

nsirc

Impact Guide

Responding to Industrial Challenges

NSIRC Founding Partners...



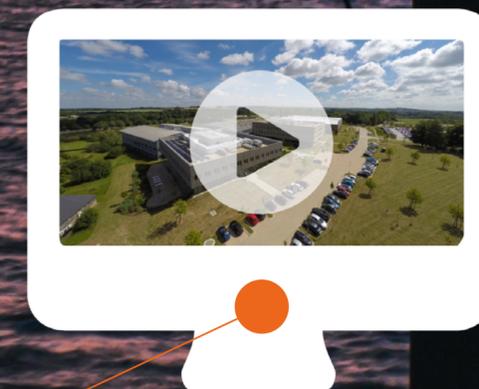
Global engineering and scientific industries are facing a skills shortage of highly qualified researchers.

What the world needs are research facilities that can prepare students for management level careers within industry.

While most traditional postgraduate programmes offer a kind of 'industrial' or 'business' exposure, what makes NSIRC different is the quality of that experience and training, making the transition from academia to career within industry a much more effective process.

Since 2012, research carried out by NSIRC students has made an vital impact on industry by successfully solving technology challenges, influence standards and making the world safer.

Today, the research conducted by NSIRC students continues to lead innovation in the fields of materials, joining technologies, structural integrity, digitalisation, manufacturing, net-zero, hydrogen and many more.



Watch a ITN report on the TWI YouTube channel about NSIRC and academia with industrial impact

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In 2012, the United Kingdom high education system had a need for a robust collaboration between academia and industry that could support innovation and the development of the UK economy.

That year, the National Structural Integrity Research Centre (NSIRC) was established with the objective of boosting the impact of academic research in industry. By pioneering a new model of operations between industry and academia, NSIRC has created a step change in the process of innovation, resulting in improved technologies with global relevance.

NSIRC provides access to cutting-edge scientific research while supporting and promoting the training of the next generation of engineers.

NSIRC bridges the gap between research conducted in academia and industry's need for marketable products.

NSIRC gives students the opportunity to gain expert know-how across industry sectors, and the training to succeed in a business environment.



THE STORY OF NSIRC...

Our Vision

To be a world-renowned centre of industrially driven academic excellence in the field of structural integrity.

The Mission We Accepted

- To develop a critical mass of research informed by the needs of industry, across the field of structural integrity
- Develop novel postgraduate programmes to train the next generation of researchers and engineers to support UK science and innovation
- Accelerate the translation of science into industrially relevant products and services
- Contribute to the development of effective standards and regulations
- Become the research provider of choice for industry in the area of structural integrity

2009

TWI and Brunel University London partner to launch **Brunel Innovation Centre** to bringing together academia and industry for technology research and innovation.



2012

January

Rt Hon Lord David Willetts MP, Minister for Universities and Science calls for a new type of university focused on science and technology for postgraduates

October

TWI and **Brunel University London partner** to submit a successful bid to the **Regional Growth Fund** and the **Higher Education Funding Council for England** to establish new postgraduate engineering facility

NSIRC is launched with sponsorship from bp, Lloyd's Register Foundation and TWI

Brunel University London named **Lead Academic Partner** of NSIRC

2013

May

First student enrolls at NSIRC with their degree to be awarded by Brunel University London

September

The **first paper from an NSIRC student is delivered** at an international conference in Spain

December

The **first peer-reviewed journal paper** from an NSIRC student is published

2014

September

Brunel University London commences its **MSc in Structural Integrity** delivered at NSIRC with the course designed in partnership with TWI

October

University of Cambridge becomes the 10th university to sign an agreement for a PhD with NSIRC

The first student sponsored by **Lloyd's Register Foundation** enrolls with NSIRC and University of Leeds

2015

June

NSIRC holds **inaugural Annual Conference** showcasing the research of its PhD students

September

HRH The Princess Royal formally opens TWI and NSIRC's **new multi-million pound research laboratories** with state-of-the-art equipment for PhD and MSc students

Academia with Impact...



