

October 12, 2021

Auditorium 1

Welcome

9:00 **S. Weihe**, MPA University of Stuttgart, Germany

Plenary Session

- 1 09:05 **Challenges in Decarbonising the Energy Industry**
G. Stamatelopoulos, EnBW AG, Stuttgart, Germany
- 2 09:35 **Validation and Quality Management for Additive Manufacturing**
S. Piegert, Siemens Energy Global GmbH & Co. KG, Berlin, Germany
- 3 10:05 **Influence of Hydrogen Uptake and Diffusion in Structural Components in the Field of Renewable Energy**
O. Sobol, J. Nietzke, F. Konert, T. Böllinghaus, Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
- 10:35 Communication Break
- 4 10:55 **Reliability in Product Design - The Key for Managing Uncertainty of New Technologies to Prevent Oversizing**
M. Dazer, Y. Gretzinger, A. Grundler, B. Bertsche, Institute of Machine Components (IMA), University of Stuttgart, Germany
- 5 11:25 **Predictive Maintenance - Opportunities and Challenges of Intelligent Condition Prediction**
P. Zeiler, Head of Research Group Prognostics and Health Management, Esslingen University of Applied Sciences, Germany
- 6 11:55 **Advanced Manufacturing Methods and High-Temperature Materials to Enable the Energy Transformation**
J. Shingledecker, D. Gandy, Electric Power Research Institute (EPRI), Charlotte, NC, USA
- 12:30 Communication Break

Additive Manufacturing I

- Keynote:**
- 7 13:30 **Fatigue Damage Tolerance in Additive Manufactured Metals Applying Enhanced Measurement and Modelling Approaches**
J. Tenkamp, M. Awd, F. Stern, D. Kotzem, **F. Walther**, Department of Materials Test Engineering (WPT), TU Dortmund University, Germany
 - 8 14:10 **Digital Twins for Additive Manufacturing for Nuclear Reactor Applications : A Review**
V. Yadav, Idaho National Laboratory, Idaho Falls, B. Lin, M. Yoo, U.S. Nuclear Regulatory Commission (USNRC), Washington DC, I. van Rooyen, Idaho National Laboratory, Idaho Falls, R. Iyengar, D. Eskins, R. Gascot Lozada, J. Carlson, U.S. Nuclear Regulatory Commission (USNRC), Washington DC, USA
 - 9 14:40 **Overcoming Trepidation in Advanced Manufacturing Processes with the Digital Twin**
P. Witherell, National Institute of Standards and Technology (NIST), Gaithersburg, MD, USA
 - 15:10 Communication Break
 - 10 15:30 **Preliminary Results from Assessment of Advanced Manufacturing Technologies (AMT) for Reactor Materials and Components**
M. Audrain, M. Hiser, A. Hull, **M. Yoo**, U.S. Nuclear Regulatory Commission (USNRC), Rockville, MD, USA
 - 11 16:00 **Additive Manufacturing Standardization: Status, Challenges and Opportunities**
M. Seifi, ASTM International, Washington, DC; Case Western Reserve University, OH, USA

Research Work at MPA Stuttgart

- 12 16:45 **Investigations on Limit Strains Using an Enhanced Rousselier Model**
F. Fehringer, MPA University of Stuttgart; Institute for Materials Testing, Materials Science and Strength of Materials (IMWF), University of Stuttgart, M. Seidenfuß, Institute for Materials Testing, Materials Science and Strength of Materials (IMWF), University of Stuttgart, Germany
- 13 17:10 **Experimental and Numerical Investigations About the Failure Behaviour of Additively Manufactured Specimens Made of AISi10Mg**
M. Hankele, MPA University of Stuttgart; Institute for Materials Testing, Materials Science and Strength of Materials (IMWF), University of Stuttgart, M. Werz, S. Weihe, MPA University of Stuttgart, Germany
- 14 17:35 **Component Tests and Numerical Investigations to Determine the Lifetime and Failure Behaviour of End Stage Blades**
L. Frank, S. Weihe, MPA University of Stuttgart, S. Sheng, Siemens Energy Global GmbH & Co. KG, Mülheim, Germany
- 15 18:00 **Hydrogen Effects on Fatigue Crack Growth in Martensitic Stainless Steel**
M. Schwarz, S. Weihe, MPA University of Stuttgart, Germany

