

# **55th Annual Conference of the British Institute of Non-Destructive Testing (NDT 2016)**

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**09.20 Opening Plenary Paper – Roy Sharpe Prize Lecture – Status and trends of the conversion from film to digital radiography and the quantitative evaluation of image quality**

*Chair: Professor R A Smith*

*Author – Professor Dr U Ewert, Head, Radiological Methods Division, BAM – Conference Theatre*

**10.00 Plenary Paper – ‘Apprenticeship update’ – The importance of continued professional development**

*Chair: Professor R A Smith*

*Author – Mr R Lyon, Project Manager, Apprenticeships, BINDT - Conference Theatre*

**Session IA – Ultrasonics I**

*Chair: Professor K J Kirk Conference Theatre*

**11.00 In-service NDT of additive manufactured parts**

*Authors – MV Felice<sup>1</sup>, T Barden<sup>2</sup> and K Milne<sup>1</sup>*

*<sup>1</sup>Manufacturing Technology Centre, <sup>2</sup>Rolls-Royce plc*

**11.25 Extending the capability of guided wave inspection to pipe bend geometries**

*Authors – J Allwright, R Sanderson, K Thornicroft and S Blackwell TWI Ltd*

**11.50 Ultrasonic monitoring of grout**

*Authors – F Guarato<sup>1</sup>, C MacLeod<sup>1</sup>, G Pierce<sup>1</sup>, A Gachagan<sup>1</sup>, R O’Leary<sup>1</sup> and K Wright<sup>2</sup>*

*<sup>1</sup>University of Strathclyde, <sup>2</sup>FoundOcean Ltd*

**12.15 M-skip for the sizing of uninsulated external corrosion to determine the remaining wall thickness in thick-walled components**

*Authors – S F Burch and H R Peramatzis ESR Technology*

**Session IB – Electromagnetics I**

Chair: Mr T Peyton Suite I

**11.00 Development of a technique for inspection of the graphite bricks in an advanced gas-cooled reactor core**

Authors – H Tesfalem<sup>1</sup>, A Peyton<sup>1</sup>, A Fletcher<sup>2</sup>, M Brown<sup>2</sup> and B Chapman<sup>3</sup>  
<sup>1</sup>University of Manchester, <sup>2</sup>EDF Energy, <sup>3</sup>NDT Consultant

**11.25 Multiplexed electromagnetic array probes: solutions for ferrous and non-ferrous heat exchanger tubing inspection**

Authors – O Lavoie, S Savard and M Grenier, Eddyfi

**11.50 Development of a tool for the magnetic assessment of microstructural changes in Grade 91 power station steel tubes**

Authors – J W Wilson<sup>1</sup>, N Karimian<sup>1</sup>, A J Peyton<sup>1</sup>, C Davis<sup>2</sup> and J Liu<sup>2</sup>  
<sup>1</sup>University of Manchester, <sup>2</sup>University of Warwick

**12.15 Detection and depth sizing of stress corrosion cracking in pipelines using tangential eddy current array**

Authors – M Sirois, J Crepeau and A Raude, Eddyfi

**Session IC – Applications I**

Chair: **Mr I Cooper Suite 2**

**11.00 Thermography combined with thickness testing in order to characterise subsurface defects**

Authors – J Gryzagoridis<sup>1,2</sup> and D Findeis<sup>2</sup>

<sup>1</sup>Cape Peninsula, University of Technology, <sup>2</sup>University of Cape Town

**11.25 Increasing the reliability of industrial multi-MW wind turbines**

Authors – J Zhou, S Roshanmanesh, F Hayati, V Jantara Junior, T Wang, S Hajiabady, X Ying Li, H Dong and M Papaelias, University of Birmingham

**11.50 HRSG finned tube inspection with eddy current near-field array technique**

Authors – A Kuczynska, D Pain and F Hardie, Doosan Babcock

**12.15 Development of a sensor module for the detection of internal corrosion in steel petroleum pipelines**

Author – N Purushottam Kashinath, Indian Oil Corporation Ltd

**Session 1D – Novel Developments**

*Chair: Mr J Hansen Suite 3*

**11.00 Integrity testing of cast-in-place piles: comparison between cross-hole sonic logging and fibre optic**

*Authors - J Simpson and O Hamza, University of Derby*

**11.25 Augmented reality-based visualisation of NDT data**

*Authors – J Meyer<sup>1</sup>, J Holtmannspoetter<sup>1</sup> and K Dekker<sup>2</sup>*

