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## Seminar: From Powder To Promise

ZEISS 3D Manu**FACT**

Holistic 3D Manufacturing Inspection  
For Aviation, Medical & Automotive

28 November 2017, Tuesday  
9:00 AM - 2:30 PM

### **Advanced Remanufacturing and Technology Centre (ARTC)**

3 CleanTech Loop, #01-01  
CleanTech Two  
Singapore 637143  
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# From Powder To Promise: ZEISS 3D ManuFACT

## Overview and Agenda

3D printing processes, also known as additive manufacturing, are increasingly becoming part of industrial production chains. This is especially true in safety-critical areas such as aerospace, medical technology and automotive industries where demanding standards apply. The biggest challenge is to prove the absolute reliability of 3D printed parts.

To tackle this, ZEISS looks to uncover the FACT in 3D Manufacturing. Through its broad portfolio of imaging and measurement technologies, ZEISS is playing an integral role in the following areas of the 3D printing workflow

**Materials Characterization + Non-destructive Evaluation + Reverse Engineering + High Accuracy Metrology + Data Management and Analysis**

Only this integrated process brings the most trusted knowledge and certainty about the reliability of 3D components.

To find out more, we invite you to join us for this seminar to enjoy the thought-stimulating talks from overseas speakers who have years of valuable knowledge and experience to share. After each talk, there is allotted time for interactive discussions through the Q&A sessions.

While the event is an exciting view into microscopy, metrology and analytical techniques, it is also a great opportunity to network with leading technologists and researchers.

**We hope to see you soon to share our enthusiasm for a future filled with innovation!**

9:00 AM	<b>Registration</b>
9:15 AM	<b>Welcome Address</b> ZEISS
9:30 AM	<b>From Powder To Promise. Research and Quality Control Solutions for Additive Manufacturing by ZEISS</b> Dr. Robert Zarnetta <i>Head of Business Sector Manufacturing &amp; Assembly, ZEISS Microscopy</i>
10:00 AM	<b>Light Microscopy Solutions for Additive Manufacturing – Optical Inspection, Metallography and Roughness and Topography</b> Dr. Robert Zarnetta
10:30 AM	<b>Electron Microscopy Solutions for Additive Manufacturing – Powder Characterization, Grain Orientation (EBSD), Compositional Mapping</b> Mr. Bruno Linn <i>International Sales Director, Electron Microscopy, ZEISS Microscopy</i>
11:00 AM	Coffee Break
11:15 AM	<b>X-ray Microscopy for Additive Manufacturing</b> Mr. Luke Hunter <i>Solutions Manager, Business Sector Manufacturing &amp; Assembly, ZEISS X-ray Microscopy USA</i>
11:45 AM	<b>CT Inspection &amp; Measurement Solutions for Additive Manufacturing</b> Mr. Ralf Benninger <i>X-Ray Sales Development Manager, ZEISS Industrial Metrology Asia Pacific</i>
12:15 PM	<b>3D Scanning Solutions for Additive Manufacturing</b> Mr. Alden Aranzano <i>Product Support Manager, ZEISS Industrial Metrology Southeast Asia</i>
12:45 PM	<b>Quality Data Management Solutions</b> Mr. Alden Aranzano
1:15 PM	Lunch
2:00 PM	<b>Tour of ARTC</b>
2:30 PM	End of Seminar

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# From Powder To Promise: ZEISS 3D ManuFACT

## Speakers and Abstracts



### **Dr. Robert Zarnetta**

Head of Business Sector Manufacturing & Assembly, ZEISS Microscopy, Jena

9:30 AM

#### **Talk Title: From Powder To Promise. Research and Quality Control Solutions for Additive Manufacturing by ZEISS**

Additive manufacturing techniques can produce complex anisotropic 3D structures. The reliability and performance of the produced parts relies heavily on the resultant microstructure, surface parameters and correct dimensions. These challenge require research and quality control tools to gain insight into these complex structures for a wide range of materials.

ZEISS offers a broad range solutions from optical inspections of powders, characterization of microstructure to metrology applications and handling the data flow. This introduction will give an overview on the applications and characteristic lengths scales that help to verify part quality and help to understand the production process in order to enable repeatability and reliability.

10:00 AM

#### **Talk Title: Light Microscopy Solutions for Additive Manufacturing – Optical Inspection, Metallography and Roughness and Topography**

Light microscopy solutions address important fields of applications such as optical inspection of powders, of produced parts and pore size and pore size distribution. Moreover, light microscopy solutions are usually the first step within a failure analysis workflow and are suitable for surface roughness and topography measurements. Last but not least, they provide the possibility for optical metrology on small dimensions and thus are an important foundation for qualification of additive manufactured parts.

