



**BHR** Group

EXPERTS IN FLUID ENGINEERING

**ENGINEERED  
SYSTEMS INTEGRITY  
CAPABILITY STATEMENT**

[www.bhrgroup.com](http://www.bhrgroup.com)



## HIGHER, FASTER, SAFER

The provision of specialist knowledge in fluid engineering – a discipline that encompasses hydrodynamics, hydraulic transport, high-pressure engineering and fluid power knowledge – is becoming an ever more significant requirement in many industries. The integrity of engineered systems is increasingly becoming more regulated, more highly scrutinised and more subject to conflicting engineering demands.

The challenges due to the strategic and political nature of the aerospace and defence industries are in part a function of the long life cycle of each product that can last over 50 years from concept to end-of-life. A reliance on constant maintenance, repair and overhaul (MRO) and equipment upgrades through its operational life means that design decisions made now can have consequences on the longevity and reliability of critical engineered systems long into the future.

The integrity of hydraulic systems in marine vessels and machinery for agriculture, construction and mining is crucial to their long-term economic

operation. Similarly, the design and validation of fluid power systems can yield significant savings in both initial project and on-going lifetime costs.

The provision of specialist knowledge in heat transfer and modelling of complex airflows also extends to safety-critical applications, such as fire suppression or tunnel ventilation systems. Whilst the capability to test, analyse and propose improvements to mechanical designs in many specialist engineered systems is a key factor in commercial success.

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.



## CUSTOMER NEEDS

**As problems in design, validation and optimisation continue to impact on the industry – resulting in lengthy project times and costly delays – the importance of engineers knowledgeable in fluid engineering, hydrodynamics and computational simulation on the profitability, safety and integrity of Engineered Systems cannot be overstated.**

Experienced engineers who understand the problems associated with fluid power, high pressures and safety critical systems are in short supply – and finding the right skill fit is a constant challenge for both small start-up companies and seasoned multinationals alike.

Similarly, the lack of specialist equipment can result in a time-consuming search for qualified, dependable partners with extensive test facilities.

Bringing this expertise in-house may not be the most cost-effective option, as solutions to some of the more intractable problems may require a fresh insight. But, by working as an extension to your team, the knowledge and wealth of experience of our world-renowned industrial experts can provide practical and effective solutions to your problems.

By working in collaboration, BHR Group provide the leading edge knowledge and technology you require. By delivering and implementing sustainable solutions, you save both time and money – the key drivers in any business.



**ENGINEERED  
SYSTEMS  
INTEGRITY**



**TRANSPORT**



**AEROSPACE  
& DEFENCE**



**INFRASTRUCTURE  
SECURITY**



**CONCEPT  
GENERATION**



**THEORETICAL  
OVERVIEW**

Technical review



**INNOVATION  
MANAGEMENT**



**FEASIBILITY  
STUDIES**

Desk study  
Feasibility study

**DESIGN AND DEVELOPMENT**



**COMPUTATIONAL  
SIMULATION**

Computational fluid  
dynamics  
Pressure surge  
analysis



**PROCESS  
DEVELOPMENT**

Mixing - gas phase  
Mixing - liquid/gas  
Dispersion  
Nanotech



**PHYSICAL DESIGN  
AND MODELLING**

Physical modelling



**TESTING AND  
VALIDATION**



**COMPONENT  
TESTING**

Fatigue testing  
Pressure testing  
Seal testing  
Pump testing  
Wear testing  
Thermal testing  
Valve testing



**SYSTEM  
TESTING**

Flow testing  
System validation  
Tracer testing

## OPTIMISATION



DESIGN  
OPTIMISATION



PROCESS  
OPTIMISATION



## 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 our scaled physical modelling. Whilst our experimental work, 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.

### UTILISING A MULTI-DISCIPLINARY TEAM OF EXPERIENCED CHARTERED ENGINEERS AND DEDICATED PROJECT MANAGERS WE PROVIDE SOLUTIONS IN:

- Mathematical modelling (including CFD & FEA)
- Hydraulic analysis and design of fluid power systems
- Site audits & testing
- Field measurements & troubleshooting
- Research & development
- Specialist fluids and materials engineering expertise
- Independent environmental test services at extreme pressures and temperatures
- Integrated end-to-end engineering solutions often in collaboration with a supply chain
- Novel process or product development
- Fatigue and creep characterisation
- Component life prediction



## EXPERIENCE

**BHR Group is an independent technology organisation providing engineering consultancy, industrial research and product development services based on its core expertise in fluid engineering. We apply over 60 years of know-how to design, develop, validate and optimise processes for the benefit of engineered system customers around the world.**

Our heritage provides you with the exceptional advantage of access to a diverse range of engineering services and our combination of engineering skills and investment in key technologies gives us a unique capability to help you to solve your fluid engineering problems in all systems that require engineering integrity.