*<sup>1</sup>Bundeswehr Research Institute for Materials,*

*<sup>2</sup>University of the German Armed Forces*

**11.50 Numerical analysis of anisotropic composite material using EMAT**

*Authors – S Thomas<sup>1</sup>, M A Soladoye<sup>1</sup>, G P Yusuf<sup>1</sup>, N Ofodile-Keku<sup>2</sup> and E C Ashiqwuike<sup>3</sup>*

*<sup>1</sup>Airforce Institute of Technology Kaduna, <sup>2</sup>University of Leicester <sup>3</sup>University of Abuja*

**12.15 Mixed light inspection**

*Author – Geoff Diamond, CTO Inspection Technologies Ltd*

**Session 2A – Ultrasonics 2**

*Chair:* **Dr M J Mienczakowski** Conference Theatre

**14.10 Enhanced imaging of CFRP laminates using guided processing**

*Authors – L J Nelson and R A Smith University of Bristol*

**14.35 Improvement of ultrasonic cross-sectional imagery via the application of coherence weighting and the total focusing method**

*Authors – B Knight-Gregson<sup>1</sup>, M Weston<sup>2</sup>, C Davis<sup>3</sup>, A J Peyton<sup>1</sup> and P Scully<sup>1</sup>  
<sup>1</sup>University of Manchester, <sup>2</sup>TWI Ltd, <sup>3</sup>University of Warwick*

**15.00 Optimal utilisation of conventional and phased array inspection techniques in ultrasonic testing of complex components of aircraft jet engines**

*Authors – A Miltreyger, M Bron and A Gershon, ScanMaster Systems Ltd*

**16.25 In-service application of an ultrasonic system permanently attached to the extrados of pipework to monitor possible wall loss due to flow-accelerated corrosion**

*Author – A Hipkiss, Applus RTD UK Ltd*

**16.50 Ultrasonic array imaging of defects in polymer pipes**

*Authors – J S Egerton, M J S Lowe and P Huthwaite, Imperial College London*

**Session 2B – Electromagnetics 2**

Chair: **Mr J Hansen Suite I**

**14.10 Current deflection NDE for defect screening**

Authors – R Jarvis<sup>1</sup>, P Cawley<sup>1</sup> and P B Nagy<sup>2</sup>

<sup>1</sup>Imperial College London, <sup>2</sup>University of Cincinnati

**14.35 Evaluation of precipitate and grain size distribution in steels by magnetic hysteresis measurement**

Authors – J Liu<sup>1</sup>, J Wilson<sup>2</sup>, C Davis<sup>1</sup> and A Peyton<sup>2</sup>

<sup>1</sup>University of Warwick, <sup>2</sup>University of Manchester

**15.00 THIS SLOT IS AVAILABLE FOR A LATE SUBMISSION**

**16.25 A new feature extraction of angular defects characterisation in tubes for eddy current sensors**

Authors – T Hamdouche and R Mehasni, University of Constantine

**16.50 Phase-sensitive eddy current method of metallic coating thickness measurement. On the question of calibration and verification of coating thickness gauges and metallic coating thickness standards**

Authors – S S Golubev<sup>1</sup>, V A Syasko<sup>2</sup>, N I Smirnova<sup>2</sup> and K V Gogolinskiy<sup>3</sup>

<sup>1</sup>Federal Agency on Technical Regulating and Metrology,

<sup>2</sup>Constanta Ltd, <sup>3</sup>D I Mendeleev Institute for Metrology



**Session 2C – Applications 2**

Chair: **Dr S Burch Suite 2**

**14.10 Monitoring of degradation in stainless steel at high-cycle fatigue**

*Authors – G Pisarenko and A Mailo National Academy of Sciences of Ukraine*

**14.35 Applicability instrumental indentation method for determining mechanical properties of in-service equipment by hardness evaluation**

*Authors – M B Bakirov<sup>1</sup> and G M Bakirova<sup>2</sup>*

*<sup>1</sup>Centre of Material Science and Lifetime Ltd, <sup>2</sup>MUBATEC GmbH*

