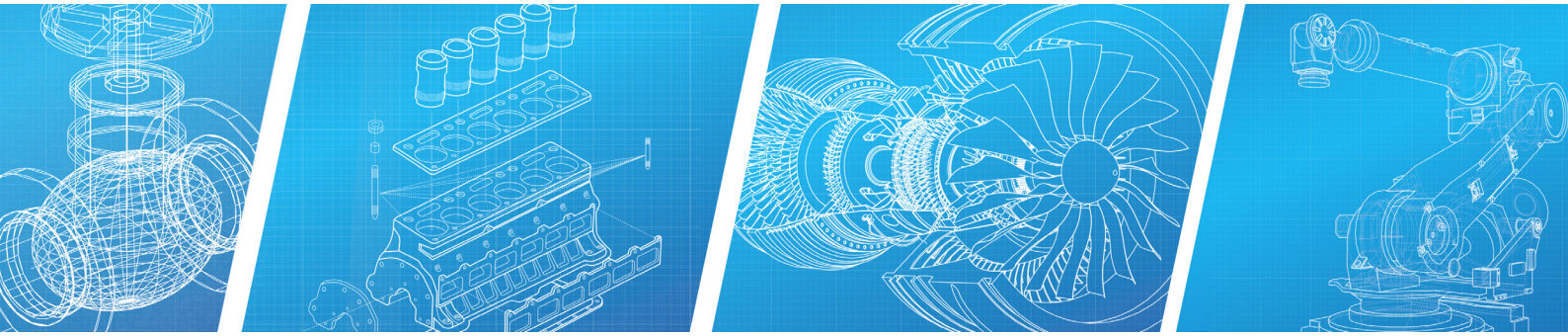
Bowers Group Case Study

Nuclear AMRC



Company Name: The Nuclear Advanced Manufacturing Research Centre (Nuclear AMRC)

Location: Sheffield, UK

Industry: Nuclear

Products Supplied: Moore & Wright IP54 Water Resistant Caliper

APPLICATION BACKGROUND

The Nuclear Advanced Manufacturing Research Centre (Nuclear AMRC) helps UK manufacturers win work across the nuclear sector. Located on the Advanced Manufacturing Park (AMP) in South Yorkshire, on the border of Sheffield and Rotherham, the centre's manufacturing innovation capabilities and supply chain development services are open to all UK manufacturers, from specialist SMEs to top-tier OEMs.

Engineers and specialists at the Nuclear AMRC work directly with companies to develop innovative techniques and optimised processes for large-scale high-precision manufacturing. The centre also provides a range of supply chain development support to help manufacturers enter the nuclear market and compete worldwide.

The Nuclear AMRC is owned by the University of Sheffield, and is backed by industry leaders and government, forming part of a world-leading innovation cluster alongside the AMRC, Castings Technology International and AMRC Training Centre.

THE CHALLENGE

There are many key components within a nuclear power plant that are manufactured by joining together large sub-components in a way that is resistant to corrosion, and that maintain material integrity under extreme conditions whilst in service.

The welding research and development team at the Nuclear AMRC develops advanced and innovative joining and cladding techniques tailored to the nuclear industry, where extremely high levels of quality and assurances are required.

Welded joints between thick-walled nuclear components often require over 100 weld passes using standard techniques, which is understandably a complex task on such a large scale.

In addition, the repeated heating and cooling that the joints are exposed to can have significant effects on the properties of the material around the joint, potentially harming the long-term performance of the component.

Ensuring the overall performance of the weld in service is absolutely critical, meaning that the welding team at the Nuclear AMRC are required to identify any discontinuities in the welding profile, including careful measurement of weld shrinkage. This careful evaluation of the weld will determine acceptance or rejection depending on the required criteria.

The quality of joints and the surface thickness of nuclear components must be specified for fracture mechanic properties. As these components are typically make up steam generator pipes and high-pressure feed line pipes, they must meet extremely tight tolerances in order to be acceptable for use in these critical environments.

THE SOLUTION

A Moore & Wright IP54 Water Resistant Caliper is used by the Nuclear AMRC to accurately measure weld shrinkage. The welding team at the Nuclear AMRC carry out Time of Flight Diffraction (TOFD) testing, an advanced non-destructive testing method widely used for weld inspection, which uses ultrasonic probes.

Weld shrinkage must be carefully monitored and accurately measured as distortion of the weldment is commonplace during the expansion and contraction of the weld metal during the welding process.

Monitoring weld shrinkage is particularly important because it has a direct effect on residual stress in the weld, which can increase susceptibility to failure through corrosion fatigue, stress corrosion cracking and fracture.

Each measurement is logged by the Nuclear AMRC, and parameters for tolerances strictly met in order for the part to be accepted.

COMMENTS

John Crossley M.InstNDT, NDT Technology Lead at the Nuclear AMRC said: "The accurate measurement of weld shrinkage is really important to the work we do at the Nuclear AMRC.

We carry out welding work for nuclear, offshore, and oil and gas applications, all of which require the highest levels of quality due to extreme conditions and safety considerations.

We use the Moore & Wright calipers to measure weld shrinkage simply because it they are the best tools for the job.

All of the shop floor welding team use the caliper on a daily basis when welding; it's perfect for the job, easy to use, and provides good accuracy.

We also ensure that the accuracy is maintained by carrying out regular in-house calibration to traceable UKAS standards."