Auditorium 2

Integrity

- Keynote:**
- 16 13:30 **Modelling the Crack Arrest Behaviour of Gas Pipelines**
S. Münstermann, F. Shen, RWTH Aachen, V. Keim, A. Nonn, OTH Regensburg, Germany
- 17 14:10 **Development of Advanced Concepts for the Fatigue Assessment of Power Plant Components**
J. Rudolph, Framatome GmbH, Erlangen, T. Schopf, C. Swacek, MPA University of Stuttgart, Germany
- 18 14:40 **Development of an Analytical Stress Intensity Factor Solution for Embedded Inclined Circular Cracks in Cylinder Shells Under Pressure and Thermal Gradients**
K. Heckmann, J. Sievers, Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) gGmbH, Köln, Germany
- 15:10 Communication Break
- 19 15:30 **SMILE Project - Studsvik Material Integrity Life Extension Project**
S. Björnsson, **M. Bjurman**, A. Jenssen, L. Nystrand, Studsvik Nuclear AB, Nyköping, Sweden, P. Scott, Consultant, Noisy-le-Roi, France
- 20 16:00 **Technical and Regulatory Aspects for Molten Salt Reactors**
W. Reed, B. Harris, R. Torres, A. Chereskin, R. Iyengar, U.S. Nuclear Regulatory Commission (USNRC), Rockville, MD, USA

16:45 Poster Session

Development of Test Concepts for the Evaluation of Additiv-manufactured Components for High-Temperature Use

A. Udoh, S. Weihe, A. Klenk, MPA University of Stuttgart, C. Kontermann, P. Schücker, MPA/IfW Darmstadt, Germany

Determination of Remaining Life Time on Basis of Microstructure and Damage Development of 9- 12 % Cr Steels

A. Udoh, A. Klenk, MPA University of Stuttgart, Germany

Simulation of Crack Behavior of Nickel Cast Alloys with Large Grain Size at High Temperature

M. Speicher, C. Kohler, MPA University of Stuttgart, L. Woellmann, F. Müller, Chair and Institute for Materials Technology, TU Darmstadt, Germany

Ni-based alloys for Operation of 725 °C Power Plants

D. Osorio, A. Klenk, S. Weihe, MPA University of Stuttgart, Germany

Quality Assurance by Calibration in the Field of Materials Engineering

S. Gerber, MPA University of Stuttgart, J. Ellermeier, MPA/IfW Darmstadt, Germany

Do you know your Blind Spots? – Quantification of NDE Reliability as Asset for Product and Component Quality

A. Jüngert, MPA University of Stuttgart, Germany

Investigation on Leak Rates in Thin-Walled Structures

F. Silber, MPA University of Stuttgart, Germany

Materials Under Hydrogen Pressure - Mathyp

J. Quatier, S. Zickler, C. Kohler, MPA University of Stuttgart, P. Fayek, K. Bauer-Troßmann, Robert Bosch GmbH, Renningen, Germany

Steady State and Cyclic Flange Testing

K. Kettler, A. Klenk, S. Weihe, MPA University of Stuttgart, Germany

Numerical Simulation of Turbulent Thermal Mixing Characteristics in Pipe

E. Cenk, E. Laurien, Institute of Nuclear Technology and Energy Systems (IKE), University of Stuttgart

System-Reliability Demonstration of a High-Voltage Battery with Consideration of Simulation Data

A. Grundler, Institute of Machine Components, University of Stuttgart, M. Göldenboth, Mercedes-Benz AG, M. Dazer, B. Bertsche, Institute of Machine Components, University of Stuttgart

19:00 Evening Reception

Welcome

Prof. Stefan Weihe, MPA University of Stuttgart, Germany

Rosswag Best Paper Award for the lectures in the session “Research Work at MPA Stuttgart”

Dr. Sven Donisi, Rosswag GmbH, Pfinztal Germany

Awarding of the Carl-von-Bach-Commemorative-Medal

Prof. Stefan Weihe, MPA University of Stuttgart

Address and honor for Prof. em. Dr.-Ing. Dr. techn. E.h. Karl Kußmaul, former MPA Director

Prof. Stefan Weihe, MPA University of Stuttgart

Laudatio for Prof. em. Dr.-Ing. Dr. techn. E.h. Karl Kußmaul, former MPA-Director on the occasion of his 90th birthday

Günther H. Oettinger, former Vice-President and Member of the European Commission

Dinner

Musical accompaniment: Brass Quartett „Metallophon”