100%
PhD completion rate



900
Combined years of
PhD research since 2021



32%
Female participation rate



13
Standards update
contribution from
NSIRC research

2016

January

The **first student sponsored by bp** enrolls with NSIRC and Coventry University

2017

April

The **first NSIRC student passes their Viva** and is awarded their PhD by Brunel University London

September

Brunel University London moves its **MSc in Oil and Gas Engineering** to NSIRC's premises

October

NSIRC and Aston University launch the **MSc and Degree Apprenticeship in Engineering Leadership and Management**

2018

December

Paper by NSIRC PhD Student Xu Liu titled, 'Fatigue Performance of Welded Joints Under Variable Amplitude Loading Spectra' contributes to **BS 7608**

2019

January

NSIRC enrolls its first PhD student sponsored by the Non-metallic Innovation Centre, a partnership between **TWI, Saudi Aramco Technologies Company** and **Abu Dhabi National Oil Company (ADNOC)**, focusing on the next generation of composite pipes.

October

Research by Natalia Garbán NSIRC MSc student is recognised by way of a conference paper. Along with co-authors Philippa Moore, Philippe Bastid and Kevin Hughes, the paper was awarded by the American Society of Mechanical Engineers (ASME). Natalia's project explored how the width of the weld and mismatch ratio affect the fracture toughness of metallic material. Titled 'The Effect of Weld Width on the Accuracy of Fracture Toughness Test Results', the aim was to identify whether the calculations supporting the standard **BS EN ISO15653** were still valid.

Academia with Impact...



197

International academic, industry journal and conference publications



16

Awards and Recognitions for Research Excellence from External Organisations



45

Affiliated Universities in the UK, Europe and Worldwide

2020

April

Madie Allen, Brunel University London and Lloyd's Register Foundation PhD student, was been awarded the **Richard Dolby Rolls-Royce Prize 2020**. The award is presented by The Welding Institute's Younger Members Committee. Her research project was titled, 'Predicting the microstructure of metal additively manufactured parts'

November

NSIRC and De Montfort University collaborate to offer the **Master of Business Administration (MBA)** designed especially for senior managers in the engineering sector, also available as a Degree Apprenticeship

December

Paper co-authored by PhD Student Jazeel Chukkan titled, 'Evaluation of the Solutions for Calculating Misalignment-Induced Stress Concentration Factor at Girth Welds in Pipelines' contributes to standards including **BS 7910**.

2021

January

PhD Student Konstantinos Kouzoumis publishes in the International Journal of Pressure Vessels and Piping. His work has influenced the revision of **BS 7910**, the UK standard for flaw assessment, and forms an important part of the evidence base, demonstrating that the standard can be safely applied to a wide range of structures and types of materials

Brunel University London launches its **MSc in Lightweight Structures Impact Engineering** at NSIRC



Watch a Webinar on the NSIRC YouTube channel about the centre, featuring Professor Geoff Rodgers from Brunel University London and Dr Jan Przydatek from Lloyd's Register Foundation.

2022

January

TWI launches NSIRC International programme

to establish NSIRC bases in new locations outside the UK.

March

10 Year Anniversary of NSIRC - Centre creates a special addition of the NSIRC logo to mark the year.

Engineering Continuing Professional Development (CPD) courses now offered by NSIRC & Brunel University London.

June

MoU signed between **Parahyangan Catholic University (UNPAR)** and TWI to establish NSIRC Indonesia

MoU signed between **King Mongkut's University of Technology North Bangkok (KMUTNB)** and TWI to establish NSIRC Thailand

September

MoU signed between **Universiti Sains Malaysia** and TWI to establish NSIRC Malaysia

November

Brunel University London begins recruitment for **Engineering CPD Courses** that will take place in-person at their NSIRC facilities in Cambridge.