**15.00 Robotic ultrasonic inspection of AGR fuel cladding**

*Authors – M Morozov<sup>1</sup>, S G Pierce<sup>1</sup>, G Dobie<sup>1</sup>, G T Bolton<sup>2</sup> and T Bennett<sup>2</sup>*

*<sup>1</sup>University of Strathclyde, <sup>2</sup>National Nuclear Laboratory*

**16.25 Rail defect depth inspection using multiphysics integrated eddy current pulsed thermography**

*Authors – Y Gao<sup>1,2</sup> and G Y Tian<sup>1,2</sup>*

*<sup>1</sup>Nanjing University of Aeronautics and Astronautics, <sup>2</sup>Newcastle University*

**16.50 7.5 MeV PXB betatron with digital detection for corrosion measurement**

*Author – J McNab, Oceaneering International Services Ltd*

**Session 2D – Novel Developments continued**

*Chair: Ms C Bull Suite 3*

**14.10 Advances in 3D remote visual measurement technologies**

*Author – M Griffiths, GE Inspection Technologies, UK*

**14.35 Emerging modality: UT camera for rapid quantitative multi-modal compression and shear wave inspection**

*Authors – B Lasser, D Rich, J Kula and R Carvalho, Imperium Inc*

**15.00 UV-LED lamps for fluorescent magnetic particle and penetrant testing in practice: technical and practical requirements, new possibilities and upcoming standardisation of UV-LED lamps**

*Author – M Breit, SECU-CHEK GmbH*

**16.25 Flexible wedge phased array transducers for inspecting variable-geometry or complex components**

*Authors – P Dumas, J Poguét, A Membre and L Fournier, Imasonic*

**16.50 Improving the acoustic performance of linear phased array transducers**

*Author – P Dumas Imasonic*

**09.00 Plenary Paper – Automation in NDT: New risks and risk sources**

**Chair: Professor R A Smith**

*Author – M Bertovic, BAM Federal Institute for Materials Research and Testing, Germany –  
Conference Theatre*

**Session 3A – Reliability and Human Factors in NDT**

**Chair: Dr B McGrath Conference Theatre**

**09.50 NDT reliability: a regulator’s perspective**

*Author – R Booler, Office for Nuclear Regulation*

**10.15 Human factors aspects of non-destructive testing in the offshore oil & gas industry**

*Author – M Wall, Arcadis ESR Technology*

**11.15 Model-assisted inspection optimisation and probability of detection**

*Author – J R Pettit, Frazer-Nash Consultancy*

**11.40 Why you need a written practice in an ISO 9712 environment**

*Author – J Taylor, SGS Group*

**12.05 Using application workflows to enhance operator training performance and improve data acquisition repeatability and reliability**

*Author – R Ward, GE Inspection Technologies, USA*

**12.30 BINDT’S strategy for serving the NDT, CM and SHM community: a 2016 update**

*Author – Mr C Sinclair, CEO of BINDT – Conference Theatre*

**12.45 Benevolent Fund update**

*Author – G Long, Tetrade Ltd – Conference Theatre*

**Session 3B – Phased Array Applications**

*Chair: Mr G Luckett Suite 1*

**09.50 Advances in small bore phased array UT (SBPAUT) techniques**

*Author – F Hardie, Doosan Babcock*

**10.15 Development of methodology for inspection of welds in lined pipes using array ultrasonic techniques**

*Authors – R Baiotto<sup>1,2</sup>, C Nageswaran<sup>1</sup> and T Clarke<sup>2</sup>*

*<sup>1</sup> TWI Ltd <sup>2</sup> Universidade Federal do Rio Grande do Sul*

**11.15 True advancements for longitudinal weld pipe inspection in PA**

*Authors – P Rioux<sup>1</sup>, J Turcotte<sup>1</sup> and P Cyr<sup>2</sup>*

*<sup>1</sup> Sonatest AP, <sup>2</sup> Eclipse Scientific Inc*

*Gary Lowton will present the paper*

**11.40 Ultrasonic defect characterisation using array data**

*Authors – L Bai, A Velichko and B W Drinkwater, University of Bristol*

**12.05 Monitoring of fatigue crack growth using non-linear ultrasonic phased array imaging**

*Authors – J Cheng, J Potter, A Croxford and B W Drinkwater, University of Bristol*

