

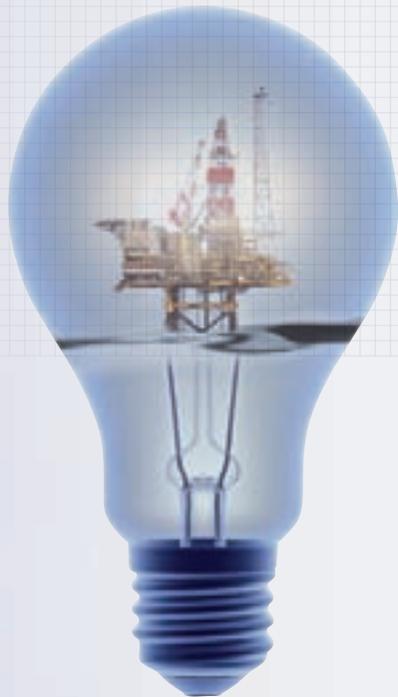
# *CONSULTANCY*

A UNIQUE BLEND OF  
EXPERTISE & RESOURCES

resultsdelivered™



*A FUNDAMENTAL STRENGTH  
TO OUR CONSULTANCY WORK  
IS THE RESULTS WE ACHIEVE  
IN OUR OTHER SERVICE AREAS*



OUR EXPERIENCE IN SEPARATION AND PRODUCED WATER TECHNOLOGY FEEDS INTO OUR CONSULTANCY WORK, JUST AS THE KNOWLEDGE WE GAIN FROM CONSULTANCY INFORMS OUR TECHNOLOGY DEVELOPMENTS, ADDING VALUE AT EVERY STAGE.

*WE DELIVER HINDSIGHT  
FOR BETTER PERFORMANCE*

Such hindsight comes from our experience, software tools and the facilities we employ to simulate results across all areas of separation and produced water treatment.

*ADDING VALUE*

It's something of a cliché, but we really do seek to add value by delivering results beyond our clients' expectations. With the facilities and technologies we have at our disposal we can take analyses of problems to a degree of detail and accuracy that frequently turns up some unexpected but welcome issues that may otherwise have gone undetected. This is where we believe we add the most value.

*A UNIQUE COMBINATION*

No other company in the world has our combination of expertise and resources. We provide an integrated service that means Opus is the only company you need for separation and produced water consultancy.

# PROCESS STUDIES

WE PUT OUR CLIENTS' NEEDS AND OBJECTIVES FIRST. WE CONTRIBUTE SPECIALIST KNOWLEDGE AND UNDERSTANDING, GAINED OVER YEARS OF EXPERIENCE, TO PROVIDE A COMPREHENSIVE RESOURCE FOR PROCESS STUDIES.

Our clients seek help for a number of reasons ranging from the design of complete separation and produced water treatment systems, to troubleshooting and investigation of de-bottlenecking opportunities. By considering the system as a whole, we help identify where gaps in a process may exist.

Our process studies are complemented by the use of Computational Fluid Dynamics (CFD), physical modelling and fluids characterisation. We get to the core of performance inefficiencies using the tools and techniques that are a key part of our approach. Armed with the results, our clients gain confidence in their investment decisions.

Process surveys establish important factors which form the foundation to our process consultancy. At this stage we gather and analyse the necessary information in order to gain a thorough understanding of the process. We also provide the expertise and equipment to collect data both onshore and offshore. This covers:

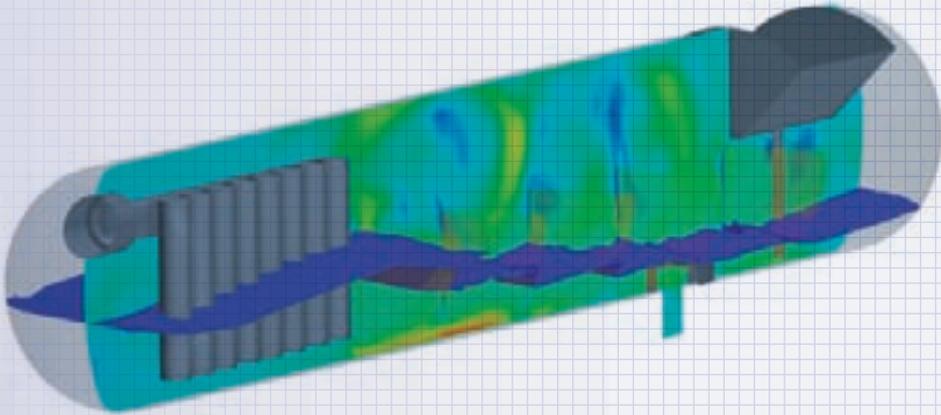
- > Definition of performance objectives
- > Operating parameters
- > Fluids characterisation
- > Review of theoretical and actual performance
- > Recommendations for improvement
- > Strategy for implementation

Opus considers all aspects of the process to ensure that core problems are identified and solved. Our experience means we know where to look, what to look for and which technology is best employed. From survey to review, through to implementation, Opus unearths the problems and applies the solutions to:

- > Enhance system performance
- > Increase throughput and product quality
- > Maintain cost effectiveness
- > Improve produced water quality
- > Manage transient conditions
- > Optimise chemical treatment
- > Improve operability



# COMPUTATIONAL FLUID DYNAMICS



WE DO NOT APPLY COMPUTATIONAL FLUID DYNAMICS IN ISOLATION. KNOWLEDGE GAINED FROM OUR HISTORY OF PROCESS UPGRADES AND OUR EXTENSIVE EXPERIENCE OF PHYSICAL MODELLING IS A FOUNDATION FOR OUR CFD CONSULTANCY.

