



Advances in Metal Additive Manufacturing

14th Annual International Wohlers Conference

Date and Time	Thursday 29 November 2012, 09:30 – 17:00
Location	Room Frequenz 2, Hall 11, Exhibition Center Frankfurt/Main, Germany
Organizer	DEMAT GmbH
Chairman	Terry Wohlers, Wohlers Associates, Inc.
Conference Language	English
Registration Fee	Full day €300 + VAT (exhibitor), full day €390 + VAT (non-exhibitor), half day €160 + VAT (exhibitor), half day €220 + VAT (non-exhibitor). 10% early bird discount when registering by 31 October. Fee includes entrance into the conference and exhibition, technical papers, refreshments, and lunch.
More Information	Contact Mrs. Verena Frenkler at 49 69 27 40 03 30, verena.frenkler@demat.com, or fax 49 69 27 40 03 40.

Conference Overview

The production of metal parts by additive manufacturing (AM) is gaining impressive attention. Aerospace companies are hard at work qualifying materials and processes and certifying new designs. Medical companies in Europe are using AM to produce metal orthopedic implants in the tens of thousands. Meanwhile, new processes are being developed that are capable of producing relatively large metal parts at a much faster rate.

Metal products for consumers are also being produced by additive manufacturing. Jewelry designers are creating new products that are sold for a premium due to their distinctive look and appeal. Beautifully designed sculptures and other products are also being made by AM.

Attend this event to gain an understanding of the current state and future potential of the technology and how organizations around the world are putting it to work.

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Session I: Morning

Includes lunch and special presentation



09:30

Welcome

Dr.-Ing. Eberhard Döring, Chief Executive Officer
DEMAT GmbH (Germany)

Dr. Döring is a mechanical engineer with a PhD in plastics processing. He created the EuroMold exhibition concept and has been the CEO of DEMAT and exhibition manager since 1996.



09:45

Growth of Metal Additive Manufacturing

Mr. Terry Wohlers, Principal Consultant and President
Wohlers Associates, Inc. (USA)

Through Wohlers Associates, Mr. Wohlers has provided consulting assistance to 170 organizations in 23 countries. He has authored nearly 400 books, articles, and technical papers and has given 90 keynote presentations on five continents. In 2007, more than 1,000 industry professionals from around the world selected him as the #1 most influential person in rapid product development and additive manufacturing. He is the principal author of the *Wohlers Report*, an annual global study that many refer to as the “bible” of the additive manufacturing industry.

Presentation Summary The growth and development of metal additive manufacturing have been impressive. In fact, some argue that it has developed more impressively in 10 years than AM for plastics developed in more than two decades. Organizations in aerospace, medical, dental, motor sports, and some consumer products are aggressively investigating ways in which they can benefit from the range of processes and materials. Government agencies, the investment community, and other groups are also interested in understanding what opportunities the technology may bring.



10:15

Keynote: High-Speed Laser Additive Manufacturing

Dr.-Ing. Ingomar Kelbassa, Department Head
Fraunhofer Institute for Laser Technology (Germany)

Dr. Kelbassa studied mechanical engineering at RWTH Aachen University, Germany. He has been working in the field of laser material processing at the Fraunhofer Institute for Laser Technology (ILT) in Aachen and has served as the chair of Laser Technology LLT at RWTH Aachen University since 2000. Currently, he is vice and academic director of LLT, RWTH Aachen University and department head at Fraunhofer ILT. In March 2011, Dr. Kelbassa became a member of the Fraunhofer Vintage Class, Fraunhofer’s internal qualification program for the next generation of Fraunhofer institute directors. He has authored about 50 scientific publications.

Presentation Summary Laser additive manufacturing (LAM) of parts offers process-specific advantages such as nearly unrestricted geometric freedom, material freedom, and targeted, achievable material properties. Thus, custom parts can be manufactured, repaired, and modified by LAM. This presentation addresses the advances in speed of LAM processes using higher feed and deposition rates. In the first part, the speed increase in laser powder bed fusion processes is presented. The second part focuses on investigations of processing speeds of up to 600 meters per minute in directed energy deposition processes.