### **About the Speaker**

Robert Zarnetta joined ZEISS Microscopy in 2012. He was responsible for developing the industrial sales strategy and structural blue print for Microscopy and the implementation thereof. In 2014, he joined the SSC Germany in order to help establish an independent industrial sales organization and was responsible for leveraging the full ZEISS portfolio within the industrial markets. In 2017, he took over the role as Head of the Business Sector Manufacturing & Assembly and thus drives the connected solutions portfolio spanning all major applications for microscopy and (optical) metrology across different market segments and trends such as transportation and e-mobility.

Born in Karl-Marx-Stadt, Germany and growing up in Berlin, Robert moved to Jena at the age of 19 and studied Material Science at the Friedrich-Schiller-University. After completing an exchange year at the Dalhousie University in Halifax, Canada; he worked at Caesar, Bonn, Germany and moved on for his PhD to the Ruhr-University in Bochum, Germany. While completing his PhD, he was in addition a Fellow of the International Max Planck Research School for Surface and Interface Engineering in Advanced Materials and received the Young Researcher Award of the German Materials Research Society in 2010. After his work as Science Manager at the Ruhr-University Bochum, he joined Roland Berger Strategy Consultants (Munich, Germany) within the Engineered Products & High-Tech Competence Center covering Basic and Advanced Materials, Microelectronics and Aerospace and Defense markets.

## From Powder To Promise: ZEISS 3D ManuFACT

### Speakers and Abstracts



#### **Mr. Bruno Linn**

International Sales Director, Electron Microscopy, ZEISS Microscopy

*10:30 AM*

#### **Talk Title: Electron Microscopy Solutions for Additive Manufacturing – Powder Characterization, Grain Orientation (EBSD), Compositional Mapping**

Electron microscopy solutions enable high-resolution imaging of critical surfaces (such as powders) and a detailed characterization of microstructures (e.g. using EBSD). In addition, they provide the capability of analytics: composition mapping in order to qualify the material homogeneity.

Moreover, they are capable of providing 3D Dataset (destructively) that characterize the microstructure and/or distribution of precipitates within a characteristic volume and thus provide critical insights for further improving part quality and reliability.

#### **About the Speaker**

Bruno Linn received his Diploma at University of Muenster Department Geosciences in 1985. From 1985 to 1989, he worked as an Application Specialist for image analysis systems for a spin-off company called Soft Imaging Software (SIS) GmbH.

From 1989 to 1994, he was an Application Specialist at Leica Microsystems GmbH and lead the group of System Integration Specialists (SEM/ IA/ LM) in the European application lab. After a short period at a company called Kontron Electronics, he started working at ZEISS in 1997 as an International System Integrator for software and imaging solutions in light microscopes, and organized the ECC group of specialists of laser scanning microscopes.

In 2002, he joined ZEISS NTS as a Sales Director for electron microscopy. In 2006, he extended his responsibilities to parts of Asia and dedicated his time into a collaboration coordination with the strategic partner SIINT in Japan.

After the merge between ZEISS NTS and ZEISS Microscopy, he has been working as the International Sales Director in the Asia Pacific and Europe regions.

## From Powder To Promise: ZEISS 3D ManuFACT

### Speakers and Abstracts



#### **Mr. Luke Hunter**

Solutions Manager, Business Sector Manufacturing & Assembly, ZEISS X-ray Microscopy USA

*11:15 AM*

#### **Talk Title: X-ray Microscopy for Additive Manufacturing**

Additive manufacturing techniques can produce complex anisotropic 3D structures. The reliability and performance of the produced parts relies heavily on the resultant microstructure from often-proprietary feedstock. These challenges require the tools to gain entirely new insights into these complex structures for a wide range of materials with quick turn-around.

X-ray microscopy (XRM) supports this effort by delivering maximum 3D information non-destructively, from R&D, to process development, to manufacturing. The presentation will overview the potential and advantages XRM for additive manufacturing through a series of examples highlighting high resolution imaging and unique imaging flexibility.

#### **About the Speaker**

Luke Hunter has been working with x-ray tomography for over 10 years. He was Manager of x-ray applications for Xradia which was acquired by ZEISS in 2013. Since 2016, Luke has been part of sector marketing where he continues to focus on x-ray, looking to advance the technology, specifically in the area of additive manufacturing.

Luke acquired his Bachelor of Science in Mechanical Engineering from Washington State University and his Master of Science from University of California, Berkeley.