Computational Fluid Dynamics feeds into the improvement recommendations that form the basis of our consultancy work. We provide oil companies with a detailed understanding of how fluid dynamics has an impact on their process efficiency and how it can contribute to substantial improvements in productivity.

The behaviour of fluids in a process system directly impacts on how effective that process is. This is particularly relevant when undertaking the separation of oil, gas, water and solids. CFD allows us to demonstrate complex fluids behaviour and is applied extensively in our consultancy activities.

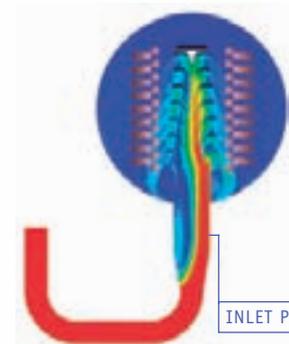


FLARE DRUM ANALYSIS

We remain at the forefront of applied CFD, using expert engineering knowledge to make best use of this powerful visualisation process. Our experience means we can validate the results intelligently against real-world understanding, providing confidence in the solutions we deliver. These firm foundations bring added value and assurance for our clients.

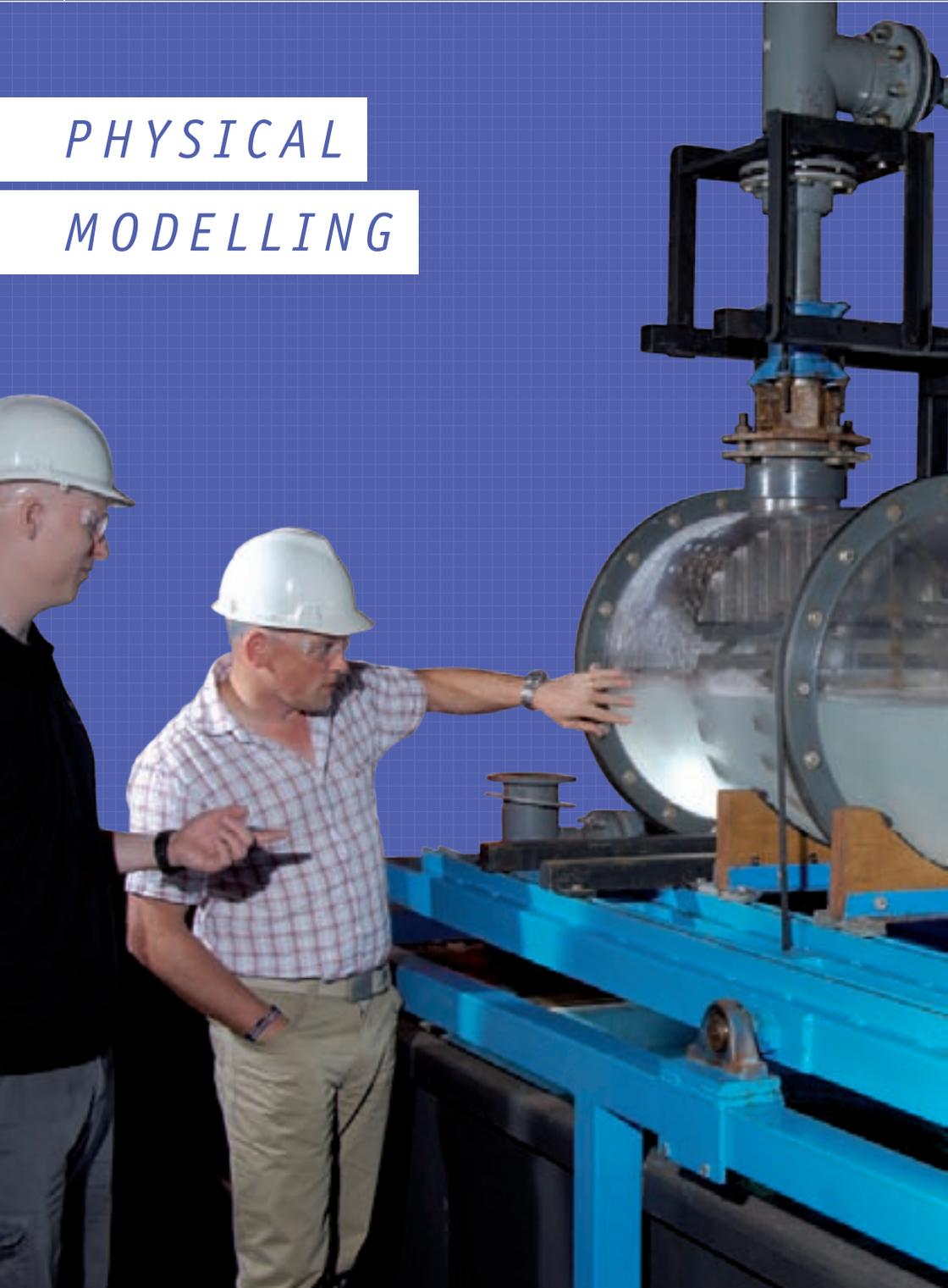
## BENEFITS

- > Verification by experienced engineers
- > Unique capability with process understanding
- > Validation of technology prior to investment
- > Understanding your process at real conditions
- > Cost-effective results for implementation



