



BHR Group

EXPERTS IN FLUID ENGINEERING

**PRODUCT DEVELOPMENT, TESTING
& VERIFICATION SERVICES**

www.bhrgroup.com



CONSISTENT, SAFE, OPTIMISED

Consistent product quality, safety, process optimisation and environmental protection are only a few of the reasons why industrial flow measurement and control is becoming increasingly important. Many industrial plants rely on flow measurement and control devices to ensure efficiency, safety and accuracy in production. Accurate flow measurements can mean the difference between making a profit or a loss. Worse, inaccurate flow measurements or device failure can have disastrous results.

BHR has a range of large scale test facilities designed to support fluid device manufacturers in product development, testing and qualification or type approval of these safety critical devices. Our test facilities cover high pressure and high flow, extremes of temperature and full-size testing of components.

We provide test and qualification services for most types of flow devices and pressure-containing envelopes, including valves and actuators, flowmeters, pumps and pipework. For products and conditions outside the scope of our standard facilities, we can offer design and build of bespoke rigs to deliver a broader range of sizes, flow rates and pressures.

Our facilities cover a wide range of services, including:

- Factory acceptance tests
- Pattern approval of new products or components
- Independent product development and evaluation
- Product lifetime and endurance testing
- Pressure fatigue cycling

Whatever the industry – aerospace, transport, defence or specialist engineering – the challenges facing the sector today call for specialist design, development and validation services in all aspects of fluid engineering – provided by the world's leading engineering experts.

When BHR was established by the UK Government as a Research Association over 65 years ago, we were set the goal of being those experts providing innovative technologies, design and support across all industries. Today, as an independent engineering consultancy, we continue to challenge ourselves to be the people you trust in fluid engineering.



CAPABILITIES

BHR Group's multi-disciplinary teams provide an integrated engineering approach to fluid system design and build, testing and verification, optimisation and scenario-planning. Our computational modelling and simulation expertise is complemented by scaled physical modelling, whilst our experimental work, in-house and on-site testing, and evaluation allows us to validate and calibrate our results.

BHR offers its dedicated and bespoke test rigs for impartial qualification testing and the wealth of our technical expertise for novel product development. We have a range of test facilities that can physically replicate the range of on-site working and environmental conditions which we use in the modelling and understanding of flow assurance, thermal management, fluid power, high pressure and high temperature requirements for determining the integrity of engineered systems in a controlled laboratory environment.

All this is augmented with computer aided design tools that simulate the physical and chemical behaviour of fluids in critical hydraulic, cooling or control systems and equipment.



OIL & GAS



PROCESS



**AEROSPACE
& DEFENCE**



TRANSPORT



FLOW TESTING



PERFORMANCE CHARACTERISATION

Compressible & incompressible fluids
Flow characteristics
Pressure drop
Closed seat & leak tests
Linearity & hysteresis
Endurance testing
Noise & vibration



QUALIFICATION / TYPE APPROVAL

HIGH PRESSURE / EXTREME TEMPERATURE



COMPONENT TESTING

Valve manifolds
Valves & actuators
Gaskets
Hose, tube, ducts
Instrumentation



TEST TYPES

Pressure fatigue
Burst pressure
Cryogenic testing
Thermal cycling
Leakage



DOWN-HOLE



MULTIPHASE WELL TEST FACILITY

Pumping
Separation
Pressure measurement
Flow-metering
Leak testing
Drilling fluids

WATER FLOW LOOP FACILITY

Test components up to DN200 at flow rates up to 60 l/s

Designed for continuous operation for the measurement of pressures, temperatures and flow rates, for pipe diameters from DN10 to DN200.

The rig's hydraulic and pneumatic systems give excellent flow control and stability over a wide operating range up to 60 l/s.

The facility can be used to determine flow characteristics such as Cv, Kv, dP of any flow device and to test for:

- Valve linearity and hysteresis
- Endurance and leak testing
- Valve breakout and reseating torques
- Fluid induced airborne noise and structure borne vibration

HIGH PRESSURE WATER FLOW FACILITY

Test devices up to DN25 at fluid pressures up to 75 bar

Designed to measure flow, pressure and differential pressure across the test device and fluid temperature.

The facility is capable of measuring performance characteristics of flow devices in high pressure / high temperature fluid conditions and can be used for product development, testing and qualification / type approval of devices.

Data Acquisition and Control

All our flow and pressure test facilities are fully instrumented and DAQ controlled for continuous operation and measurement using NI LabVIEW software.

