ARBURG Success Story

SAMAPLAST AG
KUNSTSTOFFTECHNIK

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SAMAPLAST – Implants from original materials

ENDLESS INNOVATION

Additively manufactured meniscus implant made of two components

SUMMARY

Additively manufactured implants made of original material for specific patients: it may sound incredible, but it is now actually a reality. SAMAPLAST AG is doing pioneering work in this field. The company can look back on a long and very successful history of developing products for the healthcare industry. Since 1960 it has been producing high-quality plastic injection moulded parts that are used for medical components and implants all over the world. Based in Switzerland, SAMAPLAST has discovered a biocompatible material that is perfect for such applications. The company is well versed in the use of additive manufacturing machines, but none of them were capable of processing these plastic granules – until the firm came across ARBURG and the freeformer, which can process the biocompatible material additively to create customised parts for patient-specific implants.

INTRODUCTION

3D printing is nothing new in medical technology, where it serves, just like in many other industries, as an efficient technology for prototype development. As the materials used in these processes evolved, so too did the range of applications. One leading manufacturer approved to produce 3D-printed titanium implants is Stryker Instruments. Titanium is used to make hip and knee replacements, skull reconstructions and spinal implants, for example.

However, many thermoplastic materials are still being evaluated at the moment. Recent data suggests that PEEK and PEKK are great alternatives and much more cost effective than titanium. The orthopaedic industry is beginning to boom right now with additively manufactured implants. As of 2019, over 600,000 implants were estimated to have been produced by 3D printing. By 2027, this number is expected to exceed 4,000,000.

CHALLENGE

„We are driven to be technology leaders," said Thomas Moesli, Plastics Engineer at SAMAPLAST AG. „We have a long history of success in medical device manufacturing and were looking for an opportunity to differentiate ourselves in the market." Moesli, who has been with the company for over twelve years, went on to explain how crucial it is to put the customer's needs front and centre. According to SAMPLAST AG, it is a leading supplier of the very highest quality plastic injection moulded components for use in technical, medical and implant fields, from idea to market maturity. The company wanted to develop and drive its business in a way that could simultaneously benefit existing customers and attract new ones. SAMAPLAST entered the world of additive manufacturing in 2018, quickly recognising that there was greater potential in this business area than most people realised.

Thanks to additive manufacturing (AM), SAMPLAST was now able to assist its clients earlier in the product development lifecycle. With access to several different AM technologies, the company was now capable of providing customers with a way to functionally test their products earlier and get to clinical trials faster. Rapid prototyping proved to be a significant advantage for mitigating risks and considerably reducing time to market.

When SAMAPLAST discovered the freeformer and ARBURG Plastic Freeforming (APF), it immediately saw the unique and revolutionary opportunities offered by the open system and freedom to choose materials. The issue now was to ascertain whether APF really was suited to processing medically approved implant materials such as Evonik RESOMER® or DSM Bionate and what impact this could have on the company's business operations. „The freeformer is ideal for additively processing absorbable and implantable materials in granule form that are typically used for injection moulding. Being able to iterate with these materials even before serial production would provide a significant advantage," said Moesli, referring to the initial freeformer evaluation phase.

SOLUTION

The freeformer is an open 3D printing system compatible with a wide variety of materials, which is rare on the AM market. Up to three different materials can be combined using the APF process. A support material that is washed away afterwards can be used as the third component to help create complex geometries. Firstly the freeformer melts the plastic granules, similar to how it is done for injection moulding. It then strategically deposits tiny droplets of the melted material onto a moving part carrier. This open system gives users a unique opportunity to process even special, in-house or biocompatible materials by means of additive manufacturing. SAMAPLAST has grasped this opportunity and made it a great success.

„We have over 25 years of experience with implantable plastics," Moesli said, discussing several specific projects, including one to develop a replacement meniscus component. „With the APF process, we were able to additively manufacture a multi-material meniscus (from different types of polyurethane) in just a few days. And this meant our customer could start testing the product straightaway. Without the freeformer, we would have had to injection mould the part, perhaps waiting several months for the appropriate mould." What's more, defects in the mould or multiple iterations of the mould design could have led to considerable delays in the product development phase, which would have had a huge impact on costs.

Another example are injection moulded plastic spinal rods, which are long-term implants developed for orthopaedic surgery that can remain in the body for longer than 180 days. SAMAPLAST uses the freeformer to produce parts of these implants, so their strength and functionality can be assessed in advance. In addition, the freeformer enables SAMAPLAST to additively manufacture several different variations quickly and cost-effectively, ultimately helping its client get to market faster. While most products are standard sizes and dimensions, the APF process opens the door to personalised implants that will improve patient care and outcomes in future. This is an area that SAMAPLAST is focussing on at the moment.

Additive manufacturing of implants with the freeformer

RESULTS

Process	Time	Mould costs	Product costs
Traditional process (high-volume injection moulding production)	45 days	CHF 22,800	CHF 500 (50 parts)
Prototyping* (low-volume injection moulding production)	10 days	CHF 7,800	CHF 750 (50 parts)
freeformer	3 days	-	CHF 800 (5 parts)

* Manufacture of an implant holder with a 30 mm diameter

ADVANTAGES AT A GLANCE

- Three to six times faster time to market: injection moulding six to 12 months; additive manufacturing one to two months
- Freedom of design, none of the restrictions typical of injection moulding
- Reduce product development lifecycle by 75%
- Efficiently manufacture a small number of parts right through to implants for specific patients

OUTLOOK

„Our relationship with ARBURG is excellent. During the evaluation process, the communication and feedback loop was perfect," Moesli said. „After we purchased the freeformer, ARBURG helped us promote our capabilities and business has increased. We are excited about the future."

Moesli expressed his support of the company and technology. When asked about the potential of APF and where he sees it progressing in the coming years, Moesli responded: „I see this impacting several industries. Patient-specific parts in healthcare. Veterinary applications and pet orthopaedics. Low-volume production in aerospace. The opportunities for innovation are endless."

Thomas Mösli,
Plastics Engineer,
SAMAPLAST AG

COMPANY

As an internationally recognised medical device manufacturer with customers in Europe and elsewhere (e.g. Brazil, Japan, USA, Asia), SAMAPLAST AG is today a sought-after partner for companies who wish to go from idea to serial production quickly. In fact, in December 2020 the company was certified to DIN SPEC 17071 (in future ISO ASTM 52920) by TÜV Süd, which authorises SAMAPLAST as a contract manufacturer with the FDA in America. Similar to EN ISO 9001 or EN ISO 13485, this certification allows the firm to use additive manufacturing for components to specific industry standards.

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SAMAPLAST uses AM technology to assist its customers at an early stage of product development

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