The evening reception takes place in the Plenary Hall of the Filderhalle

October 13, 2021
Auditorium 1

Hydrogen Applications

- Keynote:**
- 21 08:40 **Ultracompact High Performance Heat Exchangers for P2X and Hydrogen Applications - Possibilities for Heat Transfer - Challenges for SLM-Additive Manufacturing**
W. Bender, Hülsenbusch Apparatebau GmbH & Co. KG, Kempen, M. Fuchs, Institute of Thermodynamics (IfT), Leibnitz University Hannover, P. Schwarz, Rosswag Engineering, Pfinztal, Germany
- 22 09:20 **Qualification of Materials for Natural Gas Pipelines for the Use of Hydrogen Gas by Fracture Mechanics Investigations**
C. Günther, U. Marewski, M. Steiner, Open Grid Europe, Essen, H. Silcher, MPA University of Stuttgart, Germany
- 23 09:50 **Use of Additive Manufactured Components in Hydrogen Applications: Impact of Heat Treatment and Surface-Condition on Hydrogen Embrittlement Sensitivity of AM 316L**
E. De Bruycker, ENGIE Laborelec, Linkebeek, L. Claeys, L. Deconinck, T. Depover, Department of Materials, Textiles and Chemical Engineering, Ghent University, S. Nardone, ENGIE Laborelec, Linkebeek, K. Verbeken, Department of Materials, Textiles and Chemical Engineering, Ghent University, Belgium
- 24 10:20 **Joining Processes in Hydrogen Technologies - Current need and future R&D activities, a review**
M. Rhode, T. Kannengießer, Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
- 10:50 Communication Break

Additive Manufacturing II

- Keynote:**
- 25 11:10 **Additive Manufacturing for High Quality Applications at KSB**
A. Munk, KSB SE & Co. KGaA, Pegnitz, Germany
- 26 11:50 **WAAM Process Influences on Local Microstructure and Residual Stresses in High-Strength Steels**
K. Wandtke, D. Schroepfer, Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, R. Scharf-Wildenhain, A. Haelsig, Technische Universität Chemnitz, Chair of Welding Engineering, Chemnitz, A. Kromm, T. Kannengießer, Bundesanstalt für Materialforschung und -prüfung (BAM), Berlin, Germany
- 27 12:20 **Processing of a Novel Titanium Aluminide Alloy by PBF-EB**
A. Kirchner, B. Klöden, T. Weißgärber, Fraunhofer Institute for Manufacturing Technology and Advanced Materials (IFAM), Dresden, Germany
- 12:50 Communication Break
- 28 13:50 **Laser Powder Bed Fusion - Potentials and Challenges of Additive Manufacturing for Manufacturing Spare Parts for Nuclear Applications**
D. Nerweyi, Teollisuuden Voima Oyj (TVO), Olkiluto, Finland
- 29 14:20 **Additive Repair of Nuclear Power Plant Components via High-Pressure Cold Spray Processing (HP-CSP)**
M. Ellingsen, K. Johnson, R. Roy, A. Nardi, K. Klus, B. Haddad, VRC Metal Systems, LLC, Box Elder, SD, USA
- 30 14:50 **Microstructure Design in Laser Material Processing of Aluminium Alloys**
C. Böhm, MPA University of Stuttgart, J. Wagner, C. Hagenlocher, T. Graf, Institut für Strahlwerkzeuge (IFSW) University of Stuttgart, S. Weihe, MPA University of Stuttgart, Germany
- 15:20 Communication Break

Characterization of Additively Manufactured Components

- 31 15:40 **State-of-the-art CT Inspection for Additive Manufacturing in the Energy Industry**
P. Sperling, Volume Graphics GmbH, Heidelberg, Germany
- 32 16:10 **Direct Observation of Fatigue Damage Induced by a Complex Stress State in Metastable Austenite by Means of Magnetic Force Imaging**
V. Lyamkin, Chair of NDT and Quality Assurance (LZfPQ), Saarland University, Saarbrücken, P. Starke, Department of Materials Science and Materials Testing (WWHK), University of Applied Sciences Kaiserslautern, H. Derouach, J. L'huillier, Photonic-Center Kaiserslautern e.V. and OPTIMAS Research Center Technische Universität Kaiserslautern, C. Boller, Chair of NDT and Quality Assurance (LZfPQ), Saarland University, Saarbrücken, Germany
- 33 16:40 **3D Characterization of Pore Structure in Additive Manufacturing Using Serial Sectioning**
D. Rowenhorst, R. Fonda, The U.S. Naval Research Laboratory, Washington DC, USA

