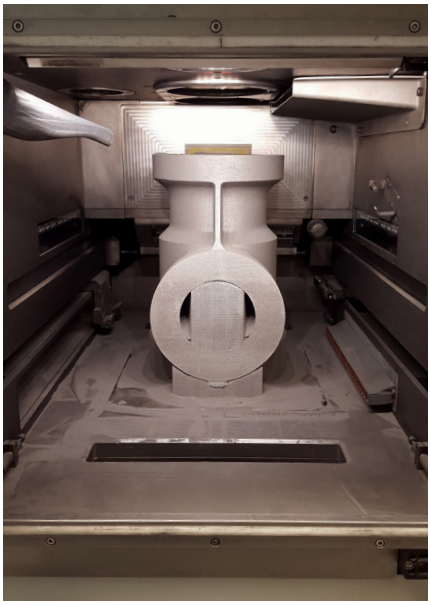
Spacecraft Valve Body 3D Printed in Titanium

SLM Solutions Additive Manufacturing System Aides A&D Industry



SLM Solutions, a leader in design and development of cutting edge metal 3D printing technology, announces the completion of a 3D printed titanium aircraft component that measures 12.21" x 8.74 x 8.66" diameter – the largest part to date built in an SLM280HL with dual 400W lasers, which made it possible to build a part of this size in a relatively short time frame compared to conventional manufacturing. The standard build plate size for machines of this class is 250 mm x 250 mm. However the SLM 280, with its increased build plate size at 280 mm x 280 mm, makes larger-sized parts possible.

SLM Solutions has become a leader in meeting the demands of OEMs with the company's technology advancements in metal 3D printing using the selective laser melting (SLM) technology, and specifically in Titanium for aerospace/aircraft applications due to its strength and light weight. SLM Solutions has overcome – and continues to make headway in this area – the size limitations of the build chamber and the other challenges that come with building large Titanium parts. Advancements in 3D printing using Titanium are particularly critical because it is a material that is normally is very hard and thus subject to cracking due to high residual stresses, which was the real challenge, explains Mike Hansen, applications engineer for SLM Solutions North America. "While the geometry wasn't particularly complex the shear mass of building something that large in titanium with the additive process was challenging," he states.

The dual, overlapping laser technology developed and patented by SLM Solutions contributed to the success of this large titanium part. Two lasers working simultaneously on the part in the overlap area enabled not only a faster build but a larger part as well. SLM Solutions carried out tests on these overlap areas showing there is no difference in quality between the area built exclusively by one laser and the area in the overlap worked on by both lasers interchangeably. SLM Solutions engineers went through several iterations to prepare the file and build some sample test pieces to see if the job could be accomplished. The customer was trying to achieve a way to manufacture this part that would result in cost and time savings, and weight reduction.

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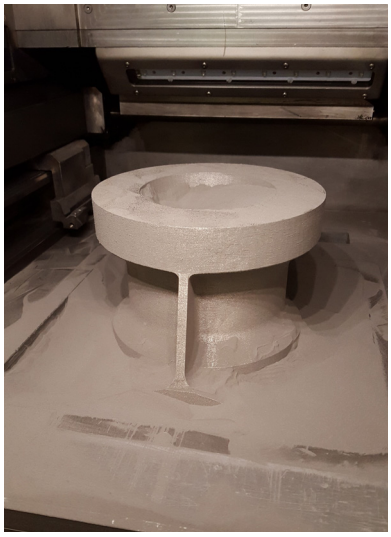

"This part is noteworthy because of its size and the fact that it was built out of Titanium in six and a half days with no process interruptions," says Hansen. "The fact that our SLM machine can operate for that period of time without requiring cleaning or experiencing any interruptions, is in itself extremely significant."

While 3D printing tends to get attention for its ability to build unique geometries, the nature of this aircraft component was not particularly complex. However, printing a part of that size in Titanium in such a short time was something that could not have been achieved had the part been machined out of a billet. "With additive manufacturing you're not restricted to traditional tools and machinery, so you can design in more organic shapes and the entire cycle of designing and engineering a critical part for the aircraft industry is condensed considerably," Hansen comments.

Richard Grylls, head of the applications engineering department/North America Technical Director and a Ph.D metallurgist, stated: "The part's size meant that it would have taken several weeks to machine conventionally, given that it would have required four or five setups it would have been a costly process. Casting the part would have taken even longer given that the tooling would have to be built, which could take as long as six months. And traditional tooling is expensive. We were far faster even though the cost was more. Still, in terms of the total time saved the cost is worth it for a critical part of this size."

