RESIDUAL STRESS: MEASUREMENT, TEMPERATURE AND PERFORMANCE

Organised by

Institution of MECHANICAL ENGINEERS

KEYNOTE SPEAKERS INCLUDE:

Paul Hurrell
Technical Specialist
Rolls-Royce Submarines

John Bouchard
Professor of Materials in Energy
The Open University

Costas Soutis,
Director, Aerospace Research Institute,
University of Manchester

Simon Smith
Technical Manager
TWI

17 February 2016
Institution of Mechanical Engineers, London

More details available at
events.imeche.org/residualstress

Structural Technology and Materials Group
Seminar

EVENT PARTNERS:

RESIDUAL STRESS: MEASUREMENT, TEMPERATURE AND PERFORMANCE

17 February 2016
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HOW EFFECTIVE MEASUREMENT AND TEMPERATURE CONTROL CAN REDUCE RESIDUAL STRESS AND ENHANCE OVERALL PERFORMANCE

Hear and learn from leading experts on how their current projects are supporting the reduction of residual stress across a number of industries.

This one day seminar will reveal the variety of situations and materials that residual stresses can occur in. The unique sharing of this knowledge across different sectors will allow attendees to take away the cross-fertilisation of ideas of how to measure and control residual stresses through interactive discussions.

BENEFITS OF ATTENDANCE:

- **Discover** the latest techniques for assessment of residual stresses from world-leading experts
- **Hear** and learn the lessons from Industry and Academia case studies featuring the latest tools and techniques
- **Understand** how to improve performance in safety and structural integrity assessments and more accurately predict the lifespan of structures and components
- **Identify** with leading experts the prediction, measurement and characterisation of residual stress

Key topics include:

- Structural integrity of nuclear manufacturing methods
- Relaxation of weld residual stress during high temperature operation
- ISO/TS 18166 Numerical welding simulation: Execution and documentation
- Distributed internal strain measurement during composite manufacturing using optical fibre sensors
- Thermal relaxation processes

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PROGRAMME

WEDNESDAY 17 FEBRUARY 2016

09:00 **REGISTRATION AND REFRESHMENTS**

09:30 **CHAIR'S OPENING REMARKS**
Simon Quinn, Chair Structural Technology and Materials Group, Institution of Mechanical Engineers

09:40 **OPENING ADDRESS: RELAXATION OF WELD RESIDUAL STRESS DURING HIGH TEMPERATURE OPERATION**
John Bouchard, Professor of Materials in Energy, The Open University
- Predicted relaxation in thick section welds
- Measured stress relaxation (using diverse techniques)
- Is triaxiality important?

10:10 **ISO/TS 18166 NUMERICAL WELDING SIMULATION: EXECUTION AND DOCUMENTATION**
Simon Smith, Technical Manager, TWI
- ISO standards for an area are developed and maintained by Technical Committees (TC). ISO/TC 44 covers "Welding and Allied Processes"
- The Working Groups (WG) of a committee are responsible for the drafting documents. ISO/TC 44/WG5 covers "Welding Simulation"
- ISO Technical Specifications (TS) represent a technical consensus of a WG. WG5 prepared TS 18166 to provide high level recommendations for simulations of welding

10:40 **NETWORKING REFRESHMENT BREAK**

11:10 **DISTRIBUTED INTERNAL STRAIN MEASUREMENT DURING COMPOSITE MANUFACTURING USING OPTICAL FIBRE SENSORS**
Matthieu Gresil, School of Materials, University of Manchester
- Understanding quality and mechanical properties of a composite material post production
- Using optical sensors to measure the residual strain and changes in temperature
- Acquisition of data to characterise the strain profile during the manufacture process

11:40 **RESIDUAL STRESS IN POWDER BED LASER MELTING**
Chris Sutcliffe, Senior Lecturer Centre for Materials and Structures, University of Liverpool
- Measurement methodologies
- Mitigation strategies
- Future work

12:10 **QUESTION AND ANSWER PANEL SESSION**
An opportunity to ask any questions to the morning's presenters.

12:30 **NETWORKING LUNCH**

13:30 **POLYMER COMPOSITES IN AEROSPACE: ACHIEVEMENTS AND CHALLENGES**
Costas Soutis, Director, Aerospace Research Institute, University of Manchester
- Gain insight in to the applications of modern composite systems
- Understand the challenges of such material systems, including technical and financial
- Explore the thoughts on future needs, developments and prospects for novel materials (3D woven architectures, graphene composites) and processes, structural health monitoring (SHM), maintenance, repair and recycling

14:00 **EXPLORE SAFETY AND LIFE ASSESSMENT OF HIGH VALUE PLANT ITEMS**
Speaker to be announced

14:30 **NETWORKING REFRESHMENT BREAK**

15:00 **WELDING RESIDUAL STRESS ANALYSES INFORMING THE STRUCTURAL INTEGRITY OF NUCLEAR MANUFACTURING METHODS**
Paul Hurrell, Technical Specialist, Rolls-Royce Submarines

15:30 **QUESTION AND ANSWER PANEL SESSION**
An opportunity to ask any questions to the afternoon's presenters.

16:00 **CHAIR'S CLOSING REMARKS**

16:10 **END OF SEMINAR**

For the most up-to-date and detailed programme for the event, please visit events.imeche.org/residualstress
- This programme is subject to change.
- The Institution is not responsible for the views or opinions expressed by individual speakers.

