



NUCLEAR AMRC
ADVANCED MANUFACTURING RESEARCH CENTRE



Helping manufacturers
win work in nuclear
2019

The Nuclear AMRC helps UK manufacturers win work.

We work with UK manufacturers to improve their capabilities and performance for nuclear and other demanding sectors. Our facilities and services are open to companies of all sizes.

Our researchers focus on developing innovative techniques and optimised processes for large-scale high-precision manufacturing.

You can use the expertise of our engineers and our facilities to develop and test new processes on production-scale machines without losing capacity in your own factories.

As well as technical support, we provide a range of business development services to help manufacturers enter the nuclear supply chain and compete worldwide.

Since our launch in 2012, we have worked with more than 1,000 companies, delivered real value to the industry, and become established as the UK's centre of excellence for advanced nuclear manufacturing.

We work closely with nuclear industry leaders including new build groups, reactor developers and decommissioning site licence companies, and advise government through our seat on the Nuclear Innovation and Research Advisory Board.

We form part of the High Value Manufacturing Catapult, a national alliance of seven leading manufacturing research centres backed by Innovate UK. We are owned by the University of Sheffield as part of its world-leading advanced manufacturing innovation cluster.

We are committed to best practice in nuclear safety culture. As of the start of 2019, we have recorded over 2,260 days of full operations without a lost-time accident.





NUCLEAR AMRC

We help companies through two interlinked work programmes:

Manufacturing innovation

We work with you to overcome your manufacturing problems, and help you develop the technical capability to compete on cost, quality and delivery.

We can take new manufacturing technologies and processes from proof of concept towards production readiness.

Supply chain development

We help you compete by raising quality, reducing costs, and developing new capabilities.

We work with you to identify gaps in performance and capability, support sustainable business improvements, and help you move into nuclear from other sectors.

Manufacturing innovation

The Nuclear AMRC works with companies to overcome their manufacturing problems, and help them develop the technical capability to compete on cost, quality and delivery.



Our research factory on the Advanced Manufacturing Park in South Yorkshire is designed for production-scale technology development and demonstration.

Many of our machining centres and welding cells feature unique capabilities, or are the largest or most powerful of their kind available for industrial research anywhere in the world.

We continue to expand our facilities and extend our capabilities to meet industry needs, based on consultation with our customers, members and Fit For Nuclear companies.

The capabilities of our workshop are matched by the expertise of our team. Our engineers have proven experience of working with industry in long-term collaborations to significantly reduce costs and lead times. We have also completed hundreds of shorter projects with a host of companies to investigate new processes, resolve process problems, and tackle manufacturing challenges.

Working with us can give you:

- Game-changing process improvements.
- Rapid solutions to your current manufacturing problems.
- De-risking of high-value projects.
- Proof of concept for innovative manufacturing techniques.
- Knowledge transfer from other sectors.
- New intellectual property.

Core technologies

We focus on R&D with the maximum impact for the UK nuclear industry.

We continually consult with our industry and research partners to identify technology areas which will deliver the maximum value from targeted R&D.

Our core themes are:

Machining technologies – new and optimised processes for the machining of large and complex components.

Joining technologies – mechanised welding and solid-state bonding methods, including arc, power beam and diffusion bonding techniques.

Additive manufacturing and near-net shape forming – high-integrity production and customisation of large metal components.

Automation and digitalisation – robotics, artificial intelligence and data-driven manufacturing to improve productivity and develop new capabilities.

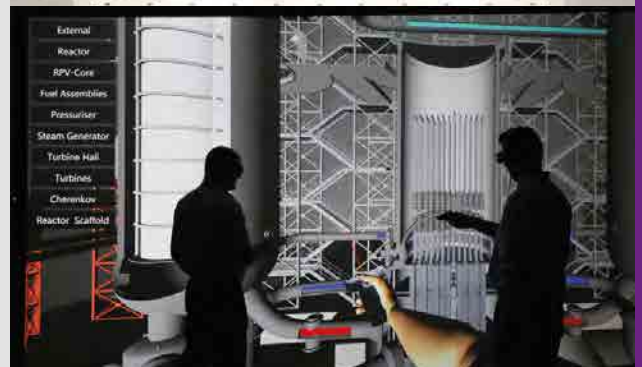
Controls and instrumentation – digital sensors, instruments and safety systems for nuclear power plants and other industries.

