# Nuclear AMRC relies on Moore & Wright for critical weld shrinkage measurements

The welding team at the Nuclear AMRC is using a Moore & Wright caliper to accurately measure weld shrinkage on nuclear components. Measurements are carried out as part of Time of Flight Diffraction (TOFD) testing, an advanced non-destructive testing method widely used for weld inspection using ultrasonic probes.

John Crossley M.InstNDT, NDT technology lead at the Nuclear AMRC says: "We use the Moore & Wright IP54 water resistant calipers to measure weld shrinkage simply because they are the best tools for the job. All 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."

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.

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.

Ensuring the overall performance of the weld in service is absolutely critical, meaning that the welding team at the Nuclear AMRC is 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.

John Crossley concludes: "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."

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# Non-contact technology simplifies torque monitoring and aids efficiency


Monitoring torque in a drive shaft is one of the best ways of assessing the performance of plant and machinery. However, because drive shafts rotate, hard wiring a sensor into place usually requires the use of a delicate slip ring. An alternative solution is to use a non-contact radio frequency detector to monitor 'Surface Acoustic Waves' (SAWs), as Mark Ingham of Sensor Technology Ltd explains.

Torque imparts a small degree of twist into a driven shaft, which will distort SAW devices, small quartz combs, affixed to the shaft. This deformation causes a change in the resonant frequency of the combs, which can be measured via a non-contact Radio Frequency (RF) pick-up mounted close to the shaft. The pick-up emits an RF signal towards the shaft which is reflected back by the combs with its frequency changed in proportion to the distortion of the combs.

Electronic processing and calibration of the returned signal generates a precise, real time indication of the torque being transmitted by the shaft. A SAW transducer is able to sense torque in both directions and provides fast mechanical and electrical responses. As the method is non-contact, it also offers complete freedom from slip rings, brushes and/or complex electronics, which are often found in traditional torque measurement systems. SAW devices also have a high immunity to magnetic forces allowing their use in, for example, motors where other analogue technologies are very susceptible to electronic interference.

SAW-based torque sensors have been used around the world and in many fields, from test rigs to wind turbines and generators based on tidal or river flows. They are used extensively in the high-tech world of the development of engines and gearboxes for Formula 1. Pharmaceutical companies employ them to monitor the pumps micro-dosing active ingredients into medicines and tablets. Torque feedback systems can be used by security firms to determine the direction their movable CCTV cameras are facing so that they can efficiently watch premises under their protection.

Today, many are increasingly turning to torque monitoring to generate the vital operating and production data that maintains production and efficiency.

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