Digital information twin opens up new business opportunities

Martin Steuer, Senior Vice President, EOS Electrical Optical Systems in an interview with EngineeringSpot

Internet of Things and predictive maintenance ensure greater availability

Ralf Steck, Friedrichshafen, for Quanos Solutions

EOS is the leading technology provider worldwide for industrial 3D printing of metals and plastics. The independent company, which was established in 1989, is a pioneer and innovator for comprehensive solutions in additive manufacturing. Hundreds of systems leave company's Maisach production site in Bavaria each year. This makes servicing and the management of servicing an increasingly important topic. In an interview Martin Steuer, Senior Vice President of the EOS Software Division, speaks about the servicing and maintenance requirements of EOS's customers.

Mr Steuer, please briefly introduce EOS.

EOS GmbH – Electro Optical Systems was established in 1989 by Dr Hans J. Langer and is today the leading technology provider worldwide for industrial 3D printing of metals and plastics. The company offers comprehensive solutions for additive manufacturing and now employs more than 1200 employees around the world.

Selective laser sintering (SLS) technology for polymer and selective laser melting (SLM) was developed together with the company's pilot customers. In the early days, this was special mechanical engineering in the truest sense. In the meantime, 30 years later, hundreds of our top-sellers, EOS M 290, EOS P 396 and EOS P 100, are delivered to customers each year.

Of course, this must mean that over the years the demands placed on production and servicing have changed completely?

Correct. Before, our customers just had one or a few of our machines and only used them to create prototypes and small production batches. Today, we have an increasing number of customers with an entire fleet of machines producing series parts or medium-sized quantities of parts. As such, topics such as reliability, availability and repeatability have become much more important. Service technicians have to be able to get defective or to-be-serviced machines back up and running in the shortest time possible, have the appropriate spare parts and know how to install them.

Therefore, the documentation outlining how each machine is equipped is of great importance. We continuously optimise our machines and this optimisation happens in series batches. The service technician needs information on which parts are installed in a machine of a certain series batch, i.e., whether they are 'as built', or whether parts have been upgraded during a previous service, i.e., 'as maintained' or 'as upgraded'.

Last but not least, new functions and components, with which older systems can be retrofitted, are constantly being developed, such as for the analysis of powder coatings with the Powder Bed or the correct energy input with optical tomography or the precise analysis of the welding process with Melt Pool Monitoring. We also need to manage this information and make it accessible.

Quanos

How do you approach such a challenge?

With the help of a digital twin. This contains all the data and information from a product or a specific machine so that the physical product can be digitally mapped and simulated. Many of these 'digital twins' exist depending on the state and application.

It begins with the digital product twin that is created from all information generated during the design process, starting with the development ideas and results and ending with the complete 3D model. This data pool is then expanded, for example, to include all data from purchasing and sales and other areas, thus depicting the product as it is to be manufactured.

The second digital twin is that of production. Here, it is determined how the product is to be produced, which machines and tools are required, which purchase parts come from where, how the production and assembly will be conducted etc.

Once the product has been produced and delivered what follows next is the digital information twin, which maps a specific machine, it's replacement parts, documentation, operating manual, replacement parts catalogue and the assembly and disassembly instructions for all maintenance and repair works.

So, this digital information twin becomes the tool with which servicing is carried out?

Yes, at least in part. Today, we have fully digitalised our design and production documents and servicing editors make this information available to our service technicians around the world on their laptops. Currently, we are working on updating our online platforms with all 'as maintained' and 'as upgraded' information and on making this available to any authorised person anywhere and at any time.

Other potential applications come to the fore when we combine the digital information twin with information from IoT sensors and additional production data. Our machines have to be available at all times, this means that predictive maintenance becomes increasingly important.

Quanos

Machines today are already equipped with a range of sensors and can send their data via a secure data transfer to a central data pool, the so-called data lake. Statistics algorithms and AI then scan for any anomalies and analyse these.

This makes it possible, for example to detect a badly-running Z axis or filter systems that are becoming clogged, even when the deviation is not yet process-relevant and estimate the remaining running time. To be on the safe side, the customer then shifts any particularly challenging jobs to another system and the service technician arranges an appointment for the maintenance with the customer, which, for example, will be carried out in the downtime between two orders.

In the digital information twin, the service technician finds not only the appropriate replacement parts for precisely this machine, but also the relevant instructions. The system can also let the customer know that other machines have the same z-axis or filter systems with a similar running time installed, which they may want to order at the same time and have replaced during the same visit. This is how the digital information twin facilitates more efficient servicing.

Can you see any other applications for the digital information twin?

In our business in particular operator models or 'pay per use' are very interesting topics. The acquisition of our systems for industrial 3D printing is a large-scale investment and some potential customers first need experience with the systems to evaluate the business case for their acquisition. If we were able to supply the customer with a system and invoice them for the use of this system, this would represent a big opportunity for both the customer and us. In this sense, the digital information twin opens up new business models.

The key requirement for such new business models is high availability, which is something we can guarantee with the abovementioned IoT-driven digital information twin workflows.

Such business models are also of interest for customers that purchase lots of systems from us. Here, the focus is on the ability to monitor the machines and their processes. Those running digital factories want to know which machines are running at what capacity, the status of particular orders etc., and the data lake and AI can even help here.

This is an interesting glimpse into the future. Mr Steuer, thank you very much for talking to me.

Ralf Steck is a freelance technical journalist specialising in CAD/CAM, IT and mechanical engineering in Friedrichshafen

Quanos Solutions GmbH
Hugo-Junkers-Str. 15-17 · D-90411
Nuremberg, Germany
+49 911 21794 199
info@quanos-solutions.com