintering (SLS) is setting new standards for the manufacture of precision components in production and prototyping environments. The innovative 3D printing technology uses a high-power laser to selectively fuse powder material, layer by layer, to create complex and mechanically robust components directly from designed 3D models. Unlike traditional manufacturing technologies, SLS enables the production of complex geometries and small details with a high degree of precision that would otherwise be impossible or prohibitively expensive with conventional processes.

The technology can work with a wide range of materials including plastics (PA, TPU materials), metals and composites (glass or carbon fibre reinforced plastics), opening opportunities for industries such as aerospace, automotive, medical and consumer products. The pieces do not require post-treatment in the form of removal of supports.



The process of manufacturing components by selective laser sintering.

2. TECHNICAL CHARACTERISTICS

The key advantages of the technology are the production of complex geometric details and the production of different internal structures in the components, which allows optimisation of material consumption and thus a more cost-effective manufacturing process without reducing the load-bearing characteristics of the components. The process is flexible and efficient, especially for small series or the development of customised personalized parts.

The technology allows components to be made from engineering materials, most commonly polyamide-based, which means that the components have good mechanical properties. The homogeneity of the

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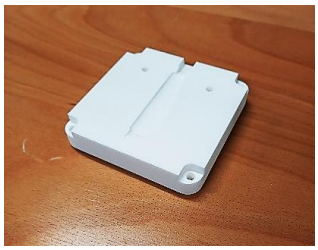
material structure, which is made by sintering the powder, gives the components uniform mechanical properties throughout the cross-section of the product. The parts produced are known for their high strength and good resistance to fatigue, making them suitable for functional prototypes as well as for end-use parts subjected to demanding conditions in their operation. It is suitable for the manufacture of thin-walled larger products which have a high degree of mechanical stability. The wall thickness to be produced is up to 0.7 mm. The precision of the pieces produced is within tolerances of up to 0.1 mm. The technology allows a high degree of technological flexibility in the event of changes to the product, enabling shorter development times and faster time-to-market. The technology is a sustainable solution for many industrial environments, as it reduces material waste and enables more efficient use of resources. In addition, many materials can be recycled.

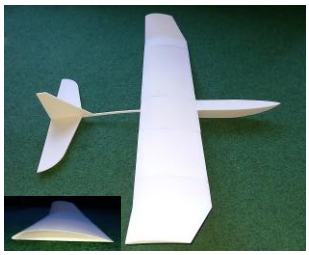
3. APPLICATIONS

The components are present in various industries, such as aerospace, which requires lightweight and mechanically robust customised components for aircraft and spacecraft. Components produced with SLS technology are used for the automotive industry for the rapid production of functional prototypes as well as high-performance components such as brackets and interior components. In medicine, components produced with SLS are used for patient-specific implants, in prosthetics, for surgical tools tailored to individual needs. In general, pieces made with SLS are used in the consumer goods world for prototyping for testing prior to series production and custom manufacturing. Selective laser sintering technology enables the production of a wide range of different products, from structural support elements to prototype inserts for further processing of polymer materials, to aesthetic housings for various applications.


Insert for injection moulding


Esthetical housing


Gears


Lighweight aircraft


Figure


Storage

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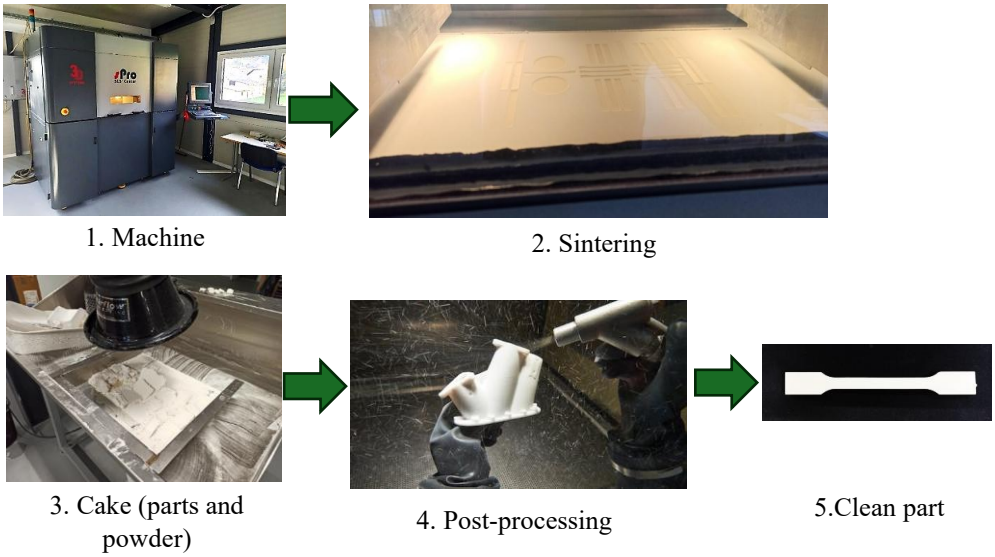
4. DEVELOPMENT GUIDELINES

SLS technology enables the introduction of advanced approaches to product design through Design for Additive Manufacturing (DfAM), changing the way manufacturers approach manufacturing and offering unparalleled flexibility, efficiency and cost-effectiveness.

Optimisation of the gear body by implementing a structure to rationalise material use.

5. FTPO SELECTIVE LASER SINTERING MACHINE FOR POLYMER POWDERS

The general characteristics of the SLS sPro 60 HD (3D Systems) are as follows: maximum laser power is 25 W; laser beam thickness is 450 µm and the maximum operating temperature of the machine is 178°C. The working area of the machine and, at the same time, the product manufacturing capability are the following dimensions: 381 x 330 x 437 mm. The following table shows the technical parameters of the SLS sPro 60 HD selective laser sintering machine.



1. Machine

2. Sintering

3. Cake (parts and powder)

4. Post-processing

5.Clean part

Procedure of manufacturing using SLS technology.