



**BHR Group**

EXPERTS IN FLUID ENGINEERING

**PROCESS  
CAPABILITY STATEMENT**

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



## VOLUME, VARIETY AND VARIABILITY

From paints to pasta, deodorants to decongestants, the challenges facing companies within the Process industry sectors are shared over a vast array of individual products and processes. The successful scale-up from laboratory to pilot plant and from pilot to full-scale production is critical. Leading edge process mixing knowledge can reduce time to market, minimise down-time and reduce production costs.

Improving process efficiency – whether by understanding heat transference or mixing regime – can pay dividends in terms of reduced waste, decreased energy usage, better batch-to-batch repeatability or increases in yield. Production engineers who are tasked with the validation and optimisation of industrial processes and equipment are often working within a framework of limited capital investment and the constraints of existing equipment.

All aspects of the production process can come under scrutiny. Overall Equipment Effectiveness (OEE) and the desire for cost saving are being used by many production engineers and process equipment vendors to reinforce the benefits of their production lines or equipment. However the mixing process itself is often overlooked as the skills required may not be available within the organisation.

Whether mixing high or low viscosity components, dispersing solids or looking for improved cycle times, the challenges facing the Process 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 the British Hydrodynamics Research Association was established by the UK Government over 65 years ago, we were set the goal of being those experts, providing innovative technologies, design and support across all industries. Today, BHR Group is an independent engineering consultancy but our aim remains the same: to be the people you trust in solving your fluid process problems.



## 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 experienced in fluid engineering, hydrodynamics and computational simulation on the profitability and safety of processing operations cannot be overstated.**

Experienced engineers who understand the problems associated with mixing, dispersion or rheology 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 a wealth of experience of our world-renowned industrial experts can provide practical and effective solutions to your problems.

By working in collaboration, BHR Group can 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.



**FOOD &  
BEVERAGES**



**PERSONAL  
CARE**



**PHARMA &  
FINE CHEMICALS**



**PETROCHEMICAL &  
BULK CHEMICALS**



**PAINTS &  
COATINGS**

## DESIGN AND DEVELOPMENT



### COMPUTATIONAL SIMULATION

Computational fluid  
dynamics  
Pressure surge analysis  
Computational vessel  
design



### PROCESS DEVELOPMENT

Mixing - liquid/liquid  
Mixing - liquid/solid  
Mixing - liquid/gas  
Dispersion  
Nanotech



### PHYSICAL DESIGN AND MODELLING

Physical modelling  
Hydraulic modelling



## CONCEPT GENERATION



### THEORETICAL OVERVIEW

Technical review



### INNOVATION MANAGEMENT



### FEASIBILITY STUDIES

Desk study  
Feasibility study



## TESTING AND VALIDATION



### COMPONENT TESTING

Pressure testing  
Seal testing  
Pump testing  
Thermal testing  
Valve testing



### SYSTEM TESTING

Flow testing  
Mixer testing  
System validation  
Rheological testing



## OPTIMISATION



DESIGN  
OPTIMISATION



PROCESS  
OPTIMISATION



PROCESS  
INTENSIFICATION



## CAPABILITIES

**BHR Group's multi-disciplinary teams provide an integrated engineering approach to process 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 a wide range of industrial processes. We use these in the modelling and understanding of dispersion, suspension, fluid mixing and rheological characteristics for Process operations in a controlled laboratory environment.

All this is augmented with computer aided design tools that simulate the physical and chemical behaviour of fluids in pipelines, processing and fluid handling equipment.

**UTILISING A MULTI-DISCIPLINARY TEAM OF EXPERIENCED CHARTERED ENGINEERS AND DEDICATED PROJECT MANAGERS WE PROVIDE SOLUTIONS ACROSS THE PROCESS INDUSTRY SECTOR:**

- Process optimisation for a range of applications – liquid phase, gas phase and dispersion
- Selection and design guidance for mixing equipment
- Advanced mixer and process vessel simulation capabilities
- Mixing technology
- Rheological characterisation of pre-cursors and finished products
- Site-based audits & testing
- Field measurements & troubleshooting
- Research & development



## 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 the Process sector.**

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.

Our approach is to work in close co-operation with you 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, availability, reliability and procedural integrity are factors that are paramount to your choice of partner – and these are fundamental to the service we provide. BHR Group believes that a deadline is a commitment – on time and on budget, with no compromise in quality.