11:00

Break and Refreshments



11:30

AeroSwift: The Development of an AM System for Aerospace

Mr. Marius Vermeulen, Program Manager of Additive Manufacturing
Aerosud (South Africa)

Mr. Vermeulen is a senior engineer at Aerosud. He has developed and led the Process Automation team, which focuses on continuous improvement and the development of manufacturing processes for the aviation industry. Mr. Vermeulen’s work in AM has led to his involvement in the Rapid Product Development Association of South Africa and has been the chairman of RAPDASA for the past two years. He is also the RAPDASA representative on the ASTM International F42 Committee and is a member of the F42 Executive Committee. Mr. Vermeulen is leading AeroSwift, a development of a large-scale titanium AM system for the aerospace industry.

Presentation Summary The additive manufacture of parts in advanced metals, specifically titanium, is highly relevant to the so called “high value, low volume” industries, such as aerospace and medical. As a result, the commercial use of AM technologies is constantly on the rise in these markets. Aerosud, a supplier to OEMs such as Airbus and Boeing and to the military aerospace industry, has embraced the technology as a future manufacturing solution. However, commercially available AM technologies have limitations, such as part size and manufacturing speed. A joint project between Aerosud Innovation and Training Centre and South Africa’s Counsel for Scientific and Industrial Research (CSIR) aims to address these limitations.



12:00

Additive Metals: Thinking Outside the Build

Mr. Greg Morris, CEO
Morris Technologies (USA)

Mr. Morris is one of three principals and the CEO of Morris Technologies, Inc., a rapid prototyping, product development, and engineering firm based in Cincinnati, Ohio. Mr. Morris is also a principal with Rapid Quality Manufacturing, an additive manufacturing production-oriented company, and MicroTek Finishing, a precision surface finishing company, both located near Cincinnati. He has been involved in the AM industry since 1994. He has written many articles and presented at a wide range of industry events. Mr. Morris is a member of SME’s Rapid Technologies and Additive Manufacturing Steering Committee and currently serves as chairman.

Presentation Summary When most people talk or think about additive manufacturing, they immediately envision machines building parts layer upon layer with a 3D part coming out of the machine in finished form. The additive machine operation is often only a small part of the process of successfully producing high quality parts, particularly for additive metal components. Mr. Morris’s presentation will take a look at what usually happens prior to starting the additive machine, and the variety of operations and costs associated with metal parts after they are removed from the AM machine.

12:30

Buffet Lunch

Special Presentation For only the second time, a presentation has been scheduled to coincide with lunch. Mr. Tim Caffrey of Wohlers Associates will provide background on the National Network of Manufacturing Innovation, a \$1 billion network of up to 15 institutes proposed by President Obama earlier this year. It will provide details on the new National Additive Manufacturing Innovation Institute funded with \$30 million from the U.S. government and \$40 million from partner organizations. The bidding process and subsequent award of the pilot institute have stimulated unprecedented interest, excitement, and collaboration in additive manufacturing in the USA.



13:30

National Additive Manufacturing Innovation Institute

Mr. Tim Caffrey, Associate Consultant
Wohlers Associates, Inc. (USA)

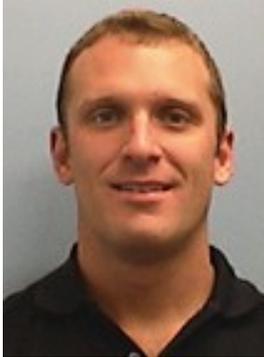
Mr. Caffrey earned a bachelor’s degree in mechanical engineering at the University of New Mexico. He was employed by The Boeing Company for 10 years, including four years directing the operation of the company’s in-house additive manufacturing (AM) services. He also wrote and performed pre-flight operational tests for aircraft engines. Caffrey served as plant manager of Plynetics Express—which was, at the time, the world’s largest AM service provider. He also served as repair development engineer at Pratt & Whitney where he wrote repair and maintenance processes for aircraft engine components.

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Session II: Afternoon

Includes lunch and special presentation



14:00

Transforming Metal Additive Manufacturing

Dr. Ryan Dehoff, Technical Lead for Metal Additive Manufacturing
Manufacturing Demonstration Facility, Oak Ridge National Laboratory (USA)

Dr. Dehoff graduated from Ohio State University with a PhD in Materials Science and Engineering in 2008, where he worked with several additive-manufacturing technologies. Currently, he is a research staff member at Oak Ridge National Laboratory, working in the area of additive manufacturing of parts using a variety of techniques including electron beam melting, laser metal deposition, and ultrasonic additive manufacturing. Dr. Dehoff is developing processing techniques and exploring new materials to improve energy efficiency during part production, decrease material waste, and improve material performance.