**Session 3C – Novel Techniques**

*Chair: Professor B Drinkwater Suite 2*

**09.50 Rapid defect characterisation by non-contact ultrasonic scanning**

*Authors – R S Edwards and O Trushkevych, University of Warwick*

**10.15 200 micron-resolution gamma radiography from single-shot acquisition laser-driven sources**

*Author – C Brenner, Rutherford Appleton Laboratory*

**11.15 Assessment of damages in concrete by the electric response parameters to pulse mechanical excitation**

*Authors – T V Fursa<sup>1</sup>, D D Dann<sup>1</sup>, M V Petrov<sup>1</sup> and K Yu Osipov<sup>2</sup>*

*<sup>1</sup>National Research, Tomsk Polytechnic University,*

*<sup>2</sup>VE Zuev Institute of Atmospheric Optics*

**11.40 Modelling and characterisation of defects in non-ferromagnetic materials using pulse eddy current (PEC) sensors**

*Authors – E Ashigwuike<sup>1</sup>, M Zakaria<sup>2</sup> and S Thomas<sup>3</sup>*

*<sup>1</sup>University of Abuja, <sup>2</sup>Electronic Engineering, Nigerian Turkish Nile University,*

*<sup>3</sup>Airforce Institute of Technology Kaduna*

**12.05 Non-destructive detection of defects in materials by a handheld QWHE magnetic scanner**

*Authors – E Ahmad, F A Biruu and M Missous, University of Manchester*

**14.30 Plenary Paper – Fraunhofer Institute for Non-Destructive Testing IZFP – expanding the potential of NDT across the entire product life cycle**

*Chair: Professor K Newton*

*Author – R Hanke, Fraunhofer Institute for Non-Destructive Testing IZFP, Germany – Conference Theatre*

**Session 4A – Invited International Session: Research at the Fraunhofer Institute for Non-Destructive Testing IZFP**

*Chair: Professor K Newton Conference Theatre*

**14.55 Non-destructive materials characterisation and testing of casting materials**

*Authors – I Veile, R Tschuncky, M Weikert-Müller, D Bruche, F Weber, M Kopp and K Szielasko  
Fraunhofer Institute for Non-Destructive Testing IZFP, Germany*

**15.20 Automated NDT of railway wheels using induction thermography**

*Authors – A Ehlen, U Netzelmann, S Lugin, M Finckbohrer, B Valeske and S Bessert  
Fraunhofer Institute for Non-Destructive Testing IZFP, Germany*

**16.15 On and offline ultrasonic characterisation and inspection of additively-manufactured components**

*Authors – M Spies<sup>1</sup>, H Rieder<sup>1</sup>, J Bamberg<sup>2</sup> and B Henkel<sup>2</sup>  
<sup>1</sup>Fraunhofer Institute for Non-Destructive Testing IZFP, Germany,  
<sup>2</sup>MTU Aero Engines AG, Germany*

**16.40 Discussion/panel session – opportunities for collaboration**

**17.30 President's Honour Lecture – Ultrasonic levitation and manipulation**

*Chair: Professor RA Smith*

*Author – Professor BW Drinkwater, University of Bristol – Conference Theatre*

## **Session 4B – Digital Radiography**

*Chair: Mr G Lockett Suite I*

- 14.55 Backscatter X-ray imaging with twisted slit collimator – quantitative simulation of and comparison to experiments**  
*Authors – G-R Jaenisch, F Wiedner, C Bellon, U Ewert, J Vogel, S Kolkoori and U Zscherpel BAM  
Dr U Ewert will present the paper*
- 15.20 Application and systematic errors of X-ray computed tomography associated with dimensional metrology**  
*Authors – W Sun<sup>1</sup>, S Brown<sup>1</sup>, P Woolliams<sup>1</sup>, M McCarthy<sup>1</sup>, J White<sup>2</sup> and M Attallah<sup>2</sup>  
<sup>1</sup>National Physical Laboratory, <sup>2</sup>University of Birmingham*
- 16.15 Have we reached the film tipping-point? Challenges and the route to success**  
*Author – N Bloomfield, GE Inspection Technologies*
- 16.40 Data management vendor-neutral data archiving**  
*Author – S Montagna, GE Measurement and Control, USA*
- 17.05 A new scatter correction technology for industrial mini- and micro-CT of large multimaterial or highly absorbing samples**  
*Authors – N Bloomfield and S Telesz, GE Inspection Technologies*

