IMPACT REVIEW 2020

In recent years, the demand for highly qualified researchers in industry has increased considerably. This has led to an increased need for research facilities like the National Structural Integrity Research Centre (NSIRC) where PhD students are prepared for careers in industry.

Most traditional PhD programmes do not offer this kind of 'industrial' or 'business' exposure and training, and this what makes NSIRC different from other postgraduate programmes.

Research carried out by NSIRC students has made an invaluable impact on industry over the last eight years, and some examples are highlighted in this brochure.

The research conducted by NSIRC students leads to innovation and safety improvements in the fields of materials, joining technologies and structural Integrity and forms one of the central pillars of the TWI Innovation Network.

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The higher education system in the UK has grown rapidly however there is still a need for robust collaboration between academia and industry to support innovation and the development of the UK economy.

NSIRC was established in 2012 with the objective of boosting the impact of academic research in industry. By pioneering a new model of collaboration between industry and academia, NSIRC has created a step change in the process of innovation, resulting in / leading to improved technologies with global impact.

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

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

NSIRC offers its students the opportunity to gain expert know-how across industry sectors and learn how to succeed in a business environment.

THE STORY OF NSIRC

Vision

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

Mission

- 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.

"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."

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

Brunel University London

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

2013

May

The first student enrols with 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 enrols 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

"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 researches. 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 Roberto Morana, Senior Materials & Welding Engineer, bp

2016

January

The first student sponsored by bp enrols with NSIRC and Coventry University

2017

April

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

September

NSIRC's reaches the significant milestone of 100 PhD students enrolled

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

April

NSIRC PhD studentships have now conducted the equivalent of 200 years of structural integrity research

2019

January

NSIRC enrols 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)

September

Brunel University London becomes the first university to reach the milestone of 50 NSIRC PhD studentships

"When we first launched the NSIRC programme in 2012, we knew that our PhD students would develop an industry mindset through aligning their research with market requirements and industrial needs.

Since then, the programme has successfully demonstrated its industrial impact through award-winning research and papers published in high impact factor journals. TWI is very proud to have invested in such a world-leading project and its influential collaboration with its sponsors Lloyds Register Foundation and bp, as well as its lead academic partner, Brunel University London.

I believe that NSIRC has enormous potential to go even further by continuing to advance postgraduate engineering research for the benefit of global standards in safety and structural integrity. From our world-class facility in Cambridge, TWI will continue supporting NSIRC to become an even stronger, knowledge-driven, industry-led research centre."

Dr Aamir Khalid, Chief Executive, TWI

2020

February

NSIRC agrees with Essex University to offer the MSc in Artificial Intelligence from January 2021

May

NSIRC and the University of Bedfordshire design a new PhD in Innovation Management to be launched in January 2021

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

2021

January

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

“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.

I am in regular contact with the NSIRC PhD students we sponsor, and I am continuously impressed to see the development of their research skills and knowledge, but equally how they develop an industry mindset making them ready to add value to the organisations they join from day one. Indeed, employment statistics show that these students are sought after by industry, bringing impact through the work they do.

In addition to developing industry ready people, the research conducted at NSIRC is targeted at real world challenges with routes to application. After six years we are starting to see NSIRC research influencing the standards of today and laying the foundations for the standards of tomorrow; the development of technology and techniques to protect, inspect and maintain the structural integrity of assets and their component parts; and fundamental knowledge of new manufacturing techniques that will ensure their safe application.

After six years we have started to see great examples of how NSIRC is enabling real-world change, and what is clear to me is that there is much more to come.”

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

Lloyd’s Register Foundation

CASE STUDY:
FROM NSIRC TO ACADEMIA

DR FARNOOSH FARHAD

Dr Farnoosh Farhad settled on her chosen career in high school. With a keen interest in maths and physics, combined with a passion for designing engineering components and solving problems, engineering was a perfect fit.

Farnoosh pursued her interests after school in her home country of Iran, studying for a Bachelor in Mechanical Engineering, before moving to the UK for a year to study for a MSc in Engineering at Newcastle University.

