# High Temperature Facility

Jacobs

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.

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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 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**.