December

Hellenic Mediterranean University joins the **NSIRC International** programme with two studentships. Both students work from the university in Crete, and the TWI Hellas office in Athens, Greece. Sponsorship for these students was provided by LRF.

Fivos Simopoulos and Georgios Kampourakis become the first **NSIRC International** students and are based in Greece.

NSIRC INTERNATIONAL

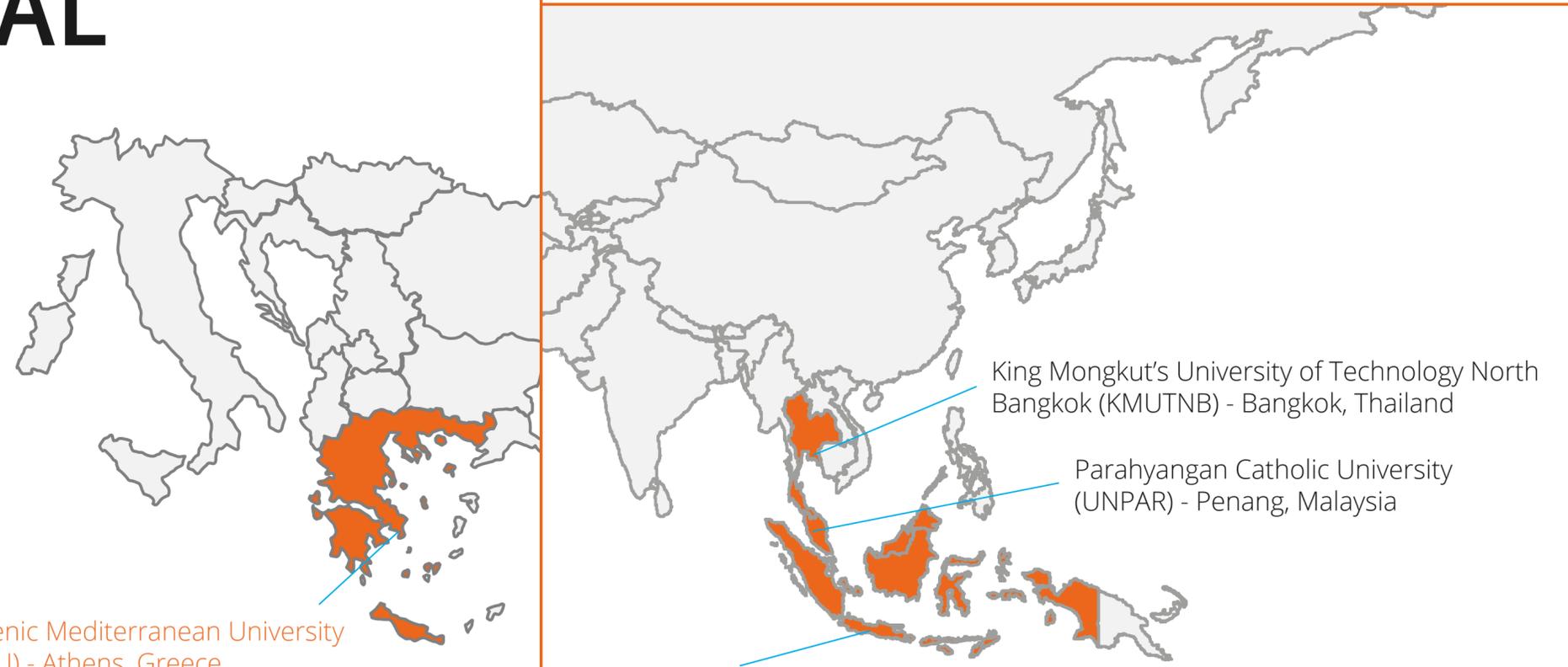
NSIRC International will allow students based in locations around the world to work on topics that are called for by industries and governments to solve their unique technology challenges and priorities.

In the UK, NSIRC has a proven track record of equipping future engineering professionals with the knowledge and expertise they need to be successful and this will continue at our new overseas locations.