Presentation Summary The Manufacturing Demonstration Facility (MDF) at Oak Ridge National Laboratory (ORNL) is helping to transform additive manufacturing using the lab's core capabilities such as neutron scattering, high-performance computing, innovative materials, advanced characterization, and industrial partnerships. The MDF provides the research facilities and expertise to help industry reduce risks and develop and deploy new materials and manufacturing technologies. Dr. Dehoff's presentation will highlight the MDF's research, which includes in-situ process modeling and closed loop control, increasing materials availability, and increasing build rates and deposition volumes. Dr. Dehoff will also discuss future applications and advanced designs made possible through additive manufacturing.



14:30

The Production of Orthopaedic Implants Using Electron Beam Melting

Dr. Ing. Michele Pressacco, Product Development Manager
Lima Corporate (Italy)

Dr. Pressacco is responsible for the development of hip, knee, and shoulder products. He is also leading all developments related to methods of additive manufacturing. He has been involved in the AM industry since 2000 and has written many related articles and presented at a range of symposiums. Dr. Pressacco has conducted research in the development of titanium alloys and processing techniques for enhanced biocompatibility. He received his master of science degree in mechanical engineering at the University of Udine.

Presentation Summary Porous structures have a wide range of applications in almost every modern field of materials science. Due to the ease of tailoring porosity and mechanical properties, porous structures have found applications in the orthopaedic field, in particular to improve osteointegration properties of arthroprosthesis. Lima Corporate is using electron beam melting technology to manufacture a cellular solid, called Trabecular Titanium™, in metallic biomaterials. This method can greatly increase osseointegration in arthroprosthesis and at the same time maintain good mechanical properties and an elastic modulus.

15:00

Break and Refreshments



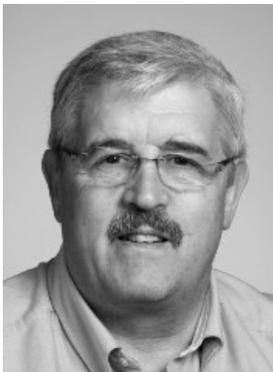
15:30

Electron Beam Melting for Implants: Past Experiences and a Look into the Future

Mr. Andy Christensen, President and Owner
Medical Modeling Inc. (USA)

Mr. Christensen has been active in the additive manufacturing industry since 1996. His vision for Medical Modeling Inc. is to improve patient care through personalized surgical solutions. Each day around the globe, the company's products are used to provide surgical teams with more confidence and provide patients with excellence in reconstructive surgical care through the use of patient-specific anatomical models, personalized surgical guides and instruments, and AM-produced implants. Mr. Christensen is active with the Society of Manufacturing Engineers' Rapid Technologies and Additive Manufacturing community and is the immediate past chairman of the organization.

Presentation Summary In the decade since electron beam melting was introduced, it has been used to produce series production parts in the aerospace and medical device industries. In the medical field, EBM has displaced traditional manufacturing techniques for many products and also enabled the production of completely new products that would otherwise be difficult or impossible to produce. In the future, much of the focus will continue to be placed on these unique applications—where EBM provides value by enabling novel products. Mr. Christensen's presentation will review where we have been with EBM and discuss where he believes the opportunities reside in the future.



16:00

The Commercial State of Precious Metal Laser Sintering and Melting

Mr. Frank Cooper, Senior Lecturer, Jewellery Industry Innovation Centre
Birmingham City University School of Jewellery (UK)

Mr. Cooper has worked for bullion dealers and major jewelry manufacturers in the Birmingham Jewellery Quarter. He has an excellent understanding of both jewelry manufacturing processes and the supply chain, and has many contacts within the UK and globally. Mr. Cooper has participated in research initiatives related to the jewelry industry, and has written and presented technical papers and articles specializing in additive manufacturing, CAD, and prototyping for the jewelry and silversmithing industries.

Presentation Summary Three papers that focused on precious metal additive manufacturing technologies were presented at the 2012 Santa Fe Symposium, the preeminent global conference for the \$180-billion jewelry manufacturing industry. This marked a turning point from theoretical work presented at AM conferences in the past to active commercialization of the technology. Mr. Cooper will provide an expert view of these presentations, discuss the specific technologies involved, examine the business case, and name some of the companies that are now commercially exploiting additive manufacturing in this high value goods sector.

16:30

Panel Discussion

Bring your most difficult and probing questions on additive manufacturing and 3D printing. Plan to attend this interesting and thought-provoking session made up of the day's speakers.

17:00

Final Questions and Closing Comments