**Session 4C – Novel Techniques *continued***

Chair: **TBC Suite 2**

- 14.55 Advances in carbon steel weld inspection using tangential eddy current array**  
Authors – D Panggabean<sup>1</sup>, A Raude<sup>2</sup>, M Sirois<sup>2</sup>, H Lemieux<sup>3</sup> and J Crepeau<sup>3</sup>  
<sup>1</sup> TWI Ltd, <sup>2</sup> Eddyfi, France, <sup>3</sup> Eddyfi, Canada
- 15.20 Quantum well Hall-effect sensor based handheld magnetic scanner with programmable electromagnetic coil for non-destructive testing of ferromagnetic and non-ferromagnetic materials**  
Authors – FA Biruu, E Balaban, E Ahmad and M Missous, University of Manchester
- 16.15 Improvement to ultrasonic spectroscopy (UltraSpec<sup>®</sup>) technique to extract reflection times**  
Authors – J Chambers and J Tucker, Southern Research Institute
- 16.40 High-temperature gallium orthophosphate transducers for NDT and monitoring purposes in nuclear power plants**  
Authors – M Kostan<sup>1</sup>, A Mohimi<sup>1,2</sup>, C Nageswaran<sup>2</sup>, T-H Gan<sup>1,2</sup>, L Wrobel<sup>1</sup> and C Selcuk<sup>1</sup>  
<sup>1</sup> Brunel University London, <sup>2</sup> TWI Ltd
- 17.05 A hybrid technique for modelling the ultrasonic response from surface-breaking defects**  
Authors – R Phillips<sup>1</sup>, D Duxbury<sup>2</sup>, P Huthwaite<sup>1</sup> and M Lowe<sup>1</sup>  
<sup>1</sup> Imperial College London, <sup>2</sup> Rolls-Royce plc



**09.15 Plenary Paper – Battle of Britain memorial flight – keeping the old girls flying**

*Chair: Mr K Pickup*

*Author – Jules Read, BAE Systems – Conference Theatre*

**Session 5A – Oil, Gas and Pipes**

*Chair: Dr S F Burch Conference Theatre*

**09.45 NDT in the oil & gas industry – the HOIS joint industry project perspective**

*Authors – H R Peramatzis and S F Burch, ESR Technology*

**10.10 Modelling of ultrasonic guided waves for circular cylindrical structures using finite element approach and selection of noise filtering technique**

*Authors – A Sharma and S Kumar, IIT (BHU)*

**10.35 On the detectability of corrosion damage with short-range circumferential guided waves**

*Authors – R Howard and F Cegla, Imperial College London*

**Session 5B – Applications**

Chair: **Professor K Newton Suite I**

**09.45 Advances in automated and remote-deployed ACFMT for surface crack detection**

*Author – M C Smith, TSC Inspection Systems*

**10.10 Eddy current pulsed thermography for blade edge defect inspection using Helmholtz-coil excitation**

*Authors – J Ji<sup>1</sup>, Y Gao<sup>1,2</sup> and GYTian<sup>1,2</sup>*

*<sup>1</sup>Nanjing University of Aeronautics and Astronautics, <sup>2</sup>Newcastle University*

**10.35 Non-destructive magnetic field recognition for assembly failure detection in enclosed devices**

*Authors – J Wasacz and P Ryba, ABB SP z o o*

**Session 5C – Aerospace**

*Chair:* **Professor R A Smith** Suite 2

**09.45** **Increasing the use of laser shearography within the military air environment**

*Author – P J Ruttle, RAF Wittering*

**10.10** **3D characterisation of impact damage for performance modelling of composites**

*Authors – J Kirkpatrick, R Smith, S Hallett and D Hallam, University of Bristol*

**10.35** **Optimising guided wave inspections for aircraft seals**

*Author – J R Pettit, Frazer-Nash Consultancy*

**Session 6A – Theoretical Modelling**

Chair: **Dr R Chapman** Conference Theatre

**11.15 Modelling and structural optimisation of a Lorentz force-based omnidirectional electromagnetic acoustic transducer**