Among the university that will be a part of the new programme will be Parahyangan Catholic University (UNPAR) in Indonesia, King Mongkut's University of Technology North Bangkok (KMUTNB) in Thailand, Universiti Sains Malaysia, and Hellenic Mediterranean University (HMU)*.

LRF funding and industrial expertise will support PhD Studentships on the international programme, with topics chosen to align with the charity's technology priorities. These focus on engineering innovation that will make the world a safer place to live and work.

LRF provided funding, either in part or in full, for 72 NSIRC PhD Studentships from 2012 to 2022

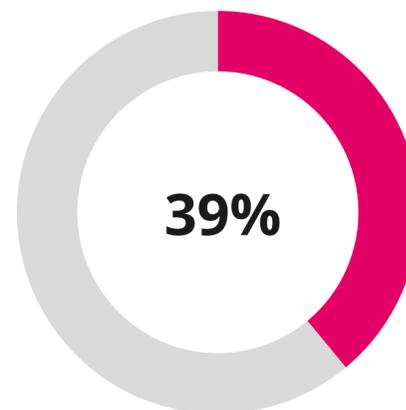


Hellenic Mediterranean University (HMU) - Athens, Greece

King Mongkut's University of Technology North Bangkok (KMUTNB) - Bangkok, Thailand

Parahyangan Catholic University (UNPAR) - Penang, Malaysia

Parahyangan Catholic University (UNPAR) - Bandung, Indonesia



£2'000'000.00

LRF has pledged two million GBP in overall funding for NSIRC International PhD's.



NSIRC IMPACT HEADLINES

“Amazing” Experience at **Oxford School on Neutron Scattering**

NSIRC and Lloyd’s Register Foundation PhD student Arunima Bhuvanendran Nair Jayakumari, has completed a 10-day summer school programme at the 17th Oxford School on Neutron Scattering, held at the University of Oxford.

Amarachi Obilor published in **International Journal of Advanced Manufacturing Technology**

Amarachi Obilor has successfully published her latest research paper in the high impact industry for Advanced Manufacturing Technology.

Results are in from AM Experiments at **Kanfit3d Israel**

NSIRC PhD Student Antonios Dimopoulos has returned from a five day trip to Kanfit3D in Israel, where he conducted research experiments on ‘Multi-Objective Optimisation of Metal Support Structures for Laser Powder Bed Fusion Systems.’

Norbert Presents at **Electron Beam Technologies Conference**

Norbert Sieczkiewicz presents at the 14th International Conference on Electron Beam Technologies (EBT), held in Varna, Bulgaria.

NSIRC PhD Students Present to **EUROCORR 2022 in Berlin**

Lloyd’s Register Foundation (LRF) sponsored PhD Students, Ana Araujo-Lascano, Adamantini Loukodimou and Adriana Castro-Vargas presented their latest research findings at ‘EUROCORR 2022 – Corrosion in a Changing World: Energy, Mobility, Digitalization’, held in Berlin, Germany.

Read More

Visit the nsirc website to read more about these stories and others.



WHAT DOES THE FUTURE HOLD FOR NSIRC?

The demand for highly-qualified engineers continues to be strong, with many businesses reporting a lack of graduates and postgraduates with the skills required to achieve business growth (The Skills and Demand Industry Survey, The Institution of Engineering and Technology).

NSIRC will continue to:

- Offer PhD studentships to a wide variety of people, including those from groups underrepresented in the profession, such as women and those from BAME communities
- Expand its MSc programme to include additional Master's and Degree Apprenticeship qualifications
- Nurture and grow mutually beneficial partnerships with universities to ensure industry needs are integrated into academic research
- Work in collaboration with NSIRC sponsors to provide world-leading research which will advance technology, improve global safety and solve engineering problems
- Publish cutting edge, innovative research at international conferences and in peer reviewed journals for the benefit of NSIRC sponsors and the wider engineering and technology sector
- Equip the next generation of engineers with the technical know-how and business skills demanded by industry and assist them to build successful careers
- Continue to engage in outreach activities, including to schools and undergraduates, to encourage the uptake of engineering careers
- Continue to be a world-renowned centre of industrially driven academic excellence in the field of structural integrity
- Be an integral part of innovation strategy and continue to deliver tangible benefits for sponsors Lloyd's Register Foundation, bp and TWI

