

Case Study: AMEC

Structural integrity expertise enhances nuclear industry assessment procedures

The challenge

Within the statutory framework that regulates the nuclear industry, there is an overriding requirement to demonstrate that all associated hazards are understood, effectively managed and controlled. Structural integrity assessments are conducted in accordance with the R6 document that outlines internationally recognised and validated procedures. R6 is owned by EDF and developed by a consortium of organisations, including AMEC.

The evaluation of internal residual stresses, the variation of material properties throughout a weld and their combined influence on failure mechanisms, such as fatigue and fracture, pose a significant challenge when assessing the integrity of welded structures. To maintain its leading structural integrity capability, AMEC must have exposure to, and produce, state-of-the-art methodology for nuclear operating companies.

The University of Manchester was able to develop cutting edge methods in these areas through diverse projects funded by the Engineering and Physical Science Research Council (EPSRC) but faced barriers to research application without a clearly defined route for translation of academic knowledge into applied safety procedures.

The University of Manchester solution

Building on previous joint collaborative projects, technical specialists from AMEC and The University of Manchester's Dalton Nuclear Institute identified that a Knowledge Exchange 'Exploitation Secondment' undertaken by Dr. Robert Hurlston would be an efficient route to meet this challenge.

- **Research outputs** were firstly identified in an extensive review of EPSRC funded projects related to structural integrity.
- **Industrial trials** and related research findings were then assessed at a collaborative workshop involving experts from industry and academia, where priority areas for knowledge exchange and suitable pathways for inclusion in the nuclear industry's structural integrity assessment method, R6, were agreed.
- **Engagement** between company members of the R6 Management Panel and academic institutions that specialise in state-of-the-art structural integrity and weld characterisation research ensured that the project achieved maximum impact.

Recommendations covering improved guidance on weld characterisation, new methodologies for the acquisition of weld properties, and important additions to testing techniques were finally presented to the R6 Development Programme Management Panel for inclusion into the R6 document.

“

The project has clearly illustrated the advantage of industry working closely with academia in order to ensure that R&D output is fully exploited for practical applications.”

*John Sharples,
Consultant and Business Manager,
AMEC.*



AMEC is a focused supplier of consultancy, engineering and project management services to its customers in the world's oil and gas, mining, clean energy, environment and infrastructure markets. They employ over 29,000 people internationally, with major operations centres based in the UK and Americas.

www.amec.com



The benefits

The technical information gained during the project has enhanced AMEC's business opportunities through exploitation of their newly enriched knowledge base.

“

This project demonstrated the tremendous value of university research in making a positive impact within the nuclear sector. ”

*Prof. Andrew Sherry FREng
Director,
Dalton Nuclear Institute,
The University of Manchester.*

- AMEC and the wider nuclear industry have benefited from the development of novel peer reviewed methodologies. Critical areas have been addressed for new build nuclear power plants, where the experimental and modelling approaches can be used to optimise welding processes, and for operating nuclear power plants, where enhanced assessment procedures can lead to more accurate safety margins being ascertained. These important factors have the potential for future costly repairs and replacements to be reduced or negated.
- The partnership has strengthened relationships between AMEC, The University of Manchester and industrial end-users of research. This has stimulated a renewed focus on the recruitment of Manchester graduates and led to additional collaborative projects in related areas, such as non-destructive testing, modelling and simulation.
- New channels have been forged for embedding research advances within the nuclear industry via the R6 structural integrity assessment method.
- The results of this project have directly informed industrial and public funding applications. In 2012 the Universities of Manchester and Sheffield were jointly awarded £4M from EPSRC to conduct follow on research as part of the NNUMAN (New Nuclear Manufacturing) programme.

The exploitation secondment of Dr. Robert Hurlston provided an exceptional opportunity for the academic team to gain insight from key industry stakeholders into real world needs. The University has also benefited from further academic research at Manchester being funded through AMEC as a direct result of the project.

Crucially, this project has paved the way for a bright future of collaborative working between the University and wider nuclear industry. “This project has been successful in bringing the industrial and academic communities together,” says John Sharples. “It has demonstrated the value of knowledge and skills transfer from academia to industry, and has opened up opportunities for more knowledge exchange projects in the future.