

## Flow Assurance Services

*Developing products and processes for the safe and cost effective delivery of hydrocarbon from reservoir to refinery*

### Profile

BHR Group (BHR) is a design, product development, technical consultancy and testing company that provide technology development and product innovation to the oil and gas industry.

BHR offers a comprehensive service related to field development, production technology, pipeline systems, separation systems, pumping and boosting and multiphase technology for both onshore and offshore applications. The company employs 75 staff, over 40 of who are professionally qualified engineers, consultants and researchers with expertise from different engineering disciplines.

A combination of engineering skills and investment in key technologies gives BHR a unique capability for the flow assurance of pipeline transportation systems, subsea equipment and surface facilities. This has been used in a variety of projects across the complete spectrum of flow assurance activities and is available on either a single client basis - focusing on a specific project need, or for an industrial consortium addressing more strategic engineering issues.

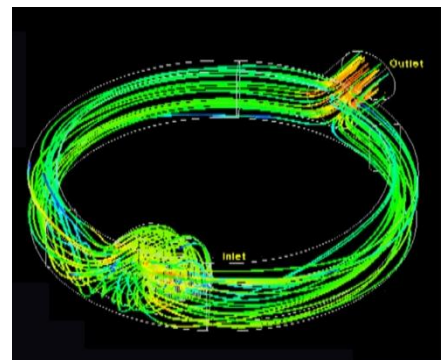
BHR has a range of test facilities that can physically replicate the flow assurance requirements for oil and gas production operations in a controlled laboratory environment. As a private company BHR also offers its dedicated and bespoke test rigs for impartial qualification testing and wealth of technical expertise for novel oil and gas product development. With computer aided design tools that simulate the fluid physical and chemical behaviour of fluids in pipelines, processing and fluids handling equipment, BHR offers a comprehensive range of capabilities suited to many emerging flow assurance challenges including, deepwater, HPHT, heavy oils, complex fluids and Artic.

### Our Services

- **Consultancy** - BHR undertakes a range of consultancy services that include troubleshooting, technical auditing and conceptual design.
- **Qualification testing** – As an independent test centre BHR is well placed to provide rapid testing to national and industrial standards on both its dedicated and custom built rigs.
- **Contract research** - A commitment to effective and co-ordinated management of technically challenging and innovative projects which provide practical solutions for our clients.



Developed Subsea Pressure Boosting System Increasing Production by 30%



Modelled and Tested Swivel for Offshore LNG Buoy



Vertical OW/G Separator being Tested on BHR 5 Degree of Freedom Rig

- **Modelling and simulation** – Applying commercial computational fluid dynamics (CFD), finite element analysis (FEA), and pipe network analysis (FLOWMASTER) code to address real industrial challenges and using our wealth of fluid flow knowledge to enhance these codes with bespoke numerical solutions.
- **Product development** - Applying technological expertise from research, mathematical modelling and physical modelling capabilities and prototype testing facilities, BHR can optimise, enhance or model the design of new or existing products and processes including 3D design using SolidEdge.

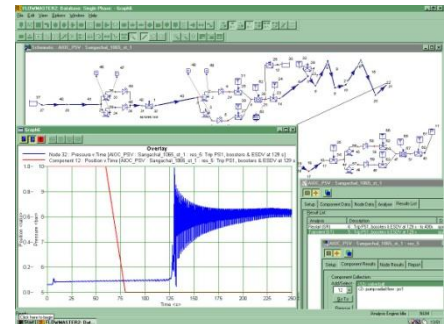


Subsea Valve Being Made Ready for Thermal Cooldown Qualification Test

## Expertise

Pipeline hydraulics and structural response:

- Pipe network hydraulic analysis
- Dynamics of risers
- Pipeline insulation and thermal performance
- Slug detection and control
- Fluid-structure interactions, slug loading, fatigue life prediction
- Marine induced fluid loading and vibration suppression.



Transient Hydraulic Analysis of Complex Pipe Networks

Separation and production processes:

- Separation vessel sizing and selection of internals
- Compact separator design
- Separator design for floating production operations
- Downhole separation
- Single and multiphase pressure boosting.



Developed, Tested and Installed Novel Subsea 3-Phase Separator

Production chemistry and fluids:

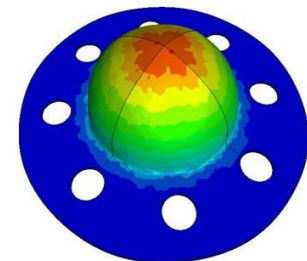
- Physical property prediction
- Complex and non-Newtonian fluids
- Erosion and corrosion
- Slurries.

Equipment design and qualification testing:

- Rotating equipment, valves
- Novel product development
- Equipment performance for HPHT and HIPPS duties
- Pig selection for dewaxing, swabbing, dewatering
- Pig selection and operation for multi-diameter pipes, wye pieces, risers
- Life cycle testing.

Sealing, containment and emissions:

- Design and testing of rotary and reciprocating seals
- Seal life prediction simulation
- Design and operation for subsurface safety valves
- Seal design for HPHT conditions and rapid gas decompression.



FEA Being Used to Investigate Gas Permeation of Elastomeric Seal

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Global Experts in Fluid Engineering

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