10 Years of NSIRC PhD Thesis Titles from 2012 to 2022

Fatigue Oriented Risk Based Inspection and Structural Health Monitoring of FPSOs (Development of Structural Health Monitoring (SHM) systems for improved decision support for risk based inspections in the integrity management of FPSO hulls) • Determination of the most appropriate parameters for butt fusion welding PE pipes for maximum long-term structural integrity of the joint • Validation of Leak Before Break (LBB) methods for piping and pressure vessels • Thermal Protection of Polymer-Based Composite Structures • High performance Nanostructured coatings • Local post-weld heat treatment on residual stresses relaxation through a synergistic use of experiments and FEA • Pattern Recognition Approach for damage detection in composite plates • Crack Tip Opening Displacement (CTOD) Formulae for Standard Fracture Toughness Test Specimens • Use of Plasma Pre-treatment in Adhesive Bonding • **Development of Transparent Conducting Coatings (TCC) using Sol-gel route** • Analyses of NDE data for remaining life assessments in pipes • Statistical Methods for the Analysis of Corrosion Data for Integrity Assessments • Data analyses and its interpretation for use in remaining life assessments • The influence of additives on the corrosion resistance of wet film coatings • Tailored Energy Distribution for Laser Beam Processing • The joining of thermoplastic composites to metals • Continuous monitoring of high temperature pipelines using ultrasonic guided wave transducers up to 350°C and 580°C • Signal processing, image analysis and feature recognition for long range UT • Reliability assessment of environmental cracking on duplex stainless steel • Effect of biaxiality on the fracture and plastic collapse behaviour of pipeline girth welds • Development of vibration based condition monitoring for the assessment of damage in pipelines • Reliability and safety of axle bearings in passenger and freight rolling stock • Vision-based Control System for high quality Arc Welding • Study of strain based low cycle thermal fatigue • Investigation of fatigue performance of low transformation temperature (LTT) welds • High-resolution 3D Assessment of Weld Toe Fatigue Crack Initiation • Online structural integrity monitoring of rails and sleepers using acoustic emission • Removal of Fouling in Submerged Structures Using High Power Guided Ultrasonic Waves • Active vibration control and condition monitoring of flexible mooring chain • The development of a risk-based inspection approach for determining nondestructive examination test locations of welds in engineering structures not subject to 100% inspection • Assessment of crack arrest behaviour of modern structural steels (ICASE AS WELL) • Modelling the mechanical behaviour of steels under high loading rates • In Situ monitoring of production of very large composite structures using tool embedded capacitors • **Predict remaining life from localised corrosion to cracking • High strength steels in structural applications** • Investigation into a method for assessing the short-term integrity of butt fusion welds in polyethylene pipes • Investigation of the shake-out effects on residual stress distributions in welded structures • Incorporation of damage specific feedback loop into PoF calculations for process equipment • Development of an electron gun design optimisation methodology • Health monitoring of carbon fibre reinforced plastics repaired patch subjected to aerodynamic loading • The effect of microstructure and cold creep on hydrogen embrittlement of (super)duplex stainless steels • Prediction and measurement of residual stresses in mooring chains and their effect on fatigue stress cycles • Influence of Pit Morphology on Crack Propagation • Development of Advanced Material Modelling for Metal Additive Manufacturing • The use of nanostructured coating and hydrogen embrittlement of high strength • Cold Spray Additive Manufacturing with Nanostructured Multicomponent Equi-Molar Materials (MEMs) • **Development of leak before break concept for filament wound composite structures** • Development of combined enriched element and continuum damage mechanics models for composites • Vessel energy efficiency enhancement using sensing for LNG Storage Containers • Transducer Miniaturisation of High Density Arrays for Guided Wave Inspection and Monitoring • Minimisation and quantification of weld cladding defects for rail and oil & gas sector applications • Cold Spray Deposition of Precipitation-Hardenable Aluminium Alloys for Structural Repairs • Monitoring system for high quality arc welding • Development of algorithms for the assessment of the reliability of offshore structures with the application of Bayesian methods to incorporate new information • Development of High Intensity printed transparent conducting films • Wall climbing autonomous walking robot (WCAWR) for non-destructive testing • **Internal in-service inspection of petrochemical storage tank floors to detect underside corrosion with sensorbots** • Development of water borne fire retardants for use in conventional and bio-based composites • An integrated approach for evaluation of microstructure and mechanical properties degradation in steels used at elevated temperatures • Simulation tool development for a composite manufacturing process default prediction • Risk assessment of underground storage tank (USTs) due to fire/gas explosion effects