## From Powder To Promise: ZEISS 3D ManuFACT

### Speakers and Abstracts



#### **Mr. Ralf Benninger, MBA**

X-Ray Sales Development Manager, ZEISS Industrial Metrology Asia Pacific

11:45 AM

#### **Talk Title: CT Inspection & Measurement Solutions for Additive Manufacturing**

Additive manufacturing is a disruptive new technology which has a strong influence on current production processes as well as for the methods used for quality assurance. A big benefit of the new technology is that the manufactured structure can be much more complex. There are nearly no limitations because of the limited capability of machining tools, so the structure follows the feature requirements.

To measure these complex structures can be a challenge with conventional metrology systems because tactile and optical systems are not able to reach all the outer and inner part areas. This is where the advantages of Computed Tomography (CT) come in. With data of CT systems, a virtual part can be calculated. The precision of the virtual part is so high, that it can be used for metrology purposes. Additionally, the virtual part can be used to assure that the printed structures have no bigger defects and no granulate residuals left in its cavities.

In other applications like in the plastic or aluminium casting industry, additive manufacturing technology is used to shorten the prototype phase of casted or injected parts. Prototypes are available in shorter time. Also in this application, it is necessary to understand how precise the parts are, to give the right feedback to the designer.

In the future, CT technology will prove quality and will help to display the advantages of additive manufactured parts worldwide.

#### **About the Speaker**

Ralf received his degree in Electro Technique from the University of Kaiserslautern. Later on, he received his Master of Business Administration from the University of Augsburg and University of Pittsburgh (USA).

Ralf's career in ZEISS started in 1986 at the Central Research Department of the company where he was a Development Engineer for solid state lasers. From 1994 to 2007, he worked in the Medical Technology business group of ZEISS where he eventually became the Product Manager for digital visualization and hospital data networks. He then became the National Sales Manager for clinical products in ZEISS Microscopy in the United States of America until 2008.

Presently, Ralf is in ZEISS Industrial Metrology as Asia Pacific's X-Ray Sales Development Manager. He brings with him a wealth of experience in metrotomography and computed tomography.

## From Powder To Promise: ZEISS 3D ManuFACT

### Speakers and Abstracts



#### **Mr. Alden Aranzanso**

Product Support Manager, ZEISS Industrial Metrology Southeast Asia

*12:15 PM*

#### **Talk Title: 3D Scanning Solutions for Additive Manufacturing**

Additive manufacturing refers to a process by which digital 3D design data is used to build up a component in layers by depositing material. While 3D printing tends to get all the glory when it comes to news headlines and discussions about innovative technologies, it is actually 3D scanning that currently has the most practical applications. There is a close and complementary relationship between the two, in part because one is essentially the reverse process of the other.

Additive manufacturing brings a digital concept into the real world, while 3D scanning converts a physical object into a digital format. Aside from that, it also used nowadays to verify the accuracy of the actual 3D printed part from the nominal. These are a few of the numerous benefits that we can get from the latest sensor technology - an area where ZEISS provides fast, intuitive and highly precise 3D scanning data.

*12:45 PM*

#### **Talk Title: Quality Data Management Solutions**

All machines and devices will be interconnected in the future. One of the challenges in the Industry 4.0 ecosystem is the handling of the huge amount of data - from project management, design, prototyping, serial production, quality control. Every bit of data and information is so crucial that not managing them properly can lead to unhealthy high levels of cost.

ZEISS PiWeb combines the quality data of multiple measuring systems to create dynamic, graphic measurement reports. It enables measuring technology, production and quality management to easily access all measurement reports anytime, anywhere. It is the best-in-class graphical reporting system which instantly translates quality or process data into valuable insights.

The presentation will explain the concept behind PiWeb, how it works and practical examples on how we can manage and utilize our quality data constantly and pro-actively to execute manufacturing processes in a much more defined manner.

#### **About the Speaker**

Alden has 14 years of experience in the art of metrology (science of measurement). He has broad knowledge and consulting experience with the some of the biggest aerospace, oil and gas, metrology institutions, and automotive manufacturing companies in Southeast Asia.

Alden joined ZEISS in 2012 as an Application Specialist in Industrial Metrology specializing in dimensional metrology using both contact and non-contact coordinate measuring machines for various applications. He is currently a Product Support Manager, responsible for promoting new technologies that are integral to Industry 4.0. These include 3D laser scanning and quality data management.

# ZEISS Microscopy and ZEISS Industrial Metrology

## Regional Presence and Local Contacts



■ Has a ZEISS Industrial Metrology Competence Centre for training, measurement services and demos

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