Success Story
Medical

ottobock.

Maximum Flexibility and Design Freedom in the Production of Orthoses

Source: Ottobock

Pleasant breathability:
the perforations in this ankle-foot orthosis with a ring closure system cover virtually the entire surface, preventing excessive sweating

Challenge

Design, CAD engineering and production of orthoses that combine several functions, optimally tailored to the needs of the patient

Solution

Construction of individually tailored orthoses for patients, using industrial 3D printing performed with the EOS P 396

Results

Functional: complete freedom of design for structures, functions and wall thicknesses

Comfortable: low weight and breathability enhance wearer comfort

Reproducible: any particular orthosis can be produced again at any time with the same structure and characteristics

Standardized: consistent and repeatable production quality with no dependence on manual production quality factors

EOS

Complex Structures and Custom Design – **How Additive Manufacturing Is Revolutionizing Orthopedic Technology**

When it comes to support orthoses, orthopaedic technicians are generally restricted to individual constructions, as forms, functions and material thicknesses must be configured to suit each individual patient's needs. When complex structures are required, traditional processes are often operating at their limits. Moreover, as orthoses are time-consuming to produce, they are not readily available. To address these issues, Ottobock employs industrial 3D printing. With the aid of production systems and consultancy services from EOS, the company produces custom-made orthoses.

Short Profile

For 100 years Ottobock, the German global market leader, has been developing med-tech products and fitting solutions for people with limited mobility in the areas of Prosthetics, Orthotics and Human Mobility and providing patient care in its MedicalCare division.

Further information
www.ottobock.com

Challenge

Every person is unique. And this is particularly true in orthopaedics, where the goal is to individually support or restore a person's mobility. For treatment to be a complete success, orthoses must be designed to precisely match the patient's anatomy and therapeutic needs. This explains why they are produced as custom constructions or in customized small series, as until now, orthopaedic technicians have been guided by the possibilities of traditional production methods such as casting, forming, modelling and milling for constructing orthoses. But complex structures and varying material thicknesses put established processes at the limits of their capabilities. If it is necessary to combine several functions in one product, individual parts must be assembled manually to build the finished orthosis, which is a very time-consuming process. At the same time, orthoses need to be available as quickly as possible to support the mobility of patients with underlying neurological disorders, such as cerebral palsy, spina bifida or paralysis. A further factor when treating children is that they grow quickly, which means that aids have to be replaced frequently. Ottobock has recognized these challenges and set itself the goal of optimizing patient care by employing industrial 3D printing. "We combine manual orthopaedic craft with the benefits of additive manufacturing," says Lukas Eckermann, Head of Patient Care and iFab (individual fabrication) at Ottobock.

Children and grown-ups like the easy handling and perfect fit of their MyNext MAFO (Source: Ottobock)

Solution

Ottobock moved into the digital production of orthoses with the acquisition of plus medica OT. This small start-up has been developing 3D printed solutions since 2015. The key priority for Ottobock is to use the potential offered by the technology to improve patient care and to make it available for all orthopaedic technicians in their network. After years of economic and technical optimization of 3D printed ortheses with special attention placed on the aspects of form and function, Ottobock introduced MyNext MAFO. This dynamic ankle-foot orthosis combines innovative characteristics enabled by digital manufacturing with the experience of skilled orthopedic technicians. In order to bring the best possible support to each and every patient, close cooperation with local orthopaedic technicians is very important. Only by coordinating all the processes in construction and additive manufacturing to the requirements of orthopaedic technology it is possible to realize the best possible results.

To this end, the company is cooperating with EOS, the technology leader in the field of 3D printing. Not only does the company supply the necessary systems and materials, but it also supports users during the development and production process. "We have benefited from the highly competent and partner-based consultancy available from EOS, for instance when it came to choosing the most suitable material," explains Lukas Eckermann. Application specialists with experience in medical engineering helped Ottobock to build up their own know-how and showed them how to fully exploit the possibilities of the technology. And even now, they remain available at any time for assistance on matters of design optimization and functional integration.

"Additive manufacturing allows us to offer tailor-made orthoses that cater to the individual needs of our patients. In addition, the design ensures air permeability and high comfort."

Lukas Eckermann,
Head of Patient Care and iFab (individual fabrication) at Ottobock

The base of every 3D-printed MyNext orthosis is a scan of the patient's foot with a body scanner made by an orthopaedic clinician. Afterwards, they will modify the scan model in a CAD software and send it together with the desired product specifications to Ottobock via the iFab customer center, a digital order platform for custom products. Next, the construction data are transmitted to the production system, an EOS P 396. The part is then built up layer by layer from a fine powder material using a laser beam. This makes it possible to create parts of any shape imaginable, without the need for special tools. The material used is the nylon-based polymer PA 1101 with a high level of stiffness and impact strength, which neither splinters nor breaks under heavy loads. This lowers the risk of injury to the patient.

Results

Additive manufacturing enables Ottobock to produce aids of the highest quality using a new approach. Complex structures can be accommodated without problem. It is also possible to incorporate varying material thicknesses within an orthosis and thereby allows to create wall thicknesses that are as thick or thin as needed. Furthermore, additive manufacturing makes the integration of different structures possible, which makes certain areas either flexible or stiff. This also applies to perforations, which serve to improve its breathability. "There are several geometries, low wall thicknesses and integrated functions that we would not have been able to realize so easily using traditional production methods," explains Lukas Eckermann. Orthoses can be better tailored to the patient's needs than was previously the case. The device is also relatively easy and inexpensive to customize from a visual perspective. In future, color variations can be created by subsequent dyeing or lacquering.

For Lukas Eckermann, optimizations in weight and integrated functions, high breathability and attractive design are all decisive factors of a treatment's success: "Nobody likes to wear an orthosis. But if you hardly notice it in your everyday life and it even looks good, it can significantly increase the wearing duration and in turn the therapeutic success of the orthosis."
A further advantage of EOS technology is that parts are easy to reproduce: once developed, the orthosis can be produced again at any time and in the same quality. This is particularly relevant with children's orthoses, which have to be replaced in a different size but with the same functionality and structure. Industrial 3D printing enables Ottobock to scale their solution easily in term of produced units as well as by introducing further types of orthoses.

EOS systems are able to manufacture medical devices. However, EOS cannot offer any guarantee that these devices meet all requirements.

Headquarters

EOS GmbH
Electro Optical Systems
Robert-Stirling-Ring 1
D-82152 Krailling/Munich
Germany
Phone +49 89 893 36-0
info@eos.info

www.eos.info
EOS
EOSGmbH
EOS.global
EOSGmbH
#ShapingFuture

Further Offices

EOS France
Phone +33 437 497 676

EOS Greater China
Phone +86 21 602 307 00

EOS India
Phone +91 443 964 8000

EOS Italy
Phone +39 023 340 1659

EOS Japan
Phone +81 45 670 0250

EOS Korea
Phone +82 2 6330 5800

EOS Nordic & Baltic
Phone +46 31 760 4640

EOS of North America
Phone +1 877 388 7916

EOS Singapore
Phone +65 6430 0463

EOS UK
Phone +44 1926 675 110