on vicinity of petrol station • Coded wave forms for high resolution ultrasonic guided wave response of complex structures • Transducer array optimisation through simulation and development of normalisation techniques • Image Analysis for Complex Data in NDT • Development of SHM platform embedded signal processing, data analysis and communication for UST • Development of Nanoscale Components with Advanced Functionalities for erosion and ice resistant composite for severe operating conditions • Structural Integrity Assessment for Wire and Arc Additive Manufacturing • **A mechanistic approach to predicting the realistic long-term corrosion performance of coatings** • Enhancement of RBI for Structural Integrity Management • Critical defect size in additive manufactured metallic components - development of structural integrity assessment methods through novel experimentation and computer modelling • The development of enhanced structural integrity assessment methods applied to additive manufacturing for the rectification and repair of metallic components using power beam and gas-shielding deposition techniques • Non-Destructive evaluation of stress and heterogeneity using acoustic methods • Multiscale experimental and computational techniques for optimising selective Laser melting additive manufacturing process parameters • Compatibility of BS 7910 and R6 in assessing the integrity of components with complex loading history under multi-axial loading • The development and understanding of similar and dissimilar material refill friction stir welded joints • Analysis and quantitative evaluation of functionalised nanoscale silica • Underwater laser materials processing • Integrity assessment of offshore assets: Novel approaches towards in-situ monitoring • Coded excitation in ultrasonic NDT (to lead to intrinsically safe devices - ATEX) • Intelligent self-monitoring coating system (intelcoat) • Mechanistic basis for defect acceptance criteria in additively manufactured ti-6Al-4V aerospace alloys • Evolution of properties and composition of material powders in additive manufacturing • Wire and arc additive manufacture for maritime constructions • A multiphysics predictive modelling framework for mitigating residual stresses • Microstructure properties and fatigue behaviour of multiple metallic materials manufactured by novel 3D printing technique • Structural integrity and qualification of 316L austenitic stainless steel by optimisation of additive manufacturing process parameters • Development of durable super repellent coatings • Reduction of hexavalent chromium in welding fume • Cold atmospheric plasma treatment to enhance joining processes • Data transfer through composite risers • Effect of Insufficient Homogenisation of Pigmented Resin during the Extrusion of Polyethylene Pipes on the Mech. Performance of Butt Fusion Welds • Ultrasonic Inspection of Austenitic Welds • **Advanced electron beam gun design for high integrity processing** • Development of Netshape Hot Isostatic Pressing for Nickel Superalloys • Investigation of the use of power ultrasonics for the improvement of manufacturing processes in joining and material processing • Autonomous defect classification for ultrasonic non-destructive testing in advanced manufacturing processes • Development of high temperature and underwater sensor for permanent magnet corrosion monitor system • Development of cost effective permanently installed corrosion monitor system using permanent magnet • Development of pulsed eddy current system for corrosion under insulation • Development of fracture toughness testing techniques for non-sharp defects • Development of an IoT DAQ with integrated Data analytics for Bridge monitoring • Developing a model to predict fatigue limit of AM materials • Developing quality category fatigue design S-N curves for AM materials • Local detection of hydrogen in steels generated from exposure to sour environments using neutron diffraction imaging • **Development of methods to evaluate dynamic fracture toughness of metallic materials at very high loading rate under conditions of limited plastic deformation** • Protection of offshore structures using low-cost, damage tolerant, sacrificial coatings (ProCoat) • Recycling of thermoset resins via the development of a solvent trigger de-curing system • Composite casing for passive cooling of battery elements • In-process quality monitoring of friction stir welding • Crack tip constraint in typical high strength steel components in arctic conditions • Investigation on improvement of corrosion monitor reliability, calibration and coverage • Readiness to manufacture with electron beam additive manufacture and beam probing (BeamAssure) technology • Approaches to Industry 4.0 implementation for electron beam quality assurance using BeamAssure • Investigation into in-line process monitoring for improved quality assurance in electron beam powder bed additive manufacture (EBPBAM) • Understanding of Laser Riveting Process • Embedded Carbon Fibre Transition Zones for Metal-Composite Hybrid Joints • Application of Probabilistic Fracture Mechanics in Quantifying the Role of Welding Residual Stress in Fracture Assessment • Fracture Toughness Scaling Model to Assess Changes in Crack-tip Constraint • Effect of partial pressures of hydrogen on high temperature vacuum brazing • Development of near net shape manufacturing of complex MMC structures by powder metallurgy hot