Auditorium 2

Martensitic Materials

- Keynote:**
- 34 08:40 **Degradation and Recovery of Creep Rupture Ductility in 9 to 12Cr Martensitic Steels**
F. Abe, National Institute for Materials Science (NIMS), Tsukuba, Japan
- 35 09:20 **Mechanism for Boron Nitrogen Strengthening in Martensitic Creep Resistant Steels**
J. Hald, DTU Mechanical Engineering, Kgs. Lyngby, Denmark, T. Neddemeyer, Siemens Energy, Berlin, Germany
- 36 09:50 **Temperature Dependence of Creep Rupture Life of Long-term Used P91 Steel**
M. Yaguchi, K. Masayuki, Central Research Institute of Electric Power Industry, Yokosuka, Japan
- 37 10:20 **Investigation of P91 Base and Weld Material Behavior for the Evaluation of Power Plant Components Subjected to Flexible Operation**
P. Gampe, U. Gampe, Chair of Thermal Power Machinery and Plants, TU Dresden, Germany

10:50 Communication Break

High Temperature Materials and Component Behavior

- Keynote:**
- 38 11:10 **Test Loop in the GKM Power Plant for Investigations on Material and Component Behaviour under Cyclic Loading Conditions**
A. Klensk, MPA University of Stuttgart, K. Metzger, GKM Grosskraftwerk Mannheim AG, F. Kluger, GE Boiler Deutschland GmbH, Stuttgart, Germany
- 39 11:50 **Creep-Fatigue Life Evaluation of HR6W (23Cr-45Ni-6W Alloy) Welded Joint**
H. Katafuchi, Research & Innovation Center, Mitsubishi Heavy Industries, Ltd., Nagasaki, R. Tokiyoshi, Boiler Products Headquarters, Mitsubishi Power Ltd., Yokohama, T. Honda, T. Igari, Research & Innovation Center, Mitsubishi Heavy Industries, Ltd., Nagasaki, M. Kitamura, Boiler Products Headquarters, Mitsubishi Power Ltd., Yokohama, Japan
- 12:20 **Metallurgical Investigation of Long-term Microstructural Degradation and Damage Mechanism of SUPER304H**
T. Tokairin, Mitsubishi Heavy Industries, Ltd., Takasago, K. Tominaga, H. Kawashima, N. Hiruta, T. Nogami, Mitsubishi Power, Ltd., Japan

12:50 Communication Break

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- 40 13:50 **Influence of a P92 Typical Post Weld Heat Treatment on the Long-term Properties of Alloy 617 at 600°C Power Plant Operation**
G. Maier, Fraunhofer Institute for Mechanics of Materials (IWM), Freiburg, H. Sommer, RWE Nuclear GmbH, Essen, M. Widera, F. Neumann, RWE Power AG, Essen, Germany
- 41 14:20 **On Small Punch Creep Testing**
A. Varias, Public Power Generation S.A., Athens, Greece, T. Nakata, Gifu University, Gifu, M. Yaguchi, Central Research Institute of Electric Power Industry, Yokosuka, S. Komazaki; Graduate School of Science and Engineering, Kagoshima University, Kagoshima, Japan
- 41 14:50 **Creep and Creep-Fatigue of Martensitic Steels and their Welds**
A. Klenk, T. Bender, S. Weihe, MPA University of Stuttgart, Germany
- 15:20 Communication Break

Lifetime and Reliability

- 42 15:40 **IMPLANT – Advanced Materials and Manufacturing for Improved Power and Process Plant Performance**
D. Allen, A. Shibli, European Technology Development (ETD), Leatherhead, Surrey, UK
- 43 16:10 **Securing Qualified Test Programs for Boiler Systems by Means of Online and Offline Lifetime Calculations**
T. Hauke, Lausitz Energie Kraftwerke AG, Cottbus, P. Jentsch, Lausitz Energie Kraftwerke AG, Boxberg, **P. Kozlowski**, Lausitz Energie Kraftwerke AG, Peitz, Germany
- 44 16:40 **NRC Activities on Potential Endorsement of Consensus Codes for High Temperature Materials and Reliability Integrity Management (RIM)**
J. Poehler, B. Lin, T. Lupold, M. Gordon, U.S. Nuclear Regulatory Commission (USNRC), Rockville, MD, USA