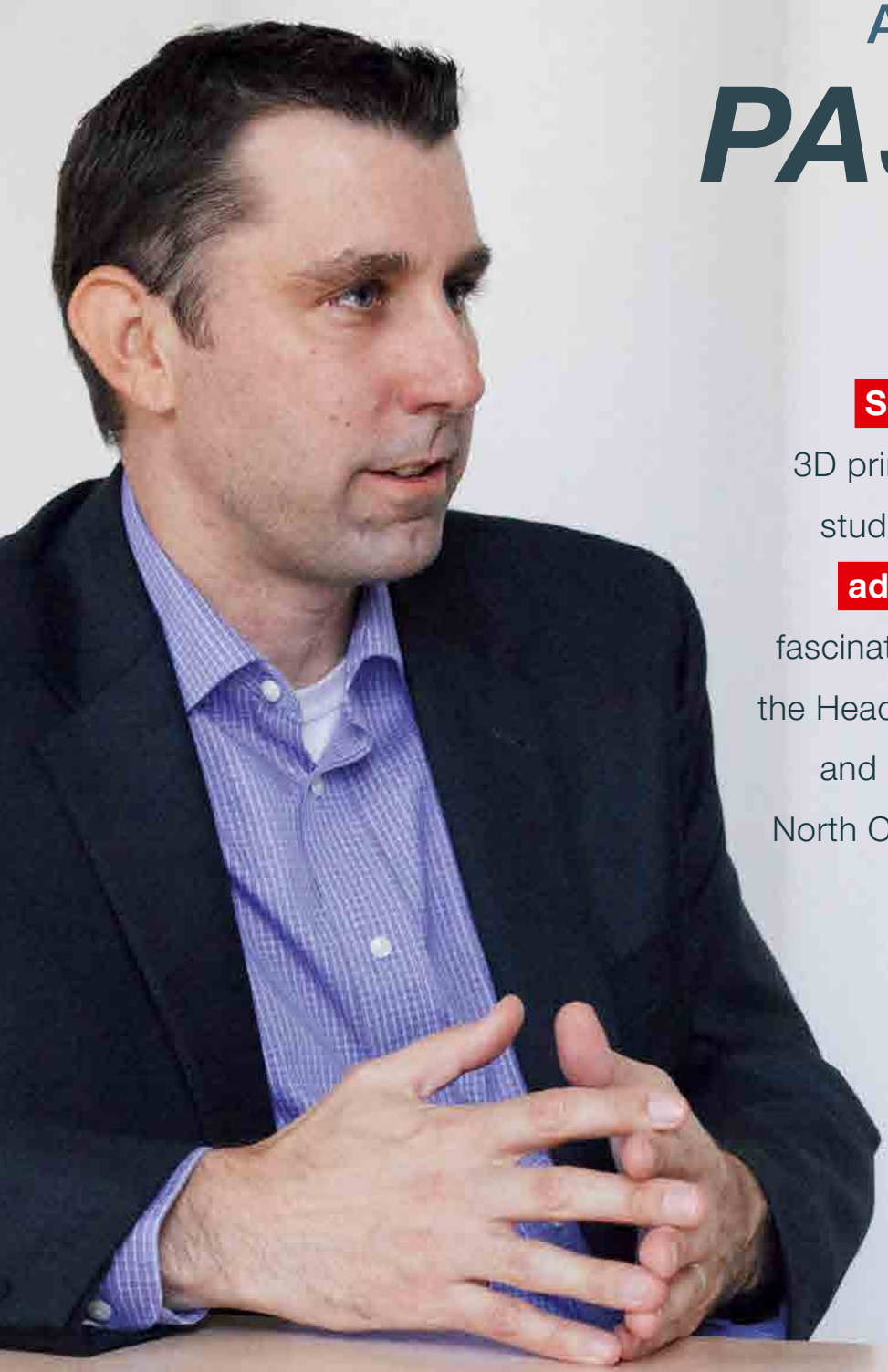


A QUESTION OF *PASSION*

Shawn Kelly encountered a 3D printer for the first time while a student. Since then, the topic of **additive manufacturing** has fascinated him. Anyone who meets the Head of Oerlikon's AM Research and Development department in North Carolina will understand why.

