



# PEDAL TO THE METAL

HOW CONCEPT LASER  
IS SPEEDING UP  
PRECISION TOOLING



**ACCELERATING  
3D TECHNOLOGIES**

**T**he 3D printing of metals is the industry's fastest growing sector; various reports suggest that sales of metal-based 3D printers are up on last year's numbers by upwards of 50%. According to a recent survey of additive manufacturing (AM) professionals the use of metal additive manufacturing is set to double over the course of the next three years, in that same survey 84% of participants said they'd like to see further developments in metal materials for additive manufacturing.

One company leading the way in metals both in terms of growth and R&D is Concept Laser. After revenue growth of 75% in 2014 the German machines manufacturer consolidated its growth with a further 35% revenue increase in the first six months of 2015. While 45 systems were sold in the same period of the previous year, the company received 68 orders this year, a significant increase of around 50%.

The company's founder, President and CEO, Frank Herzog pioneered laser melting technologies a decade and a half ago; his work in developing Concept Laser's LaserCUSING® technology has seen him nominated for the prestigious German Future Prize 2015 for Concept Laser's work on project with Airbus as well as winning the 2015 European CEO award for his entrepreneurship in the additive manufacturing sphere.

Having met with Frank Herzog during a tour of Concept Laser headquarters in Lichtenfels, Germany last year it is clear from his passion for the future this isn't a company resting on those laurels. The fact that approximately a third of the company's employees are within R&D shows a dedication to furthering the technology and not just profiteering off a bandwagon. Frank told TCT how he has set forth plans for future-proofing Concept Laser's team:

"A commitment to training the next



QTD-Insert Drill by MAPAL Dr Kress AG



Airbus Bracket Connector



Stirling Engine Concept by DEKA Research and Development

generation is close to my heart and the establishment of the "Concept Academy" provides the ideal platform for consistent efforts in this area," explained Herzog. "I believe that on-going training and development are the best way to create a strong nucleus and a basis for future development of LaserCUSING, to get young people enthusiastic about joining us and to expand the possibilities for additive manufacturing in industry. I think that these young people hold the real potential for the future and we need to facilitate and support their development."

#### TAKING A LEAF FROM MAPAL'S BOOK

Part of Concept Laser's unprecedented growth is down to an enthusiastic user-base, willing to take on projects to truly revolutionize the traditional design process. A great example of this is the aforementioned Airbus project, if you've been to see Concept Laser at a trade show you'll no doubt have come across the Airbus A350 XWB connector bracket. The small but truly groundbreaking part is now airborne serving three major airlines, the bracket is 30% lighter than its traditional counterpart and is the first titanium component produced using 3D printing on-board a commercial aircraft.

Although aerospace, automotive and medical are oft quoted primary verticals for all metal AM companies it is perhaps a less sexy application that has many in the industry standing up and taking note. The cover star of this very edition of TCT is a QTD-series insert drill by precision tools specialist Mapal, as you've probably guessed it is manufactured additively, with LaserCUSING technology.

The benefits in additively manufacturing this part are vast, because of the technology's inherent ability to create complex internal geometries Mapal were able to design spiralling ducts in order to increase the flow of coolant to the drill head meaning that it can work longer and faster than

previous incarnations. Dr Dirk Sellmer, Head of Research and Development at Mapal explained: "Compared with the previous central coolant supply with 'y' diversion, a spiral coolant routing increases the coolant flow by 100%."

Currently using two Concept Laser M1 cusing systems Mapal is in the process of applying AM in areas where it has seen innovation hampered by previous limitations in production. Another project has seen the German company use similar methods to those discovered in the manufacture of the QTD insert drill in order to improve hydraulic clamping technology.

Hydraulic chucks improve precision, process and reliability but have previously had one major drawback, temperature resistance. As trends in metalworking move to more high-speed machining, heat resistance becomes a huge issue. If operated at over 50 °C traditional hydraulic chucks can burst, ruining an expensive part. Mapal has been working on solutions to this problem since 2009 and has recently had a breakthrough using LaserCUSING technology.

By using a specially developed steel-based metal powder and an entirely new design Mapal has eliminated the need for brazing the basic body and expanding sleeve together. The brazed connection is the problematic area when working at high temperatures, the new design allows for a greater heat transfer meaning the chuck can now work at temperatures up to 170 °C.

"Additive strategies shift the design principles towards product solutions which would have been inconceivable previously," said Dr Sellmer. "The products offer obvious positives for us and our customers. There is no other way if you want to be successful in future."

#### ENGINEERING IN THE USA

Mapal's adoption of metal additive technologies was mirrored at formnext powered by tct; the event

showcased how multi-nationals like Audi are implementing additive technologies into their production processes. Though the execution of metal AM in Europe is fast approaching mass-adoption, the landscape in the U.S. is very different; President and CEO of Concept Laser Inc (the U.S. subsidiary), John Murray, outlined to TCT the potential reasons why:

"Fully dense metal part processing was developed by our founder and CEO Frank Herzog so it makes sense



Concept Laser's M2 cusing Multilaser

European companies were the early adopters. However, it also seems European customers are more aggressive about adopting these new technologies and techniques," explained Murray. "Tooling with conformal cooled inserts, for example, is something that Hofmann Tool Manufacturing has been using for well over a decade. There is minimal adoption of this capability in the U.S. to date. Concept Laser is now 15 years old so the early adopters of metal AM have well over a decade of experience and a significant lead over U.S. companies. The U.S. market is just now beginning to open up."

Since the U.S. arm of Concept Laser, Concept Laser Inc., began operations back in August 2014 the company has seen unprecedented growth. So much so that during a recent visit by the company's founder, Frank Herzog, it was announced that the U.S. subsidiary would already have to move to a larger premises because its Grapevine, Texas, HQ was 'bursting at the seams'.

With a full stock of parts inventory at the Texas HQ and five field service engineers located nationwide, Concept Laser Inc. is perfectly placed to serve growing demand as well as the 75 plus machines installed across the U.S., Canada and Mexico. One of Concept Laser Inc.'s most progressive and longstanding customers is DEKA Research & Development, headed up by the inventor of the Segway Human Transporter, Dean Kamen.

DEKA have been using plastic 3D printing technology since its inception for rapid prototyping

purposes. DEKA was an early adopter with their acquisition of a Concept Laser M2 machine. This has meant the company is able to ramp up many of its more elaborate projects, like that of the Stirling Engine. The 19th Century invention can convert electrical power from any heat source, its advocates say it is one of the world's most efficient engines; its drawback has always been the engine's bulk-to-output ratio. DEKA is trying to eliminate that drawback using 3D printing's inherent ability to create complex geometries in an array of materials.

If successful the DEKA Stirling Engine could supply electricity to those far-flung corners of the world yet to be reached by a grid system. Helping out those in the developing world is a passion of Kamen's and the Stirling Engine excites him, he told Forbes Magazine last year: "We have powered them using cow dung in Bangladesh, and even by burning olive oil."

With a burgeoning customer base implementing LaserCUSING technologies into massively different applications globally it is easy to see how Concept Laser has established itself as one of the leaders in metal 3D printing. "German engineering and quality is highly respected worldwide and our machines reflect the disciplined engineering and manufacturing," detailed US-CEO John Murray. "Customers want machines that are reliable and consistent. Our recent advances are aimed at increasing the productivity and yield of our machines, while enabling our customers to certify their products' performance with confidence." ■

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The HTC with Narrow Contour from MAPAL Dr Kress AG