



Christoph Hauck, CEO.



Toolcraft: providing the best po

Toolcraft is a medium-sized, family-owned company that specializes in the manufacture of high-end precision parts and components. Its goal is to provide qualified and integral solutions, tailor-made to fit the needs of its customers.

3D fab+print talked to Christoph Hauck, CEO. He told us that the company's drive is to become a long-term, straightforward, and personal partner to its customers – a partner that embraces their challenges and meets them as quickly as possible with the highest product quality standards. We discussed what makes Toolcraft unique and successful, and naturally their very active role in additive manufacturing.

By Joanne McIntyre and Gillian Gane

The company was founded in 1989 in a garage rented by its owner Bernd Krebs, who started out on the road to business success with the aid of a three-axis milling machine. Anno 2016 and the company is still a 100% privately-owned company where Bernd Krebs is now the Managing Director. One of the big differences between the company then and now is that today it has around 290 employees.

Toolcraft first got involved in additive manufacturing in 2005 when it was submitted a 3D-printed part of a jet engine for CNC machining. The aircraft part had been printed by one of the company's customers in a nickel-based alloy. Mr. Hauck takes up the story: "The client placed the CNC machining order with us so that it could be finished to the necessary



ssible solution for its customers

roughness values and tolerances.

However, as this was the pioneering days of 3D printing, the quality of the product was really bad – it looked more like a Swiss cheese in terms of porosity than a jet engine part to my eyes and, to be perfectly honest, I found it difficult to believe in a future for the technology when I saw my first 3D-printed parts”.

Developing into a leader

It soon became obvious, nevertheless, that whilst not initially being a prominent runner in the 3D print industry, Toolcraft did have a unique approach to doing business. Right from the outset the company was keen to deliver complete solutions to their customers. Moreover, they had everything in-house to enable them to achieve this: “We had more than sixty multi-axis CNC machines, seven

wire cutting machines (which give a better finish than using a saw), equipment for heat treatment, and CMM and optical measurement devices,” says Mr. Hauck, “so it was just a matter of purchasing a printer and we already had the equipment to carry out six different stages of production.” A part would go from their engineering department through printing production, then heat treatment, on to wire cutting, CNC machining, and finally for a last inspection by CMM or optical measurement. The company additionally have a Nadcap approved FPI line for non-destructive testing by fluorescent penetrant inspection, which makes them quite distinctive.

In the years after 2005, Toolcraft staff began to look more intensively at the quality of 3D technology. One of its

customers, located in the south of Germany with whom they worked very closely in the field of R&D, got them to invest in a 3D printer. The client had seven 3D printing machines running at their facility and wanted Toolcraft to support them. “We decided, at that time, to purchase a Concept Laser printer, which had more open parameters than some of the others available on the market and its performance seemed the most fitting for our company,” continues Mr. Hauck. “In fact, we went out and invested around one million Euros, installing our first 3D printer in 2011. As Toolcraft was much smaller than it is now, this obviously represented a significant investment. However, the case clearly illustrates the openness and business acumen of Mr. Krebs to new ideas and technology as he was even not familiar



Metal laser melting at Toolcraft.



Toolcraft's automated solution with two CNC milling centres.



Taking optical measurements of a lightweight structure (source AKTIV Karmann).

with 3D printing at the time of approving the investment. Nevertheless, when I asked him for the funding for the 3D printer he was willing to take that leap of faith and give me the go ahead. It was an M2 machine, which could also be used for reactive materials, aluminium, and titanium. We choose this because we really did not know what to expect from the market. We also wanted to have the possibility to be able to work with as many materials and parameters as possible."

It became evident that Toolcraft had a huge potential for this new additive manufacturing business right from the start as the company already had a database containing several hundred clients – additive manufacturing being just a small section of their precision parts work. Toolcraft further had moulding and robotics divisions connected to their engineering division so they are able to program robotics on their CAM systems.



Analysing tools in the field of metal laser melting.

Beating the economic recession

When starting up in additive manufacturing, the company decided to focus on its top twenty customers, who actually were a cross segment of all the industries it

currently worked for. It was this variety of work that gave Toolcraft its great edge over its competitors when the economic crisis hit in 2009. While its competitors' businesses to fall by a margin of 20–30% Toolcraft's business remained stable during this period, albeit with less growth, but growth none the less.

"We were able to hire six new people in the worst year of the crisis due to the fact that we had customers across a broad range of industries including the medical and aerospace sectors (for which we have independent quality certifications), semi-conductors, and defence and space so we had and have tremendous diversity that we are extremely proud of," continues Mr. Hauck.

"Toolcraft focuses on producing world-class parts, particularly those for the aerospace and automotive industries."