By Gerhard Waldherr

«AM is able to create bionic structures ***with which nature's phenomena can be transferred to technology.***»

He had gotten off the bus that brought him from Munich to the AM Technology & Innovation Center in Feldkirchen only a moment before. Now Shawn Kelly shoved a piece of pizza into the microwave and poked his head through the door to ask if it would be all right if he were fifteen minutes late for the interview. There's been a lot going on. No time for lunch. "I'll just have a quick bite to eat and then I'll be right with you, okay?"

No problem. Kelly has behind him an overseas flight, jet lag and two hectic days at Oerlikon's 1st Munich Technology Conference, at which the future of additive manufacturing (AM) was discussed. Representatives of industry, science and government met for this event at the Technical University of Munich. Roland Fischer, CEO of Oerlikon, was there, as were Mohammad Ehteshami from GE Additive; professors Akhatov, Todd and Schleifenbaum from Moscow, Sheffield and Aachen; and representatives from Audi, MTU Aero Engines and 3D printer manufacturer Trumpf, as well. In short: Exciting lectures, interesting talks in between and not much time for sleep.

Kelly was much in demand, too. After all, he plays a central role in Oerlikon's ambitions concerning the new AM business unit, in which a total of 300 million Swiss francs are to be invested. Kelly works in Charlotte in the US state of North Carolina, where a research and development center with production capacity encompassing 40 printers is being established. There, he heads the AM Research & Development department, which also employs seven engineers and four technicians.

Printing is not enough

His break over, he is ready for the interview to begin. What one notices first is the calm competence he projects. This is a man who considers carefully what he says and also makes sure that what he's said is understood. A man one trusts instinctively, especially when he says right at the outset: "It doesn't matter whether you're talking about additive manufacturing, laser sintering or 3D printing: Don't be taken in by the hype – I've already experienced the cycle of a rise, fall and renewed rise of this whole topic."

At the moment, AM is considered to be the next industrial revolution. It appears that the elements for this are in place – or what does Kelly think? He leans back, gently shakes his head and says: "It's not just about printers and powders, it's also about efficiency, reliability and quality. It's about completely new process modalities. And there is a long way to go before we get there. Printing is easy. In the end, you have a part for a jet engine that looks like a part for a jet engine. But the question is, does it work, too?"

The aerospace sector is a good example. Here, in particular, AM is able to replace conventional production, especially of parts that need to be unusually light, are produced in low quantities and are therefore extremely expensive. "At the same time," says Kelly, "we have been able to create completely new parts thanks to AM." 3D printers are able to create bionic structures with which nature's phenomena can be transferred to technology. In doing so, engineers face no creative limitations; they are able to focus entirely on the functionality. Kelly states: "AM offers massive advantages here as compared to classic, industrial manufacturing."

From childhood dream to Oerlikon career

He grew up in Baltimore. As a child, he liked playing with Legos. Everything he was able to build with his own hands was fun. At that time, the NASA space shuttle was making regular trips into space. Kelly says: "I was a great fan; even in kindergarten, I already had the dream of working for NASA in a lab. It was clear to me very early on that I was going to be an engineer."

In 1995, he began his studies in materials science and engineering at Virginia Tech. The investigation of the structures and properties of metals, plastics, ceramics and glass was not considered hip at the time. Nonetheless, Kelly says: "I have never regretted the decision. Materials, especially metals, are a fascinating field and few people understand what drives their performance." →

Additively manufactured double nozzle for aerospace applications.

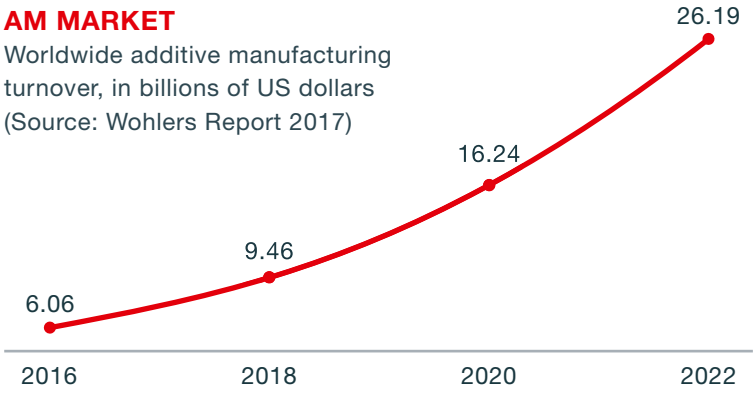
«When the microstructure is understood, ***the properties of the material can be modified and employed advantageously.»***