isostatic pressing • Digital twin technologies to build intelligent maintenance systems • Provision of condition structural health monitoring system for stress orientated hydrogen induced cracking in steel structures • Electrofusion couplers for Thermoplastic Composite Pipe • Development of in process and post process geometric and defect characterisation and control of parts made via selective laser melting • Large scale open architecture laser metal deposition for multi-planar coatings and 3D structures • Open architecture additive manufacturing for large scale aerospace components • Metallurgical analysis of thick-section aluminium FSW • Development of approaches in providing industrial cost evaluation and environmental impact assessment for the thermoplastics on doors • A Novel technique for handling missing data for structural health monitoring of HIC/SOHIC • **Establishing a best practice guide for welding of newly developed duplex stainless steel seamless pipe** • Optimisation of guided wave transducers for corrugated steel sheet piles • Application of diagnostic methods in order to monitor aging process and life prediction in polymers • Development of novel coatings for the protection of high strength steels • Fatigue initiation from small flaws in high strength thick welded shipping steels • Determination of boundary conditions for occurrence of weld metal hydrogen cracking • Smart self-monitoring coating systems (Smart Coat) • Development of a standardised environmental-mechanical test methodology for quantitative evaluation of resistance to HISC of duplex stainless steels • Design of composite pressure vessels with built-in variability in their structure for inherent "leak-before-break" capability • Development of laser-based decontamination techniques • Characterising thermal fatigue at mix points in industrial piping • Characterisation and early detection of hydrogen embrittlement in offshore bolts using Acoustic Emission • Prediction of Step Wise Cracking due to Hydrogen attack in steel vessels using finite element stress analysis and acoustic emission • Magnetic-based approach for qualitative and quantitative characterisation of localised and general corrosion in pipelines • Development of a self healable and tough polymeric nanocomposite • Development of online monitoring and inspection of wire and arc additive manufacturing • Repair of high strength corrosion resistant alloys using laser assisted cold spray • Investigation of reheated weld metal microstructure as a function of feedstock chemistry and extrapolation for additive manufacture • **Development of WAAM process to achieve consistent bead geometry and microstructure with optimised feedstock chemistry** • Digital Process Iteration human-robot for improved brazing safety and productivity • **Uncertainty quantification in precipitation strengthened alloys** • Composite to metal joining for naval vessels • Developing novel coatings for improved performance of fasteners for dissimilar material joining applications • Design and manufacture of added-value functional surfaces using laser technologies • Crack behaviour in a residual stress field at fillet welds in ship structures • Extreme High-speed Laser Application (EHLA) coatings • Examination of Environmental Cracking in Additively Manufactured (AM) Materials • Bridging the Simulation-to-Reality Gap: Machine Learning techniques for supervised and unsupervised domain adaptation of visuomotor representations and multi-dimensional datasets for rapid deployment of pre-trained robotic agents in new and unstructured environments • Enabling robot skill acquisition with inference at the edge: Data- and computation-efficient end-to-end skill modelling supporting variable and shared autonomy for robotic autonomous systems undertaking complex tasks in remote environments • Development of a novel approach that employs synthetic data to optimize the process monitoring and control of metal AM systems • Mechanistic Understanding of Life Extension of Ageing Offshore Structures • Design of materials and joints for hydrogen service (MaHy) • Coded excitation methodologies for ultrasonic testing techniques exhibiting poor signal to noise performance • Portable Cold Spray for Repair of Light Metal Components • Artificial Intelligence for NDT - Development of AI systems for robotic path planning and automated defect detection • Local Vacuum EB welding of large structures for the power sector • Influence of powder quality on the mechanical properties of HIPed materials for safety critical components • Joining dissimilar materials for future automotive structures • **Developing new resistance welding technologies to create high integrity multi-material joints** • Laser joining of aluminium to hot-dip galvanized steel for the use of car bodies • Development of approaches in providing multi-criteria decision support for optimal life cycle management of assets in the shipping sector • Development of an advanced shearography for wind turbine blade inspection on a wind tower • Development of Novel Coating systems for mitigating corrosion of offshore wind turbines • Development of additive layer manufacturing technology for aeroengine compact air oil heat exchanger • Repair of high strength corrosion resistant alloys using laser assisted cold spray • Effect of Non-Conductive Material Dielectric Permittivity and Geometrical Features on Electromagnetic Surface Wave Propagation

