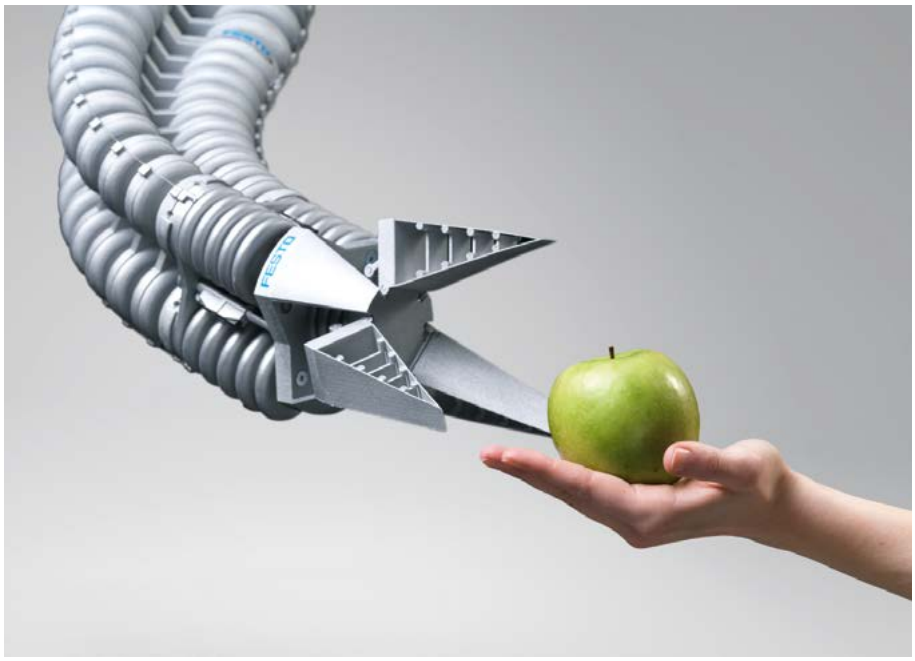
Success Story
Industry

FESTO

Additive Manufacturing Enables Automation Specialist to Design its Bionic Assistance System

Source: Festo AG & Co.KG



Bionic Handling Assistant:
A gripping tool that can reliably pick up and safely put down objects gently and flexibly.

Challenge

Production of a bionic gripper that can reliably pick up and safely put down objects gently and flexibly

Solution

Fast and economic small batch production of complex components using a FORMIGA P 100 supplied by EOS

Results

Optimized: function integration reduces the number of single parts and the expenditure for assembly

Flexible: thanks to the high degree in design flexibility, the design determines the production method

Economic: innovative manufacturing method makes grippers lightweight and long-lasting

Efficient: tool-less production saves time and money

Profitable: laser sintering has arrived in industrial production environment

EOS

Additive Manufacturing Offers
New Design Solutions for a More Economic Small Batch Production

Biological processes, motion patterns of living organisms or physical construction principles: Nature has countless solutions only waiting to be analysed by bionic science and translated into technological innovation. However, it is difficult to employ conventional manufacturing techniques to make use of the solutions which Mother Nature has developed in millions of years of evolution. Festo, a worldwide leading supplier of automation technology, uses the laser sintering process for the small batch production of some of its industrial applications which are based on bionic adaptation. In 2010, the company's Bionic Handling Assistant was awarded the „Deutscher Zukunftspreis" (German Future Award), the technology and innovation award endowed by the Federal President.

Short Profile

Festo is a worldwide leading supplier of automation technology and is thus recognized as the performance leader in the field of pneumatic and electrical automation thanks to its innovations and expertise in solving problems.

