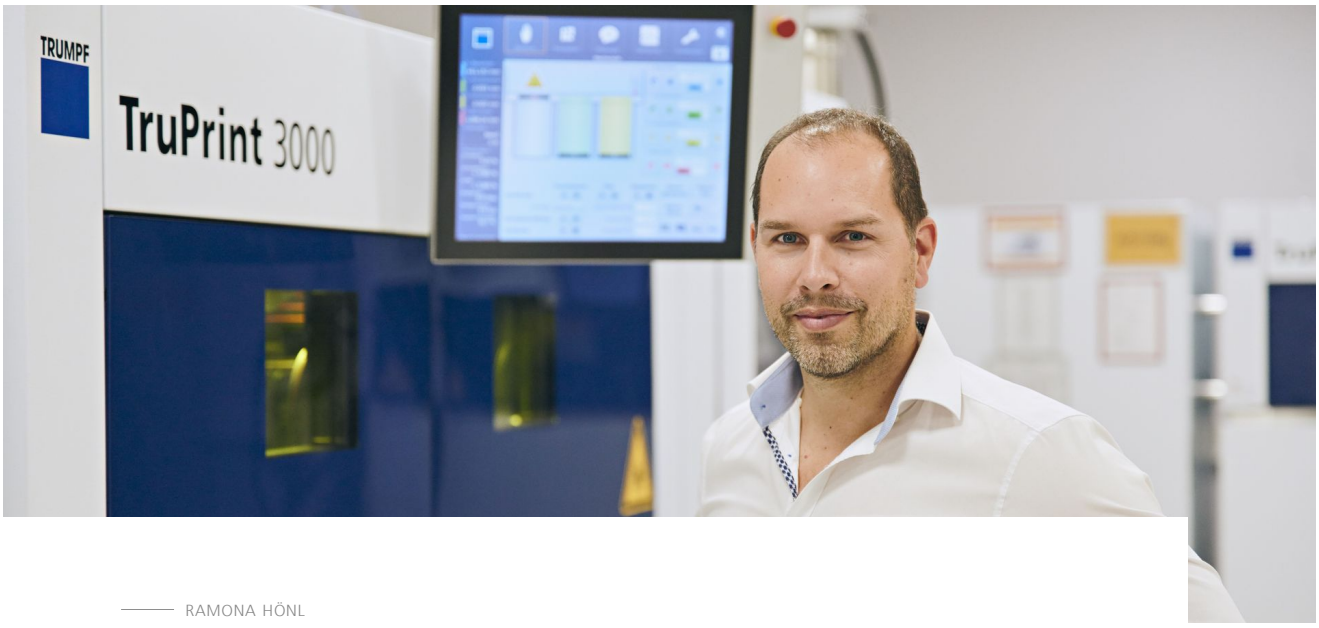

RAMONA HÖNL

3D printing for luxury vehicles and sports cars

Automotive supplier Continental Engineering Services produces brakes, accelerator pedals and similar parts – and now it also offers the benefits of additive manufacturing. Components produced on 3D printers from TRUMPF stand out for their attractive surface finish and excellent results in load tests.

Founded in 2006, the Frankfurt-based company Continental Engineering Services GmbH (CES) develops and produces solutions for the automotive industry. Employing some 1,800 people worldwide, CES focuses primarily on developing and fabricating electronic components, brake systems, driveline solutions and driver assistance systems. Many of its customers are makers of luxury and sports cars who tend to require extremely high standards. This class of automaker needs parts that are both visually striking and extremely durable. Additive manufacturing (AM), also known as 3D printing, is the perfect choice to meet this challenge. AM makes it easy to fabricate complex shapes, and it helps keep weight to a minimum by only applying material where it is actually needed. What's more, 3D printing offers a cost-effective means of low-volume production by eliminating the need for manufacturers to create tools or set up milling machines.