ENDORSEMENTS

What our sponsors
have to say...



Professor Geoff Rodgers, Vice-Provost Research, Brunel University London

"Brunel University London's strategic partnership with TWI has become a new model for university-business interactions in the UK.

The partnership has demonstrated the substantial benefits that arise when co-located research teams from universities and industry are enabled to work closely together on a portfolio of projects. It has given Brunel the opportunity to collaborate in exciting projects with new partners across a range of industrial sectors.

We look forward to working with TWI in the coming years and developing our partnership further."



Dr Roberto Morana, Senior Materials & Welding Engineer, bp

"bp, together with TWI and Lloyds Register Foundation, is a founding member of the National Structural Integrity Research Center (NSIRC), a UK industry-led postgraduate education centre.

Vision of NSIRC is to provide both industry-driven academic research and relevant training to the next generation of structural integrity engineers and researchers. This collaboration, over the last five years, has generated significant innovation in structural integrity, resulting in specialized equipment and industry-driven research in the new, unique facilities.

The new partnership has also opened up opportunities for research and innovation to support bp-identified topics which are aligned with the company's technology development program, including structure integrity, use of coatings and non-metallics and additive manufacturing (3D printing). Through NSIRC bp has access to TWI's expertise on applied research and to PhD students undertaking fundamental research to help underpin bp's commercial operations."

Dr Jan Przydatek, Director of Technology, Lloyd's Register Foundation

"Since 2014 we have been supporting NSIRC to create impact through education and research. By impact we mean changes in the real world that enhance safety and advance public education.

NSIRC's postgraduate studies not only create individuals who are technically excellent, but they are also shaped to think with an industry mindset meaning that they are ready to fully integrate and add value into organisations from day one. I am privileged to meet the PhD students we sponsor on a regular basis and watch them develop over their time at NSIRC.

What is noticeable is the change from academic thinking to seeing a bigger picture, being able to communicate and influence effectively with different types of audiences, understand the importance of processes and procedures, and knowing how to fit into commercial organisations, to name but a few."





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