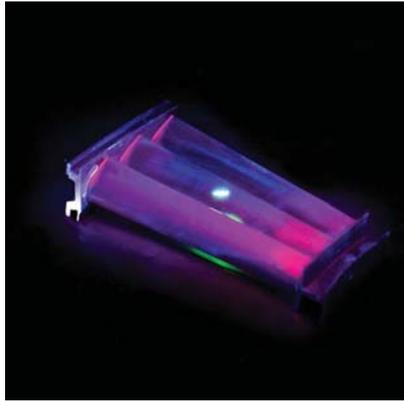
From 2011 onwards part of Mr. Hauck's role in the company was to convince existing customers to turn to 3D metal printing. "We had a small budget to spend to achieve this and as might be expected initial turnover was low. Fortunately, we had the financial support of our other businesses to cover it. In 2012 we got our second 3D printer and now we have six machines at our plant. By the end of 2016 we will take delivery of our seventh," he tells us "so growth continues rapidly."

Printing metal vs. plastic parts

Toolcraft only prints metal parts. It would be possible for it to handle plastics as it also has an injection moulding depart-

ment with twenty injection moulding machines and an affiliated facility in Indonesia, but the company considers that there is generally too much competition in the plastics market to make this investment worthwhile. Even when looking at the metal additive manufacturing sector in Germany at the moment, there are many companies producing cheap, lower quality parts. Toolcraft, therefore, prefers to focus on producing world-class parts, particularly those for the aerospace and automotive industries – parts that are capable of being subjected to high-fatigue levels. For this reason the company concentrates on productions using nickel-based alloys, titanium alloys, and high-strength aluminium for which they use Scalmalloy® together with APWorks.

"It's quite a feather in our cap to use Scalmalloy® as there are very few customers allowed to use it yet since it is a very new powder from the Airbus group. It's the best aluminium alloy with the best fatigue properties and strength – double that of aluminium silicon that is generally used as an alternative for the same parts around the world at present," continues Mr. Hauck. Moreover, he continually scans the market and talks to customers to explore where a demand for new alloys exists. In this connection, Toolcraft is currently working on a new tool steel with a six times higher conductivity value than present standard ones. And the company's R&D division



Even microscopically small cracks are revealed in the evaluation cabin.



Scalmalloy® is unique in the market. Source: APWorks.



Components produced using additive manufacturing with high-performance metals.

is heavily involved in working together with universities looking into new alloy possibilities.

Products and services in relation to future robotics

“We are presently working closely with a large German OEM supplier of CAD software to find one overall solution to CAD, CAM, and ALM so that we can ascertain an answer to the question ‘Is the customer satisfied?’ It’s very surprising but no supplier seems to be asking this at present. Printing 3D metal parts means switching between different systems, so we are not interested in using an STL model. We want to work with CAD suppliers to integrate ALM into our systems, which will enable us to carry out not only the engineering of parts, but also ALM and final machining in one production system,” continues Mr. Hauck.

Something else Toolcraft would like to develop is an automated process for the removal of the manufactured part’s support structure at the end of the printing process. At present this has to be done manually but the company is looking into the possibilities of incorporating a milling machine or a robotics solution into the equation. What is clear, however, is that everything needs to be controlled through one software system. Toolcraft is working closely with an OEM and a machine supplier to produce a solution and hopes this will be realized by mid-2017.

Finding the right solution

“Right from the very start,” says Mr. Hauck “we have always totally

understood the requirements of precision parts. The knowledge that we already had of 2D drawings and being able to interpret native data allowed us to prepare a total solution for the customer so that he will always receive a quality part that will fit into his overall assembly. Another advantage is that, because we are more than just a 3D printing company, we are able to offer the best

not we will carry out the CNC machining from plate, round bar or by fine casting or forging. Not every spare part with a traditional design will be 3D printed in the future. You have to think of 3D printing as just one possible solution. We always look at the best solution for the customer, based on all the information we get from them. This is naturally appreciated.”

“We always look at the best solution for a customer, based on all the information we get from them.”

solution to our customers. For example, we might be asked to produce parts through 3D printing but will actually recommend that a different technology is used for reasons of quality or cost effectiveness.”

“Presently, everyone wants to get their spare parts 3D printed but, to be honest, this scares me a little. We continually produce spare parts but rarely by 3D printing because this methodology requires special designs. You cannot just substitute the existing designs for a part that was cast or milled with something which is 3D printed. When this is actually the case, it is necessary to carry out a reverse engineering process on the part by taking optical scans, examining tolerances and drawings, and deciding what quantity and lifetime are required, etc. Only then is it possible to decide on the best solution to produce the part – 3D printing or not. One option may well be 3D printing with CNC machining but more often than

Sharing Toolcraft knowledge

“We like to feel that we work together with many customers in the field of additive manufacturing and in this way have produced some great solutions because there definitely are parts that can be produced faster, cheaper, and with a better performance by using this technique. However, we know the demands and requirements of our customers well and can recommend to them which parts it makes sense to produce by 3D printing and which not depending on their overviews of products, parts, assemblies, and materials. For example we may see how we can engineer or change the design slightly to print everything in one. This service, offered in our workshops, is free as it helps us obtain the order and keep our customer happy. Some companies charge for this as they feel they are selling their knowledge but for us it is just another way to bind our customers to us and continue the process of our mutual success,” concludes Mr. Hauck.