Having achieved a distinction in her MSc, Farnoosh secured employment in industry back in Iran for two years. Whilst there she discovered a research interest in an industrially orientated PhD. After passing a short course at Imperial College London, she successfully applied for a PhD with NSIRC, which she completed in December last year.

The PhD was a fully funded project sponsored by bp, Coventry University and TWI, researching the effect of sour corrosive environment on pit to crack transition in oil and gas pipelines and predicting this transition time. Farnoosh carried out a series of experimental tests, including designing a new environmental vessel for corrosion fatigue tests in a toxic environment, numerical modelling and analytical approaches. The novel vessel designed and the proposed prediction model have great potential to be used for research in a wide range of industries.

During her PhD, Farnoosh won travel grants to attend and present her research at international conferences, and published two papers in well-known journals. She was also appointed as a committee member of the Engineering Integrity Society and Honorary Editor of Engineering Integrity Journal.

Reflecting on her time with NSIRC, Farnoosh said: “When I started my PhD I was still at the beginning of a journey and had room for improvement, but over time the improvements became visible. I really appreciated the research facility at TWI and helpful technicians who were always willing to support me to deliver my test plans on time. NSIRC is the right place to do an industrially oriented PhD, and you can also have fun by joining NSIRC students’ social events. I’d like to thank my TWI supervisor, David Smyth-Boyle, my academic supervisor, Prof. Xiang Zhang, and my bp mentor Dr Roberto Morana for their support.”

Following completion of her PhD, Farnoosh took up a role as a Lecturer and Assistant Professor in the Mechanical and Construction Engineering Department at the University of Northumbria and therefore now plays a key role in advancing the knowledge of the next generation of structure integrity engineers.

CASE STUDY:
FROM NSIRC TO INDUSTRY

DR IMANOL MARTINEZ PEREZ

Dr Imanol Martinez Perez became interested in engineering when he was in high school, having considered mechanical engineering as a mixture of maths and physics but keeping in mind a practical perspective.

After studying mechanical engineering at the University of the Basque Country (Bilbao, Spain), Imanol enrolled in a double degree program with Arts et Metiers ParisTech (Paris, France). From there he secured a six months internship at Subsea7 (Suresnes, France) in the structures department, before graduating as a Mechanical Engineer.

Imanol continued to work at Subsea7 for nine months in the assets team, where his roles included performing structural calculations of installation aids, platform maintenance and sea fastening of large structures for the different vessels of Subsea7's fleet, amongst others.

In 2015 he embarked on his PhD with NSIRC and the University of Edinburgh, working in the Numerical Modelling and Optimisation Section at TWI. His research was on the computational fatigue assessment of mooring chains, taking into account residual stresses.

Within the oil and gas industry, there was concern over the increase in mooring line failures and, despite the remarkable progress in this area, there is still no robust fatigue assessment method that accounts for the combined effect of residual stresses and mean load. A significant number of Joint Industry Projects (JIPs) have been launched for better understanding and improving fatigue analysis of mooring chains.

At NSIRC, Imanol's work highlighted the need to take mean load into account, and he developed a method to do this through a computational assessment for routine use in an industrial environment. Importantly, the assessment method does not lose accuracy with respect to the original computational fatigue assessment methods. The fatigue predictions showed good agreement with fatigue testing carried out as part of a JIP at TWI.

Imanol was awarded a scholarship by ASME for presenting his research to the International Conference on Ocean, Offshore and Arctic Engineering (OMAE) 2018. During this conference, Imanol presented part of the research he did at Ecole Polytechnique (Palaiseau, France) as a visiting PhD research student at the Laboratory of Solid Materials (LMS).
Imanol regards his time studying for a PhD with NSIRC as "a great experience. It has enabled me to gain scientific knowledge, but at the same time stay connected to industry. I had regular meetings with my industrial mentor, who set me research guidelines based on the challenges faced by industry. I would like to thank my supervisors and my industrial mentors – I felt I was standing on the shoulders of giants".