Our approach is to work in close co-operation with you or your clients to understand the specific and individual needs and drivers, so that we can provide solutions that are both technologically sound and commercially viable.

Alongside access to some of the industry's leading practitioners, factors such as availability, reliability and procedural integrity are paramount to your choice of partner – and these are fundamental to the service we provide. BHR Group also believes that a deadline is a commitment – on time and on budget, with no compromise in quality.

### SOME OF OUR CLIENTS:

- ABP
- Angus Fire
- Baker Hughes
- Broady Flow Control
- Changan UK
- Crane Ltd
- Dunlop Oil & Marine Ltd
- GE Aviation
- GE Measurement & Control
- Gems Sensors
- Geodynamics Ltd
- Goodwin International
- Hale Hamilton
- HS Marston Aerospace Ltd
- Kemco Environmental Solutions
- KM Rustfri A/S
- London Underground
- MF Hydraulics Ltd
- Moog Controls Ltd
- Oakray Ltd
- Pall Europe Limited
- Pipeline Research Limited
- Pipex px
- Premtech Limited
- Powertrain Technology Ltd
- Roxar Flow Measurement AS
- StrainSense Limited
- Thompson Valves Ltd
- Transvac Systems Limited
- Truflo Marine Ltd

## TEAM WORLD-CLASS ENGINEERING EXPERIENCE

BHR Group's Engineered Systems Integrity (ESI) team provides core expertise in hydraulics and process technology underpinning asset management, resource planning, cost reduction and legislative compliance.



**MARK FAIRHURST**  
Technical Director

Mark's professional career started 35 years ago in high pressure water and abrasive water jet cutting/cleaning with the development of a patented ASJ system. His expertise was broadened to the fluid power industry working on the development of standards relating to oil hydraulic contamination, filtration and pressure impulse/fatigue.

He has designed, built and operated a varied array of HP/HT test rigs for water, superheated steam, oil, fuels, combustible gasses and LNG and is regularly consulted on a broad range of projects such as troubleshooting in the aerospace and marine industries, safety critical system designs in the defence and offshore industries and contamination sensitive systems in the food and beverage industry.

He is presently the Vice-Chairman the product testing committee of the BFPA/BSI, and the Chairman of the Technical Advisory committee of the Water Jet Technology Conference.



**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.

She has over 20 years experience in leading process and equipment, research and development projects from concept, feasibility study, scale-up, plant design, installation to commissioning. During her career, Emily has consulted on a wide spectrum of applications including fluid sealing for heavy duty diesel engines, hydraulic flood barriers and transmissions, gaskets for fuel cells, flow analyses for boiler tubes in nuclear power stations, supersonic steam injection and nozzle design for starch hydrolysis by enzymic reactions.

She is presently a member of the Fluid Sealing working group in the ISO Fluid Power Systems and Components Technical Committee.



**CRAIG KNIGHT**  
Senior Consultant

Craig has nine years experience of fluid engineering projects in Engineered Systems in defence and aerospace. He has worked on the full spectrum of activities around product design, development and qualification of systems including: hydraulic energy converters, high pressure abrasive water jetting systems used for surface decontamination and firefighting, pressure fatigue testing of aerospace equipment and HP/HT flow testing with of single and multiphase incompressible and compressible fluids.

Craig is a chartered engineer with the IMechE.



**PAUL FULLER**  
Senior Project Manager

Paul joined BHR Group in 1988 and is primarily focussed in projects involving high pressure engineering. Heavily involved with the innovative DIAJET® water-jet cutting system, he has commissioned, trained and utilised his mechanical engineering skills in such diverse projects as dismantling SS20 rocket motors, nuclear silo decommissioning and contract cold-cutting both on and off-shore.

Paul has recently project managed a broad range of critical system projects for clients in the Defence, Nuclear and Oil & Gas sectors and undertakes witnessed type approval testing of clients' products. He is a member of IMechE and is qualified under NEBOSH Health & Safety guidelines.

**Our knowledge and technology base is continually enhanced through research, development and industry funded PhD projects consolidated by practical site experience. BHR Group also participate in major industrial consortia.**

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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.