

Rapid manufacturing speeds up product development

# Layer by layer

In the Festo Fast Factory quite a few one-off items are produced – quickly and tailored to the customer's requirements. Even short runs benefit from low-cost production.



**Rapid prototyping in aluminium:** the material is applied as molten powder wherever the component is to be produced later (above).

**Aluminium laser melting:** a 2.5 kg heat exchanger for a test system is the largest component that has so far been created with rapid manufacturing.



**Thermoplastic powder:** the base material for producing models, samples, prototypes, tools and final products, such as the adaptive gripper DHDG.

## Interview



**Klaus Müller-Lohmeier,**  
Leiter Advanced Prototyping  
Technology, Festo

► **trends in automation:** Festo was awarded the German Future Award 2010 for the bionic handling assistant. What part did the Festo Fast Factory play in this innovative robot system?

**Klaus Müller-Lohmeier:** We built the individual parts of the bionic handling assistant in our "powder bakery". To do this, we intensively and

consistently used plastic laser sintering.

► What are the particular advantages of the generative manufacturing methods for the bionic handling assistant?

**Müller-Lohmeier:** Using generative manufacturing as opposed to conventional manufacturing methods, we

can create structures that are almost identical to those found in nature, such as the elephant's trunk or the vertical tail fin. There are almost no alternative manufacturing options for this particular geometry of the deep folds in the wall of the "trunk segment". There is a clear shift away from production-oriented design to design-oriented production.

► Will rapid manufacturing oust the machining process in future?

**Müller-Lohmeier:** I see the generative method more like another string to our bow of manufacturing methods that can be applied and used as required depending on the materials used, the number of parts, the complexity of the geometry, the functional requirements and the economic constraints. Experts predict, however, that a growing number of parts will be produced through generative manufacturing, although this depends on the industry. The layer manufacturing process clearly accommodates the trend for customisation.

**G**enerative manufacturing processes – called rapid prototyping or rapid manufacturing, depending on the point of view – are an integral component of the product development process today. Prototypes produced through generative manufacturing have most of the technical properties of a marketable product. Companies in medical and dental technology, aviation and space travel, machine building, as well as automotive manufacturers and their suppliers can thus quickly and cost-effectively produce small production runs without expensive and complicated moulds and tools.

### Four ways to the end product

In principle, rapid prototyping is quite simple. A component is cut virtually into individual slices using a 3D CAD model. A 3D printer then actually builds it up layer by layer. The material is applied as a liquid or as a molten powder to the places where the component is to be produced later.

In addition to selective laser sintering (SLS), three other methods are used at Festo: selective laser melting (SLM) for

metals such as aluminium or steel, fused deposition manufacturing (FDM) for polymer products and stereolithography (SLA). Experts predict a bright future for plastic processing using laser sintering and FDM. "In five years, these processes will be standard," says Klaus Müller-Lohmeier, Head of Advanced Prototyping Technology at Festo, confidently.

### Bionically fast gripping

The best example is the bionic adaptive gripper. Shaped like a fish fin, the gripper was created using the selective laser sintering method. To do this, layers of plastic powder 0.1 mm thin were applied one after the other to a platform and then each one was fused into a definite component using a laser. This reduces the weight by up to 90% compared with a traditional metal gripper.

The investment in the new Festo Fast Factory has paid off. Klaus Müller-Lohmeier adds: "We use rapid prototyping in research and development in order to reduce the time for producing initial samples, particularly for moulded parts. Ultimately this reduces the total development time and the products get to market more quickly." It will also

enable Festo to produce individual components in small production runs quickly and at comparatively cheaply because savings can be made on tooling costs.

### Close contact with customers

These modern processes are also influential during interactions with customers. "We can create sample components faster so that we can then discuss special designs with customers and offer alternative solutions," explains Müller-Lohmeier. Thus, a model for communication with customers and initial sample parts can be created overnight.

Now, only 75% of the products manufactured using the generative manufacturing method are internal developments; 25% go directly to the customer. ■