SLM Solutions excelled in speed and the resulting quality and part density. Hansen commented that "meeting the stringent quality requirements and material specifications with Titanium in highly regulated industries like aerospace and automotive involves much testing of the materials and optimizing the parameters in order to make sure the customer got what they needed."

In general aerospace/aircraft requirements for inspection are quite extensive, usually involving a CT (computed tomography) scan, a non-destructive test method, to check for porosity or voids in the part, or the customer may perform destructive testing by cutting up the part. "We used non-destructive testing on this part, then performed a real-world test by mounting it on an engine in its intended use, and running it until it failed," Hansen explained.

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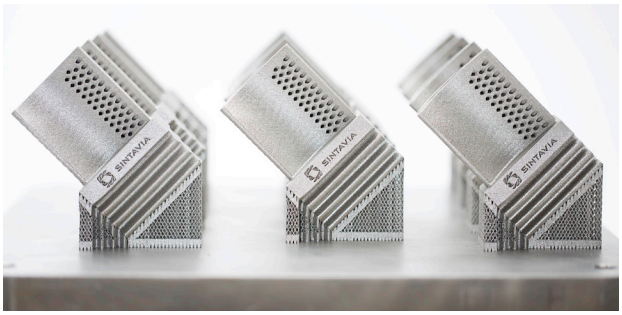
A recent study funded by the U.S. Department of Energy Advanced Manufacturing Office demonstrated that aircraft weight can be reduced by 7% by replacing conventional means of manufacturing with additive manufacturing – an astonishing number for an industry where most weight efficiency improvements are one or two percentage points. "Within 20 years, there will be a seismic shift in how we manufacture for the aerospace and defense industry," said Brian Neff, Managing Partner of Neff Capital Management who recently established a new company to focus on the additive manufacturing of production parts for aerospace and defense OEMs around the world. "However, producers who do not understand or are incapable of producing parts with repetitive quality will not play a role in the OEM supply chain."

Neff's newly established company, Sintavia, LLC, is headquartered in Davie, FL, and produces parts based on the exacting quality control standards required by the aerospace and defense industry. In addition to a serial production capability, the company maintains a state-of-the-art metallurgical and metrology lab. "We are excited to be a part of the coming industrial revolution within the aerospace and defense industry," said Neff. "Over the next few years, as more and more production is shifted to additive manufacturing within this industry, serial manufacturers with exceptional quality control, like Sintavia, will be in high demand by the OEMs."

Neff Capital's funding of Sintavia included a $10 million initial capital investment, rolled out as the company grows and develops its capabilities. To support the production highly complex metal parts, Sintavia added three Selective Laser Melting SLM 280HL systems from SLM Solutions, one with a single 400W laser and two with twin lasers of the same power. With a 280 x280 x 350 mm build envelope, the SLM 280HL system offers options to configure a single 400W or 700W laser as well as dual (400 + 1000W), or twin (400W or 700W) lasers. Likewise, the system's open software controls, bi-directional loader and closed-loop metal powder handling achieve the speed, safety and flexibility needed to optimize strict production parameters.



As the additive manufacturing industry evolves, SLM Solutions is seeing greater demand for more and more applications. However the materials and the process of producing these parts are advancing so fast that the standards are quickly becoming outdated. "We're being contacted by more companies used to traditional manufacturing that now need to increase speed and throughput while maintaining quality, and want to convert conventionally manufactured parts into additive manufacturing," added Hansen. "This industry is changing on a day-to-day basis, evolving very quickly, but there is a disconnect between the pace of the evolution in additive manufacturing and the ability of some industries to keep pace with approving new materials and processes, particularly the aerospace and automotive industries."

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About SLM Solutions

SLM Solutions is a leading provider of metal-based 3D additive technology and machinery for prototypes and manufacturing production.

SLM Machines support an optimal approach for safe, flexible and cost efficient metal part production across the aerospace, automotive, academia, energy and medical industries. SLM systems include the SLM®125HL, SLM®280HL, and SLM®500HL.

With multi-laser options, bi-directional recoating, open-software controls and closed-loop powder handling, Selective Laser Melting systems achieve best-in-class safety and increased build speeds for complex and completely dense metal parts.

Headquartered in Lübeck, Germany, SLM Solutions Group is a publicly traded company (TecDax AM3D. DE) with its North American offices located in Metro-Detroit.

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