Authors – S Wang<sup>1,2</sup>, S Huang<sup>1</sup>, A Velichko<sup>2</sup>, P Wilcox<sup>2</sup> and W Zhao<sup>1</sup>  
<sup>1</sup>Tsinghua University, <sup>2</sup>University of Bristol

**11.40 Hybrid simulation model of ultrasonic inspection of pressure tubes in the nuclear industry**

Authors – H Zhao, J Dobson, A Gachagan, T Lardner and G Dobie, University of Strathclyde

**12.05 Parametric finite element modelling study to investigate guided wave inspection sensitivity in boiler spines**

Authors – R Sanderson<sup>1</sup>, E Hutchison<sup>1</sup>, J Allwright<sup>1</sup>, K Thornicroft<sup>1</sup> and J Jian<sup>2</sup>  
<sup>1</sup>TWI Ltd, <sup>2</sup>EDF Energy Nuclear Generation

**12.30 Defect representation using the electromagnetic tensor formulation for eddy current NDT**

Authors – N Karimian, M Lu, J W Wilson, W Yin and A J Peyton, University of Manchester

**12.55 Wedge elastic waves with applications to ultrasonic non-destructive testing**

Author – V V Krylov, Loughborough University

**Session 6B – Applications continued**

Chair: **Dr C R Brett Suite I**

**11.15 Deployment of ultrasonic through-transmission inspection using twin cooperative industrial robots**

Authors – J Riise<sup>1</sup>, S G Pierce<sup>1</sup>, P I Nicholson<sup>2</sup>, I Cooper<sup>2</sup> and B Wright<sup>2</sup>  
<sup>1</sup>University of Strathclyde, <sup>2</sup>TWI Technology

**11.40 Software and digital signal processing algorithms for a novel quantum well Hall-effect (QWHE) transducer-based magnetic field camera**

Authors – E Balaban, CW Liang and M Missous, University of Manchester

**12.05 The analysis and detection of kissing bonds in adhesive joints**

Authors – F J Guild<sup>1</sup> and C Jeenjitkaew<sup>2</sup>  
<sup>1</sup>Imperial College London, <sup>2</sup>Element Hitchin

**12.30 Analysis of active noise level and vibration control inside an enclosure**

Authors – A Montazeri<sup>1</sup>, N Karimian<sup>2</sup> and S Karimian<sup>3</sup>  
<sup>1</sup>Lancaster University, <sup>2</sup>University of Manchester, <sup>3</sup>CERN

**12.55 Acceleration of sweeping frequency in eddy current computation**

Authors – Mingyang Lu, Noushin Karimian, Anthony Peyton and Wuliang Yin,  
University of Manchester

## **Session 6C – Composite Materials**

*Chair: Mr C Forrester Suite 2*

**11.15 On the tools for optimisation of X-ray CT of carbon fibre-reinforced composites**

*Authors – C I Fraij, R A Smith and P D Wilcox, University of Bristol*

**11.40 Wrinkle characterisation from ultrasonic scans of composites**

*Authors – B Larrañaga-Valsero<sup>1</sup>, R A Smith<sup>2</sup>, R B Tayong<sup>2</sup>, A Fernández-López<sup>1</sup> and A Güemes<sup>1</sup>  
<sup>1</sup>University of Madrid, <sup>2</sup>University of Bristol*

**12.05 Finite element analysis of ultrasonic CFRP laminate inspection**

*Authors – J Dobson<sup>1</sup>, A Gachagan<sup>1</sup>, R O'Leary<sup>1</sup>, A Tweedie<sup>2</sup> and G Harvey<sup>2</sup>,  
<sup>1</sup>University of Strathclyde, <sup>2</sup>PZFlex, Thornton Tomasetti, UK*

**12.30 Progress in modelling the mechanical performance of wrinkled composites based on NDT data**

*Authors – N Xie, R A Smith and S R Hallett, University of Bristol*

**12.55 Optimisation of ultrasonic inspection for 3D fibre-tow mapping in composite structures**

*Author – M J Mienczakowski, L J Nelson and R Smith, University of Bristol*