Further information
www.festo.com

Challenge

The Esslingen-based company has been gathering experience in additive manufacturing since 1995 and is now using this technology to produce several thousand parts per year. What began with concept models and functional prototypes has meanwhile developed to the level of batch production. The Bionic Learning Network, a group of renowned universities, institutes and development companies established by Festo in 2006, has made a substantial contribution to paving the way, since the technical principles of products which are derived from nature often have rather complex designs. Implementation by means of conventional manufacturing methods is impossible or difficult and always expensive. The production method determines the design of the product which all too often leads to design restrictions. Nature's efficient construction principles, on the other hand, are not subject to such restrictions. Therefore, nature can be emulated only by a technology in which the design determines the means of production and which will ideally work in serial production as well.

Unpacking of Bionic Handling Assistant: The gripping device is already functional even right after production.
(Courtesy of Festo AG & Co.KG)

"Laser sintering was the only process that made it possible to produce the Bionic Handling Assistant and its gripping element, the DHDG adaptive gripper. Due to the complexity and integrated functionality of the components, there is no alternative way of production. This process enables us to adjust the DHDG adaptive gripper to the specific application and is thus already used by customers all over the world."

Klaus Müller-Lohmeier,
Head of Advanced Prototyping Technology at Festo AG & Co. KG

Solution

One example of successful product development and production using additive manufacturing is the DHDG adaptive gripper. It has become an inherent part of Festo's production range and is manufactured on a FORMIGA P 100 supplied by EOS. Its structure is adapted from a fish fin and has two flexible bands which form a triangle to converge at the top. Intermediate webs are connected to the bands via joints at regular intervals. This flexible yet stable connection allows the gripper fingers to precisely adjust to the contour of the workpiece. Even sensitive objects or objects with varying contours are gripped and transported. The particular feature is that the gripper elements already have this functionality directly after production and not only after expensive assembly procedures. That said, laser sintering is an underlying manufacturing requirement for this design and this specific application - and there is no alternative yet. Another example is the Bionic Handling Assistant. The flexible assistance system, which is modelled after an elephant's trunk, consists of three basic elements for spatial movement, a hand axis and a gripper with adaptive fingers. "Its functionality and its structure that incorporates complex plastic components make it impossible to produce the hightech arm without laser sintering," says Klaus Müller-Lohmeier, Head of Advanced Prototyping Technology at Festo AG & Co. KG. With a FORMIGA P 100, a complete handling assistant can be manufactured in just four building sessions.

Results

The EOS technology makes it possible to directly incorporate functions that the final product is supposed to have. This is advantageous, since it reduces the number of parts and the additional assembly costs. "Thanks to the design freedom the laser sintering process gives us, we can manufacture movable, flexible but also specific rigid shapes - just as they occur in nature. Our designers can work without having to observe the restrictions of conventional manufacturing techniques and fully concentrate on the implementation of the natural principle analysed," adds Müller-Lohmeier. Moreover, the DHDG adaptive gripper is very economic, because it is about 80 % lighter than conventional grippers made of metal. The reason for this is the additive manufacturing of plastics which allows the production of especially light-weight, elastic but very strong structures. Studies have shown that the gripper elements can withstand more than five million bending cycles. Additive manufacturing production always means tool-less production. "How cost-efficient this can be is illustrated by a customer project in which we have manufactured 12,000 components using laser sintering as an alternative technology. Tool-less production saved 40 % of the unit costs compared to injection moulding. All parts were finished within one week in just four jobs. Conventional production would have taken two months," explains Müller-Lohmeier. Moreover, follow-up costs for auxiliary materials and devices are reduced and there is no delay occurring due to the production of tools. This enables Festo to launch its products much faster. The high-tech robotic arm is one example of how a mainly digital process chain is implemented in industrial manufacturing. Müller-Lohmeier adds: "At the moment, we are also using the EOS technology more and more for projects that only call for limited annual quantities of a complex part. In such cases, the process is a real alternative for us to existing, often tool-based methods."

Headquarters

EOS GmbH
Electro Optical Systems
Robert-Stirling-Ring 1
D-82152 Krailling/Munich
Germany
Phone +49 89 893 36-0
Fax +49 89 893 36-285

www.eos.info
info@eos.info

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 +1 248 306 0143

EOS Singapore
Phone +65 6430 0463

EOS UK
Phone +44 1926 675 110