Stefan Kammann heads up the ADaM (Additive Design and Manufacturing) center of competence at CES. He and his team 3D print brake calipers.
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Few automakers are currently using additive manufacturing

Despite these benefits, additive manufacturing in the automotive industry is more of an exception than the rule. Some manufacturers already use 3D printing for prototypes, replacement parts or individual components, but it's still relatively rare to see AM on the production line. This is where CES has taken on a pioneering role. In 2017, the company became one of the few manufacturers in the industry to establish its own additive manufacturing unit in the form of a center of competence for Additive Design and Manufacturing (ADaM). The unit now employs 20 people and is run by Stefan Kammann.

Most of the 3D printers at ADaM print plastic parts, generally as prototypes or for test purposes. "In low-volume production, 3D printing is faster than milling or die casting. That shortens development times," says Kammann. The team also uses additive manufacturing to configure their automated production lines. For example, if they want a robot to take hold of a metal blank, they first have to teach the robot how to do it. Additive manufacturing allows them to fabricate a simplified version of the blank, omitting any connections or brackets that the robot would not come into contact with anyway. This is more economical than using original metal blanks that would have to be discarded after the tests.

TRUMPF lasers are a key part of the company's machinery

CES has also been printing metal parts since January 2018, using two models from the TruPrint 3000 range of 3D printers from TRUMPF. CES has long relied on this Ditzingen-based high-tech company as a trusted partner. It currently has a total of ten TRUMPF systems that it uses to cut, weld and bend sheet metal. Based on the positive experience CES has had with TRUMPF in the past, they opted to take the same route for metal 3D printing.

In January 2018, CES began printing parts for the automotive industry on two machines from TRUMPF's TruPrint 3000 series.
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3D printing improves surface quality of automotive parts

Kammann relies on his two TruPrint machines to print parts that require high quality surfaces. "Only 3D printing can produce a surface as beautifully smooth as this," Kammann says, running his hand over a gleaming accelerator pedal. "This kind of result makes an outstanding impression on customers that produce luxury vehicles," he adds. He also uses the TruPrint 3000 to 3D print mirror housings, displays and control units. CES even uses the TRUMPF machines to print parts for its in-house production needs. Kammann recalls how the team was unhappy with the shielding gas nozzle for the robot welding cell. The cooling channels, drilled apertures and fluid flows simply didn't meet their requirements, so the engineers decided to design and print a new part that would have been impossible to make by conventional means. The new part distributes the shielding gas more evenly throughout the welding cell.

Printed brake calipers brake better

Kammann is particularly proud of a brake caliper he produces for a number of automakers on the TruPrint 3000. It is still fairly unusual to see 3D printing being used for these kinds of production-scale components, largely because suppliers are required to obtain a road permit, which is a complex and costly business. They have to perform numerous tests to demonstrate that the printed part behaves exactly the same on the road as a part made using conventional methods. "Few companies can do that, because it requires in-depth knowledge of the processes and quality requirements," says Kammann. In the case of the brake caliper, the ADaM team carried out computed tomography scans and tensile tests as well as dynamic load tests, which involved applying high pressure to the brakes some 30,000 times. The results showed that the printed brake caliper was actually more resilient than the brake caliper produced by conventional means. "That was enough to persuade our customer to use AM methods to produce the brake caliper in the future," says Kammann. Even better, the 3D-printed brake caliper turned out to be quicker to produce. The delivery time for traditional sand casting methods is around 12 to 14 weeks, but that drops to just one week with 3D printing. Conventional manufacturing methods may be cheaper for bigger orders, but 3D printing is an excellent choice for producing brake calipers in small batches.

The ADaM team now uses TRUMPF 3D printers for a whole range of parts, including mirror units, brake calipers and housings for control units and displays.
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Auto industry needs to be more open to additive manufacturing

Kammann hopes that, in the future, his customers from the automotive industry will be more willing to embrace 3D printing. Ultimately it's the OEMs that decide on the manufacturing method. According to Kammann, OEMs are often concerned that the technologies are not mature enough and that validation will be too complex – but these concerns are unfounded in the case of CES. "We have all the standard manufacturing methods in house, too, so we only use additive manufacturing when we can see that it will really add value. AM offers huge opportunities, especially for complex small-batch production. That's what we want manufacturers of luxury and sports cars to understand," says Kammann.

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SPOKESPERSON FOR MACHINE TOOLS