Materials, corrosion and thermal engineering – enhanced material characteristics and performance in reactors and other extreme environments.

Analysis and simulation – high-fidelity data-driven models for processing and materials optimisation, plant construction and operations.

Product and process verification – developing high-quality structural integrity data for performance models and through-life maintenance forecasts.

Codes and standards – ensuring innovative manufacturing techniques meet relevant industry standards.



Projects

The Nuclear AMRC helps companies innovate through a host of commercial and collaborative R&D projects.

The projects below are a selection of our recent and ongoing work with partners in the UK and worldwide.

Bringing new tools to market

We helped Bristol-based SME Insphere bring its rapid machine tool verification technology to market. Insphere's innovative Baseline system can measure and verify a large machine tool in less than 30 minutes, minimising the risks of unexpected downtime or process failure.

We worked with Insphere to test and develop Baseline on our largest machining platform, and prepare it for commercial launch in 2019.



Virtual reality for design and training

Our visualisation engineers worked with Sellafield Ltd and the National Nuclear Laboratory to develop an interactive model which can simulate any kind of glovebox used in the nuclear decommissioning programme.

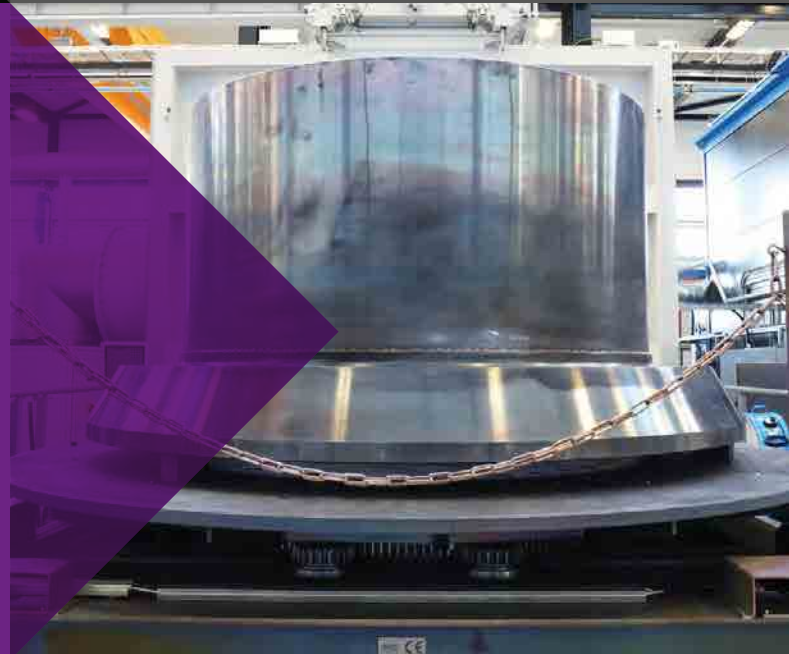
The virtual glovebox combined an adaptable physical mock-up with a detailed virtual model viewed with a headset. The project will support the design of new kinds of glovebox, planning for experiments and waste handling programmes, and training of operatives.



Advanced manufacturing for SMR pressure vessels

We are working with the US Electric Power Research Institute (EPRI) in a four-year collaboration to develop new manufacturing and fabrication methods for reactor pressure vessels.

The project aims to reduce the total time needed to produce a small modular reactor (SMR) pressure vessel from around two and a half years to less than 12 months. These two vessel sections have been electron beam welded in less than two hours, compared with 10 days by conventional arc welding.



40% time saving

Cycle time slashed for rough milling

We used a range of advanced techniques to cut the time for rough milling a large nuclear forging by more than 40 per cent – potentially saving weeks of work for a large forged component such as a pressure vessel section.