MATERIALS



MODELLING & TESTING

Permeation
Ageing
Hysteresis
Mechanical testing
Friction & wear



Operating conditions:

Max. Pressure: 40 bar

Max. Temperature: 90°C

Flow Rate: 3600 l/min (5" line)

1500 l/min (3" line)

150 l/min (1" line)

Max. Test Component Size: DN200

Test Fluid: Water

Water Tank Volume: 10 m³

Measured Parameters: Temperature,
Pressure, Flow Rate

Operating conditions:

Max. Pressure: 75 bar

Max. Temperature: 60°C

Flow Rate: 30 l/min

Max. Test Component Size: DN25

Test Fluid: Water

Measured Parameters: Temperature, Flow
Rate, Pressure,
Differential Pressure

HIGH PRESSURE / EXTREME TEMPERATURE TESTING

HYDRAULIC PRESSURE TEST FACILITY

Impulse test fluid system components up to 1,135 bar and 200°C

Designed for continuous, high speed measurement of pressure and temperature over any industry standard waveform. The facility can be used for pressure cycle testing a wide variety of pressure containing components and assemblies, including aerospace components:

- Impulse testing to standards, e.g. SAE ARP 1383, ISO 10771-1
- High and low cycle fatigue tests
- Mean cycles to failure
- Investigations of failure modes
- Pressure hold leak testing

STATIC PRESSURE TEST FACILITY

Hold test fluid system components at pressures up to 2,600 bar

Designed for static pressure testing, the facility can also be used in conjunction with the hydraulic pressure test facility, for pressure cycling under static pressure:

- Proof pressure testing
- Burst testing
- Hyperbaric testing

COMPRESSIBLE FLOW TEST FACILITY

Test with air under high pressure and high flow conditions, up to 414 bar

Designed for high speed measurement of pressures, temperatures and flow rates and for use compressible (air) and incompressible (water) flow applications. The facility is adaptable for testing any pressure containing envelope and for:

- Pressure surge testing
- Valve Kdr tests
- Flow surge and safety relief
- Regulator testing

Operating conditions:

Max. Pressure:	1,135 bar (16,500 psi)
Max. Temperature:	200°C
Cycle Frequency:	> 10 Hz
Test Fluid:	Wide range of liquids and gases
Measured Parameters:	Pressure, Temperature

Operating conditions:

Max. Pressure:	2,600 bar (42,000 psi)
Max. Temperature:	200°C
Measured Parameters:	Pressure, Temperature

Operating Conditions:

	Air	Water
Max. Pressure:	414 bar (6,000 psi)	35 bar (510 psi)
Max. Flow Rate:	23,500 Nm ³ /h (14,000 scfm) (8 kg/s)	110 l/s
Storage Capacity:	375 kg at 414 bar	1000 l
Air quality:	Dry, clean air to EN12021	

DOWN-HOLE TESTING

DOWN-HOLE TEST FACILITY

Test components or systems in a down-hole environment at a well depth of 43m

The facility is capable of testing with single or multiphase flow at elevated pressure and temperature, offering a down-hole environment for product development, testing and type approval of equipment, such as pumps, jet pumps, separators and instrumentation.

Operating Conditions:

Max. Pressure (Primary Vessel):	40 bar
Max. Pressure (Secondary Vessel):	260 bar
Max. Temperature:	90°C
Flow Rate:	18.4 l/s (10,000 bpd)

MATERIALS TESTING

PERMEATION TEST FACILITY

Test polymer components for gas permeation up to 200C and 1,000 bar

Designed to establish the permeation coefficients of seals, hoses and diaphragms to evaluate performance and functional life of polymer components.

The facility can measure the diffusion coefficients and solubility of pressured gas at elevated temperature through polymer material sheets and films.



MARK FAIRHURST

Technical Director

Mark's expertise encompasses the fluid power industry. He has designed, built and operated a varied array of HP/HT test rigs and is regularly consulted on projects relating to safety critical system designs in the aerospace, defence, offshore and process sectors.



CRAIG KNIGHT

Senior Consultant

Craig has worked on the full spectrum of activities around product design, development and qualification of systems in defence, aerospace and energy. He is an expert in HP/HT flow testing with single and multiphase incompressible and compressible fluids.



EMILY HO

Senior Consultant

Emily is an expert in thermodynamics, fluid mechanics, heat transfer, process engineering, fluid sealing and material science. Her work involves compressible and incompressible fluids at high pressures and extreme temperatures.



CARL WORDSWORTH

Senior Consultant

Carl is a highly qualified product development engineer specialising in separation technologies for the oil and gas industry. He has published several papers regarding oil-water separation technology and is the holder of several patents in the field.



PAUL FULLER

Senior Project Manager

Paul is primarily focused on projects involving high pressure engineering. He has project managed a broad range of critical system projects for clients in defence, nuclear and oil & gas and undertakes witnessed type approval testing of clients' products.

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TAKE THE NEXT STEP

Every situation is different. BHR Group would like to help solve your fluid engineering problems. Call us for a pre-consultancy discussion with one of our experienced industry specialists. We can support you in defining what we can achieve when working together in partnership.