During college, his kindergarten dream came true. Kelly was able to spend one practicum semester in the NASA Goddard Space Flight Center. There, he researched adhesives and connecting pieces for the Cassini space probe, which was to crash into Saturn 20 years later. Kelly, once again: “The time I spent at NASA was exciting, but afterward, it was clear to me: I don’t want to spend the rest of my life just testing materials, I want to understand these things better and at greater depth.”

One day, a professor suggested a research project to him that was initiated by Boeing and dealt with titanium from a 3D printer. Kelly had no knowledge of the processes with which the material was created. “Consequently, I had to investigate what took place thermally. Some microstructures are changed by heat, and some are not. It was only as a result of my investigations of the microstructures that I was able to understand how the material was put together.” Kelly turned the project into a doctoral thesis. The fascination with 3D printing has never left him since.

AM MARKET

Worldwide additive manufacturing turnover, in billions of US dollars (Source: Wohlers Report 2017)



After completing his doctorate and two engagements as an assistant at universities, Kelly landed at EWI in Columbus, Ohio, one of the leading companies for the development and deployment of new technologies. In 2015, Kelly was the head engineer in the area of AM when Oerlikon contacted him to ask if he could imagine setting up a competence center for additive manufacturing on Long Island, in the New York City suburbs. “It sounded interesting,” says Kelly, “but I liked my job, I enjoyed being in Ohio, and my wife and I couldn’t really picture ourselves on the east coast at that time; Long Island was not a good fit for our plans.” Kelly declined and recommended his college friend, Jeff Schultz.

A few months later, the phone rang again. This time it was Schultz who was calling. He had gotten the job at Oerlikon and was thrilled: “We want to industrialize AM. Maybe you could come after all?” Kelly met Florian Mauerer, who set up the AM area at Oerlikon. He also met further representatives from management. He discovered, “They all had an understanding of the technology and were committed to the concept.” Moreover, as a manufacturer of metal powders for 3D printers, Oerlikon is well acquainted with the subject. Establishing AM as a comprehensive business unit was a completely logical move. He had found his sweet spot: “I knew what it would take to get things up and running, and I knew that at Oerlikon, I could implement my ideas and make a difference.”

The playing field of microstructures

Given that AM has already proven its utility in gas turbines, Kelly sees immediate potential for its application in the aerospace and energy sectors. “Everything else is possible as well, but we need to be patient.”

In response to reports of success using huge, multi-million-dollar machines to print cars, concrete parts for bridges or pavilions made of carbon rods, he offers a different perspective. “We can print the craziest structures,” says Kelly, “but what many overlook is that we can not only create shapes with AM, but also materials which could never be produced using conventional methods. The really exciting thing is that we can virtually create our own microstructures, which are of decisive importance for the properties of a material.”

When the microstructure is understood, the properties of the material can be modified and employed advantageously, he explains. “We can also use this approach to offer the customer new possibilities or suggestions for solutions for better, more efficient production. That’s exactly what Oerlikon is all about, and that’s what we want to research and learn about so that we can make even greater, more daring and innovative decisions in the future.”

Before Kelly came to Oerlikon, he had never been outside of the USA. Now he regularly commutes between Charlotte, the rest of the US, Zurich, Feldkirchen and Magdeburg. As he does so, he remains in virtually non-stop contact with his colleagues, an eclectic mix of people from every country imaginable.

The professional demands come at certain costs to his personal time, but he has found his calling. “Do you know why I do all this? It is totally fascinating to have the privilege of developing something significant with a team of young and passionate people,” he says. “I don’t want it to sound overblown, but this is a once in a lifetime opportunity for the team and for Oerlikon.”

«It is totally fascinating ***to have the privilege of developing something significant with a team of young and passionate people.»***