The research was part of a major investigation into innovative forging and fabrication solutions for the energy sector, led by Sheffield Forgemasters with funding from Innovate UK.



Additive repair for aerospace

We are leading the Amos project to develop new techniques to repair damaged aerospace components. The project brings together a range of direct energy deposition additive technologies, working with a variety of aerospace alloys. We are focusing on wire-based arc and diode laser processes.

Amos is a four-year collaboration of international aerospace manufacturers and researchers, supported by the European Horizon 2020 programme and Canadian funding agencies.



50% time and cost saving target

Integrated tools for single-platform manufacturing

We are leading the Simple project, with funding from BEIS, to develop a single manufacturing platform capable of performing a range of machining, fabrication and inspection operations for large nuclear components.

In the first phase (ending summer 2019), we are developing an integrated welding and monitoring tool to allow automated in-process inspection of welds, improving quality and reducing the risk of weld failure. Ultimately, the project aims to achieve cost and time savings of at least 50 per cent.

Supply chain development

The Nuclear AMRC works with companies along the UK's nuclear supply chain to help them compete by raising quality, reducing costs, and developing new capabilities.

We demystify the nuclear sector and remove barriers to entry.

Our flagship Fit For Nuclear (F4N) programme is a unique service to help UK manufacturers get ready to bid for work in nuclear.

Most of the companies working through our supply chain programmes are small and medium-sized enterprises (SMEs). We help smaller manufacturers understand what the market expects from them, what they may be capable of supplying, and where they sit in the supply chain.

We also offer tailored supply chain consultancy services to build links and share knowledge between suppliers and top-tier customers, and to help developers develop their UK supply chains.

We support skills development by working with the National Skills Academy for Nuclear to provide a one-stop shop for manufacturers along the nuclear supply chain. And our sister centre, the AMRC Training Centre, provides practical skills from apprenticeships through to MBAs.



Image: OA Weld Tech



Fit For Nuclear (F4N) is an industry-recognised hallmark of business excellence.

F4N allows you to measure your operations against industry standards and take the necessary steps to close any gaps.

F4N is a journey of business improvement, typically taking 12–18 months to granting.

There is no charge for the F4N assessment or the support of our industrial advisors, but you will need to invest to close any gaps. F4N will demand commitment and drive from your senior management team, but we will support you through every step.

More than 730 companies – mostly SMEs – have taken the F4N assessment as of January 2019. More than 150 have been granted F4N status after driving improvements through a tailored action plan.

Participants have reported a wide range of benefits, from new contracts to demonstrable improvements in quality.

In a 2018 survey of participants, **nine out of ten said they would recommend F4N to other manufacturers.**

**Start your F4N journey:
namrc.co.uk/services/f4n**



Find a nuclear-ready supplier to meet your specific needs with F4N Connect, a fully-searchable online database of UK manufacturers who have demonstrated their ability to meet the expectations of the nuclear industry through the Fit For Nuclear programme.
connect.f4n.namrc.co.uk

Companies granted F4N in 2018 include:

Devoran Metals – a specialist supplier of steel bar for concrete reinforcement, Devoran entered F4N to make sure its processes met nuclear requirements. The Cornish firm has now supplied sub-contractors at Hinkley Point C and is bidding for major work packages.

“Having F4N status means we have benchmarked our performance against the standards demanded by the civil nuclear industry’s top tiers.”

Sarah Hickling, sales negotiator.

FAUN Trackway – an established supplier to defence and other demanding sectors, based on Anglesey. The firm used F4N to prepare for new opportunities across the nuclear sector.

“Acquiring F4N has given us the much-needed platform to tackle the nuclear industry.”

Gareth Williams, engineering manager.

McEvoy Engineering – an experienced supplier of high-integrity fabrications to operating nuclear power stations and the decommissioning market. The Ayrshire-based company entered F4N to benchmark its capabilities and win new work.

“To me, the F4N brand cut to the chase and very much speaks to your credibility.”

Alison McEvoy, financial and business development director.