Within the sphere of fluid engineering our experiences are truly diverse with projects ranging from the modelling of multiphase mixing systems, process design for fine chemical manufacturing, incorporation and mixing of nanoparticles, pump performance specification and testing, non-Newtonian fluid rheology and mathematical modelling.

***“We think BHR Group is the leading investigator all-over the world for mixing and fluid dynamics. The research program is good and the huge database is helpful. Also, membership of BHR Group/FMP is considered to be a status symbol and effective in the business mixing market.”***

**Ryuichi Yatomi**

Manager, Mixing Technology Group  
Sumitomo Heavy Industries

***“BHR Group helps us to develop cutting edge process technology solutions by inspiring with unique experimental facilities and the capability to investigate challenges in a multidisciplinary way. They fit perfectly in our culture of open innovation with an inside out and inside in approach.”***

**Dr Bernd Ohlmeier**

Scientist Mixing Technologies  
Royal DSM

## TEAM WORLD-CLASS ENGINEERING EXPERIENCE

BHR Group's Process team provides core expertise in mixing, dispersion, nanoparticle incorporation and process technology underpinning asset management, resource planning, cost reduction and legislative compliance.



**DAVID BROWN**  
Technical Director

David has over 16 years experience of research into and the application of singlephase and multiphase mixing in the pharmaceutical, speciality, bulk chemical and biochemical process industries. He is the creator of the definitive computer aided design mixing guide and is an authority on experimental methods and solid-liquid mixing, contributing to the Handbook of Industrial Mixing.

David's other areas of expertise include heat transfer, processing of fluids with complex rheological characteristics and process simulation. His philosophy is based around the focused application of research knowledge to solve industrial process challenges.



**GUSTAVO PADRON**  
Senior Consultant

Gustavo has over 15 years experience in chemical engineering with a particular focus on process mixing, liquid-liquid dispersion and nanoparticle break up and dispersion. Gustavo's skills made him extremely well suited to lead the Fluid Mixing Programme (FMP) industrial consortium which was established over 30 years ago. FMP offers a unique, industrially-focussed programme of applied research, the benefits that can be realised by well-designed and characterised mixing protocols run into millions of pounds.

Gustavo worked in the oil industry in Venezuela for 4 years before starting his graduate studies. Since joining BHR Group in 2005, he has published several papers and given presentations at international conferences in his capacity as Senior Consultant in the Process area.



**GÜL ÖZCAN-TAŞKIN**  
Senior Consultant

Gül has over 20 years experience in mixing and dispersion processes following her first degree in food process engineering and her PhD in the effects of viscoelasticity in mixing vessels.

She currently leads BHR Group's nanoparticle technology area, including the management of the DOMINO industrial consortium on the dispersion of micro and nanomaterials. Her areas of core expertise include the deagglomeration of nanoparticle clusters, the delamination of nanoclays, rheologically challenging liquids, dispersions and nanoemulsions.

Gül has lectured extensively during courses and conferences and is the author of a number of refereed publications.



**NIGEL HEYWOOD**  
Senior Consultant

Nigel is an expert in the rheological characterisation of difficult-to-handle liquids, emulsions, polymer solutions and melts.

Skilled in the development and application of rheological measurement and data reduction, he is an authority in the design and troubleshooting of slurry pipework, both in-plant and long distance, having carried out research and consultancy for over 35 years.

It is important to understand the link between the relevant physical properties of materials and process design, equipment selection and sizing, and specification of operating conditions in the bulk chemicals, specialty chemicals, pharma, food, coatings and other industries. Nigel often provides in-house workshops and training to companies tackling these issues.

**Our knowledge and technology base is continually enhanced through research, development and industry funded PhD projects consolidated by practical site experience. BHR Group also lead major industrial consortia on Fluid Mixing and Nanoparticle dispersion.**

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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.

*“The cooperation with BHR Group has always been an inspiring experience. I have enjoyed their deep knowledge in mixing technology and their excellent experimental capabilities. Due to this cooperation, I have learned aspects of the application of our own products that I hadn't been aware of before.”*

Sebastian Hirschberg  
Head of Production and Application Management  
Sulzer Chemtech