DDMC2016
Fraunhofer Direct Digital Manufacturing Conference

Ask an expert – our keynote speakers answer four questions about additive manufacturing!

					
Question	**Richard Bibb**	**Martin Hillebrecht**	**Karl-Heinz Dusel**	**Wouter Gerber**	**Boris Chichkov**
What do you find most exciting about Additive Manufacturing?	As a designer, it is the new possibilities that AM offers that are so exciting. Especially in my medical design work; things we wished for in 1998 when we started are now possible and becoming possible in everyday practice, changing people's lives and improving quality of life. We are still finding new ways in which AM can enable new ideas and new products in all kinds of applications.	• AM will leave the applications of "rapid prototyping" and expand the traditional production processes and structural design rules to a further revolutionary dimension. • AM produces highly complex, integral functional load-oriented and highly efficient structures that cannot be manufactured by other manufacturing processes. • Components can be direct manufactured from the data set or be specifically provided additively with reinforcing elements, enabling fast, flexible and customized production.	Additive Manufacturing is a disruptive technology over a widespread field of applications and materials. Being still in a niche today, it'll give us a huge variety of new chances and possibilities in the future, doing things in a complete different way. The various application spectrum gives us even in critical application fields as aerospace the possibility to a step-wise implementation from toolings, development parts down to critical production parts.	The most exciting aspect is the posiblities around multy material components that can be manufactured in situ; Hard alloys where you need it and lighter material where you can…	Additive manufacturing allows production of very comlex components, which cannot be fabricated using standard technologies.

Which key developments have taken place in AM over the last 5 years (in terms of technology, materials or applications)?	Metal AM has been around for longer than 5 years but it is only in the last few years that the technology has become reliable and more widely available. Metal AM enabled so many of our research advances in medical applications. The easy availability, ease of use and dramatic cost reduction of 3D scanning, CAD and 3D Printing has also made AM available to a much wider community and removed many of the financial obstacles that hindered our research in the past.	• Established in Rapid Prototyping, Rapid Tooling and in special tooling • First realization of production-ready applications on an industrial scale for product development • Qualification of metallic series materials in the aerospace industry. Research activities to reinforce 3DP plastics with higher fiber contents • Progressive technology development for upscaling of processes • Multifunctional applications such as ultralight and highly functional cooling structure for power electronics (EDAG), bionic gripper (Festo), aeronautic brackets (Airbus, LZN) and first pilot demonstrators as NextGen Spaceframe (EDAG, LZN, BLM, Concept Laser)	In terms of manufacturing technologies and materials for aerospace applications in the past five years the process understanding and process chain development for production showed significant progress. Key developments for critical applications is all about online process monitoring, as, e.g., MTU's Online Tomography, which is a crucial element of our quality assurance of production parts.	Even though the technology is getting beter, the most fundamental shift is the availability of software to assist in the optimisation and design of components tailored for AM	3D printing became a mass product
What big challenges is AM facing in coming years?	There are many challenges that we would like to overcome especially with materials. Physical properties, especially long-term, are not good enough for many of the applications we are working on. The current risk is managing expectations and overcoming the inevitable disillusionment of unfulfilled promises and over familiarity. The challenge is to harness the enthusiasm for AM but direct it towards genuinely useful products that can improve the quality of all our lives.	• When using AM, a significant added value to be generated (for example, increase the productivity of production, improve customer value by customizing or additional functionality), which justifies the current additional costs compared to conventional production. • It must be specifically designed for various applications in the automotive sector new cost-effective and robust to machine materials (plastics & metals). So far, there are still too few materials, especially in the field of metals. • The additive manufacturing processes have to be integrated in established	Additive Manufacturing is still on the step from prototyping to getting an accepted production technology. Main challenge for the technology is to prove reliability, process stability not only of the AM machines, but also along the complete process chain. A stepwise implementation with low risk applications will be required to create confidence in the technology before stepping into more critical parts.	Speaking from a civil aviation point of view; there are still significant work to be done in understanding the processes for manufacturing and certifying fatigue loaded components	Implementation of AM technologies in production lines

		manufacturing processes chains. On the other hand decentralized production structures will increase the flexibility and efficiency of the future production significantly. • Process understanding: We need to change designers minds to "additive thinking" in order to fully exploit the advantages of additive manufacturing procedures. The engineers must be trained and educated according to fully exploit the potentials. • New approaches to quality assurance are to be developed for an industrial scale. • The software tools for the engineering design not yet take account of the specific areas of action and design rules of the additive manufacturing process.			
Of the many possibilities for AM technology, could you give us a brief description of one that you expect or hope will be developed in the near future?	I would like to see our work on orthoses develop into genuinely widespread, evidence-based clinical practice where patients get to be involved in the design of the orthoses with their choice of colour, pattern and material. Our vision is for beautiful, effective orthoses that are clinically proven, robust but fast and cheap enough that everybody can have as many as they like and replace them whenever they like.	• The intelligent combination of conventional manufacturing processes with "a pinch" of additive manufacturing technology should allow economic solutions that are characterized by significantly increased functional properties. • The development process chain from the specification of the topology analysis, algorithm development, bionic design, manufacturing-oriented design is not yet established today and still very time-consuming. It is to develop a new integrated development process chain	Especially in aero engine development there is big potential in using new, high-temperature and light-weight materials. Thus high-temperature AM-machines in combination with new powder developments can play an important role in future aero engines (and other high temperature applications).	I would like to see the development of a certified process for in situ manufacturing of aerospace alloys, using either the constituent metals or a master-alloy and remaining constituent metals. This will unlock the true powder metal cost advantage.	3D bioprinting

		and to establish in the company. • Additive Manufacturing will leave the applications of "rapid prototyping" and expand the traditional production processes and structural design rules to a further revolutionary dimension.			