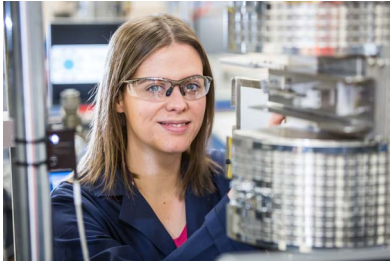


High Temperature Facility

Jacobs



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Set-up of a servo-hydraulic fatigue test station

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Contact details

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Please also consult www.htfalliance.com for further information.

The HTF, located in Warrington, was built in 2016 using funding from DECC (now BEIS). The facility can generate high quality mechanical performance data for non-active structural materials used in Gen IV nuclear fission reactors, nuclear fusion reactors and non-nuclear high temperature applications. The HTF enables environmental interactions with reactor coolants to be studied, predictive models to be developed, and new data to be generated.

The HTF complements the existing Second and Third generation high temperature water and gas testing facilities at Birchwood. The Gen IV fission reactor technologies include: Sodium-cooled Fast Reactor (SFR); High Temperature Gas-cooled Reactor (GFR); Lead-cooled Fast Reactor (LFR); Supercritical Water-cooled Reactor (SCWR); Molten Salt Reactor (MSR) and the Very High Temperature Reactor (VHTR).

The HTF provides:

- in-depth knowledge of advanced nuclear fission systems design, manufacture, operation and regulation
- track record in internationally leading R&D in conventional water-cooled reactors and high temperature fission systems
- experience of solving problems across the TRL scale and helping partners meet regulatory compliance
- quality systems in place to undertake UKAS evaluations
- experience of high temperature materials, structural integrity testing, material damage mechanisms and materials testing in novel, demanding environments.

Testing Capabilities

The HTF offers rigs up to 1000°C (higher in some circumstances), with temperature cycling in a range of novel, demanding environments (pressurised gas for VHTR/HTR, liquid metal for SFR/LFR, inert atmospheres).

We can incorporate specialised, bespoke equipment into tests to allow the construction of innovative experimental configurations. All our equipment is in a temperature- and humidity-controlled laboratory, to maximise data stability over long-term tests.

The HTF team includes engineers, materials scientists, chemists and structural integrity specialists, who can help interpret test data and design solutions to the most complex problems.

Testing includes:

- Tensile testing (loads up to 100 kN in tension and compression)
- Fracture testing (loads up to 250 kN and in the temperature range -1000 to 1000°C)
- Creep strain / rupture (loads up to 30 kN)
- Impression creep testing (deadweight-loaded)
- Creep crack growth (loads up to 30 kN)
- Strain and load-controlled low cycle fatigue initiation (loads up to 100 kN in tension and compression)
- Fatigue crack growth (loads up to 100 kN in tension and compression)
- Creep-fatigue initiation / growth (loads up to 100 kN in tension and compression)
- Thermo-mechanical fatigue initiation / growth (loads up to 100 kN in tension and compression)
- Miniaturised tensile / creep / fatigue testing (loads up to 10 kN)
- High cycle fatigue endurance / crack growth (up to 100 Hz test frequency and loads up to 10 kN).

To enable detailed analysis of tests, the rigs can be equipped with the following analytical instrumentation:

- Digital image correlation (DIC) for full field strain measurement (especially useful where welds are present), including microscopic capability
- Acoustic emission monitoring equipment for monitoring crack initiation and propagation
- Potential difference monitoring equipment for monitoring crack initiation and growth.

Operation

Jacobs provides training to staff from external organisations. Various operating models can be offered, including testing conducted by Jacobs staff; testing witnessed by partner organisations; and testing undertaken by partner organisations.

Availability

Up-to-date information about availability, in light of the COVID situation, is available at <https://www.nnuf.ac.uk/high-temperature-facility>.