ORGANISING COMMITTEE

Structural Technology and Materials Group, The Institution of Mechanical Engineers

With special thanks to:
Simon Quinn, University of Southampton,
Simon Smith, TWI

SPEAKERS AND CONTRIBUTORS

KEYNOTE SPEAKER

JOHN BOUCHARD, PROFESSOR OF MATERIALS IN ENERGY
THE OPEN UNIVERSITY

John Bouchard graduated in Mechanical Engineering (1976) and obtained an MSc in Physics of Materials (1977) at the University of Bristol. His first appointment for a Civil Engineering Consultancy broadened his engineering horizon before joining Rolls-Royce (1979) and specialising in stress and fracture analysis of rotating gas turbine components. From 1986 to 2008 he worked in the nuclear power generation industry in the field of structural integrity (supporting safety cases) and became recognised as the company residual stress expert. From 1995 onwards John initiated and managed many industry and EU funded structural integrity related research projects. In 2007 he was awarded a Royal Society Industry Fellowship and appointed Professor of Materials for Energy at the Open University in 2008.

CHAIR

SIMON QUINN, CHAIR STRUCTURAL TECHNOLOGY AND MATERIALS GROUP
INSTITUTION OF MECHANICAL ENGINEERS

Simon Quinn has been involved in the structural integrity field since his graduation. This has involved both numerical and experimental stress analysis work, as well as design. Since joining the RIfI, the industrial arm of the School of Engineering Sciences at the University of Southampton, in 2003, Simon has worked on more than 80 RIfI projects. For the previous four and a half years Simon was employed by NNC Limited, an engineering consultancy firm of approximately 1000 staff. Simon has an experimental/design background from research conducted using thermoelastic stress analysis (TSA) at the University of Liverpool.

SPEAKERS

SIMON SMITH, TECHNICAL MANAGER
TWI

Simon Smith completed doctoral studies on creep crack growth and then joined TWI in 1989. He is now the TWI Technology Manager of Numerical Modelling and a consultant in the TWI Integrity Management Group. The Numerical Modelling team have developed modelling methods for the fast and accurate assessment of the performance of welded structures, including the prediction of welding residual stresses, welding distortion and the determination of crack tip loading parameters for fatigue and fracture assessments.

MATTHIEU GRESIL, SCHOOL OF MATERIALS
UNIVERSITY OF MANCHESTER

Matthieu Gresil joined the School of Materials in February 2014 as Lecturer in Composite Materials, Non-Destructive Evaluation (NDE) and Structural Health Monitoring (SHM). He obtained his BSc degree in Physics (University of Nantes, France) and MSc degree in Physics option Matter and Materials (University of Nantes, France). He completed his PhD in Materials from Ecole Normale Superieure at Cachan, France in 2009 in collaboration with DCNS (French Navy) on the integration of functions (SHM and electromagnetic shielding) in composite materials. Then, he joined the University of South Carolina as Post-doctoral Research Fellow (2010-2014) and conducted research on SHM using multi-physics finite element to study guided wave propagation in composite and metallic structures.

SPEAKERS

COSTAS SOUTIS, DIRECTOR, AEROSPACE RESEARCH INSTITUTE
UNIVERSITY OF MANCHESTER

Costas Soutis has over 25 years of experience in working with composite structures and has made significant research contributions in modelling the compressive response of composite plates with open or filled holes under uniaxial, bi-axial static and fatigue loading; impact and post-impact compressive strength and crush energy absorption; multi-scale modelling of damage in orthotropic laminates under multi-axial in-plane loading; structural health monitoring using PZT activated Lamb waves and analysis and inspection of bonded patch repairs. Professor Soutis went on to become the first Professor of Aerospace Engineering at the University of Sheffield. In October 2012, he was appointed at the University of Manchester as Chair of Aerospace Engineering, Director of the Aerospace Research Institute and Director of the Northwest Composites Centre/National Composites Certification and Evaluation Facility.

CHRIS SUTCLIFFE
SENIOR LECTURER CENTRE FOR MATERIALS AND STRUCTURES, UNIVERSITY OF LIVERPOOL

Chris Sutcliffe, works in additive manufacturing (AM) developing new processes and products. His work is patented, licensed and published worldwide and has resulted in the development of implants and manufacturing equipment. Active in manufacturing research since 1997 and a key player in 18 EPSRC, 10 TSB/DTi and 6 EU research projects he holds a tenured academic position at the University of Liverpool and is Research Director at Renishaw AMPD and Director and co-founder of Fusion Implants.

BOOKING FORM

EVENT CODE: S6314

EARLY BIRD ENDS 15 JANUARY 2016

RESIDUAL STRESS: MEASUREMENT, TEMPERATURE AND PERFORMANCE

17 February 2016
Institution of Mechanical Engineers, London

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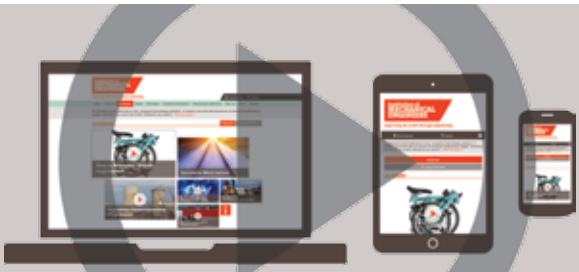

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1 Birdcage Walk
Westminster
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