Having completed his PhD, Imanol worked at Principia in France, an engineering company developing added-value offers to the energy and naval defence sectors, and is now a Mechanical Engineer at Framtome, a designer and supplier of nuclear steam supply systems and nuclear equipment, services and fuel for high levels of safety and performance. His career path shows how the links between academia and industry at NSIRC equip individuals with the skills and knowledge required of the next generation of engineers in industry.

CASE STUDY:
FROM A MASTERS DEGREE TO MANAGEMENT

WARREN BATH

Warren Bath is Group Manager of Innovation and Skills and Head of Business Analysis at TWI, whose time at TWI Cambridge began with NSIRC.

The journey Warren took to taking an MSc with NSIRC began with his undergraduate degree in Motorsport Engineering at Brunel University. Here he undertook an internship in Monaco with SBM Offshore, a Member company of TWI, where he planned to go into energy rather than motorsport, working in design and experiencing study of stress analysis for the first time. His third year at Brunel was sponsored by SBM, and his supervisor recommended he study the MSc at NSIRC.

As a fully funded course, this degree stood out compared to other options. Warren took a four-month internship in the Numerical Modelling and Optimisation Section where he became familiar with TWI's staff, systems, and projects, before embarking on the Master's programme in Structural Integrity. Warren has said that the MSc was made more appealing due to its relation to industry. The degree was almost like a qualification in TWI itself, as it allowed him to focus on the technologies TWI worked in, provided him with industry knowledge and the ability to relate to other technologists, and made him feel more like an engineer. This industry relevance was an incredibly important part of his research and role as a student.

Additionally, the financial support he received far exceeded expectations and made it significantly more appealing than opportunities offered by other institutions. The industry relevance of the dissertation and the high quality of teaching from TWI staff who are practical experts in their field rather than simply academics was particularly significant to his time as a student.

As well as academic work, Warren has praised the social elements of NSIRC. Most of all, the course was attended by students with different backgrounds, vocations and levels of education from a range of countries, as the majority of his student cohort was international. The option of working with a diverse student body from a range of nationalities was not only interesting from a scientific perspective, but also enjoyable and exciting, allowing him to befriend people from all over the world which he feels improved his personal development.

Additionally, as part of his time as a student, Warren became the course representative and enjoyed being able to work alongside TWI staff members who he would later work with as a company employee.

Warren has praised NSIRC for being immensley beneficial to his career. He started in the Structured Integrity Group, and found the connections he made and skills learnt to have been extremely useful in the beginning of his career at TWI. He was accepted for a position in acquiring government funding, becoming the first person to hold the position of Innovation Project Leader. Warren has now been at TWI for around five years and considers NSIRC to have given him a significant head start, with what he learnt having giving him advanced experience before he even started on the job.

95%

PhD completion rate

840

Years worth of industrial PhD and MSc research

100%

Employment rate within 1 year from graduating

31/69

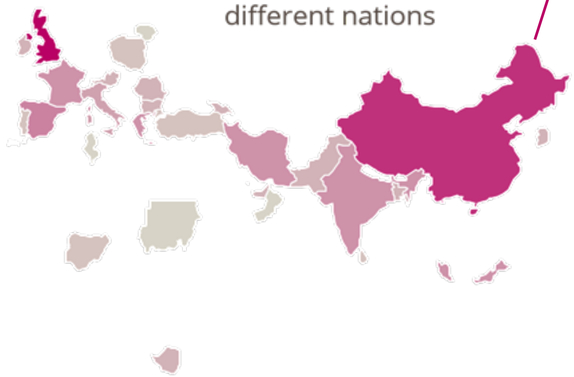
Percentage split of female and male students (industry average is 9/91)

£150m

Investment in facilities, equipment and studentships

NSIRC students represent over 30 different nations

International Europe UK



NSIRC students represent over 30 different nations

After the UK, China has the second largest number of NSIRC students at 21

FUTURE OF 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 has a proven track record of equipping future engineering professionals with the knowledge and expertise they need to be successful and this will continue throughout 2020 and beyond.

In the future NSIRC will:

- 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