QA Weld Tech – a specialist welding and engineering business, the Middlesbrough-based firm used F4N to support its expansion from the oil and gas sector into nuclear.

“The benefits of going through the F4N programme have been seen across the company in the form of increased employee engagement in all areas of health & safety, quality and process improvement.”

David Pickles, operations director.

National network

The Nuclear AMRC's production-scale facilities are designed to tackle your manufacturing challenges with no risk to your own operations.

We are based on the Advanced Manufacturing Park (AMP) in Rotherham, as part of the University of Sheffield's world-leading cluster of engineering research and training centres.

Our 8,000m² research factory is home to over £35 million worth of state-of-the-art manufacturing equipment, dedicated to developing innovative and optimised processes in machining, joining, inspection and other large-scale precision manufacturing technologies.

We are expanding our regional network of specialist facilities, to extend our capabilities and work more closely with companies in key regions.

Our Birkenhead facility focuses on research into modular manufacturing for new reactors of all sizes, as well as for the challenges of decommissioning and waste management. Hosted by our member Cammell Laird, the Nuclear AMRC Birkenhead facility also acts as a regional hub for the nuclear supply chain in North West England and North Wales.

In 2019, we are opening Nuclear AMRC Midlands at Infinity Park, Derby. We are launching R&D into controls



iHub in Derby: home to the new Nuclear AMRC Midlands.

& instrumentation and equipment qualification from our initial facilities in the iHub building. And we are developing proposals for a new research facility of around 5,000m², to focus on technologies which will deliver the maximum impact for the UK's nuclear supply chain.

We also work with The University of Manchester's Dalton Nuclear Institute through the Manufacturing Technology Research Laboratory, focusing on new materials processing, joining and surface technology.

CATAPULT High Value Manufacturing

We can help you tap into a national network of advanced manufacturing innovation and nuclear sector expertise.

The Nuclear AMRC is part of the High Value Manufacturing Catapult, a national alliance of seven leading manufacturing research centres backed by Innovate UK.

Being part of the Catapult ensures that we are at the heart of the UK's industrial strategy. It allows companies working with us to tap into a national network of manufacturing research excellence – if aspects of a particular challenge fall outside our areas of expertise, we can call on the other Catapult centres for additional knowledge and resources.



Work with us

The Nuclear AMRC is open to all UK manufacturers.

You can commission commercial research to address your specific needs, or collaborate through an externally-funded research consortium to meet your R&D objectives.

Commercial research:

- You commission research to resolve your manufacturing challenges, optimise production, or explore new technologies.
- We provide a flexible service to meet your specific requirements.
- We operate in full commercial confidentiality. You own any resulting intellectual property.
- Costs are based on staff and equipment time plus material and consumables.

Collaborative R&D:

- Industry and research organisations work in partnership, supported by external funding, to tackle a shared manufacturing challenge.
- We track new funding opportunities from UK and international programmes, and can tailor a bid to meet your business needs and interests.
- We can build research consortia, write bids, and manage projects – or bring our capabilities to your project.

Membership

Becoming a member of the Nuclear AMRC gives you the highest level of engagement and support, and a place at the heart of the UK nuclear manufacturing industry.

We are led by our member companies, ensuring that everything we do delivers value to industry. Our membership brings together manufacturers and specialist equipment providers with OEMs and reactor developers.

Membership is a strategic alliance, and a mutually advantageous relationship.

We offer our members significant business development benefits, networking opportunities, and priority access to market intelligence and targeted support.

As a member, you can help determine our research priorities and capabilities, and leverage your R&D investment through our board-directed research.

Our two-tier membership structure and flexible terms allow us to tailor your membership to the specific needs of your business. The annual fee is a contribution towards our shared resources, including the board-directed programme of core research projects.

New members in 2018 include:



Meet all our members: namrc.co.uk/members



NUCLEAR AMRC



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Of
Sheffield.

MANCHESTER
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The University of Manchester
Dalton Nuclear Institute

CATAPULT
High Value Manufacturing

Working with
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