INLET PIPEWORK ANALYSIS

# PHYSICAL MODELLING



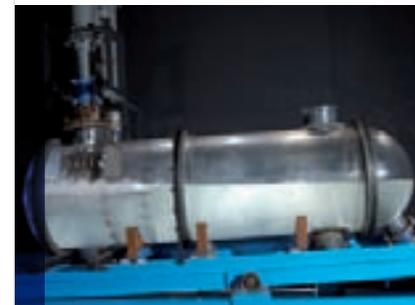
THE UNIQUE FEATURE OF PHYSICAL MODELLING IS THE IMMEDIACY OF RESULTS AND THE ACCURATE VISUAL REPRESENTATION OF FLUIDS BEHAVIOUR. OUR ABILITY TO SHOW THE EFFECTS OF HIGH TURBULENCE AND THE MIXING OF FLUIDS AND SOLIDS HAS NEVER FAILED TO IMPRESS OUR CLIENTS.

Physical Modelling is a technique for visualising fluids behaviour inside a vessel. We have a long history of using Physical Modelling to understand complex fluids behaviour including turbulence, gas carry-under and recirculation. Slugging, surging and sloshing conditions are also modelled and results for all can be further validated with our CFD service.

Performed in our test-hall facilities, Physical Modelling has been applied to a wide range of vessel designs. Process internals can be modified quickly, allowing our clients to witness with ease, improvements in separation performance.

## **BENEFITS**

- > Immediacy of results
- > Witness real fluids behaviour
- > Validate technology prior to investment
- > Study the effects of transient conditions
- > Cost effective
- > A training tool for operators



VISUALISING THE WHOLE VESSEL



SEEING THE INFLUENCE OF INLET DESIGN

# SLOSHING ANALYSES & DESIGN



CFD IS A POWERFUL TOOL FOR STUDYING COMPLEX MOTION

THE EFFECTS OF SLOSHING PLACES ADDITIONAL DEMANDS ON SEPARATOR DESIGN, REQUIRING EXPERTISE BEYOND THAT OF STANDARD TECHNOLOGY SUPPLIERS. OUR SLOSHING ANALYSES ARE BASED ON YEARS OF EXPERIENCE WITH OFFSHORE CONDITIONS. ALONGSIDE THE COMBINED BENEFITS OF OUR MODELLING TECHNIQUES, WE CAN DESIGN FOR RESULTS THAT PERFORM WELL IN DIFFICULT CIRCUMSTANCES.

Many floating production facilities are subjected to bad weather conditions which can have a substantial effect on separation performance. In extreme cases this can lead to unplanned shutdowns and concerns over mechanical integrity.

The effects of motion on processing equipment can substantially effect separation efficiency, where poor performance in one area can have a knock-on effect throughout the process train. Effective sloshing analysis accounts for the impact of motion on separation and provides assurance for the mechanical integrity of equipment under high liquids force.

Knowing what technique is best applied for sloshing analysis is an important part of what we do. The immediacy of Physical Modelling may save time and money where understanding complex motion scenarios is unnecessary for achieving results. Where motion is more complicated, CFD enables us to design internals arrangements that can cope with otherwise unpredictable fluids behaviour and the significant forces encountered within the vessel. Ideally, both Physical Modelling and CFD will be used to provide cross-verification and assurance.



WITNESS REAL-TIME EFFECTS OF MOTION ON SEPARATION

# FLUIDS

# CHARACTERISATION



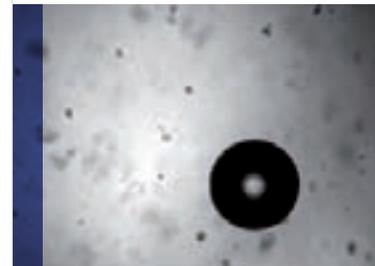
WE PROVIDE A COMPREHENSIVE RANGE OF SERVICES FOR FLUIDS CHARACTERISATION. WITH CAREFUL PLANNING AND PROJECT MANAGEMENT OUR EXPERIENCED PERSONNEL OBTAIN HIGH-QUALITY DIAGNOSTIC INFORMATION BY MEASURING THE EFFICIENCY OF EQUIPMENT THROUGHOUT THE PROCESS TRAIN TO IDENTIFY AREAS FOR IMPROVEMENT.

Our clients want to better understand the range of factors that affect the efficiency of their production facilities. Our consultancy services identify areas where enhanced product quality and environmental performance can be gained from existing equipment, reducing the need for unnecessary investment in new technologies.

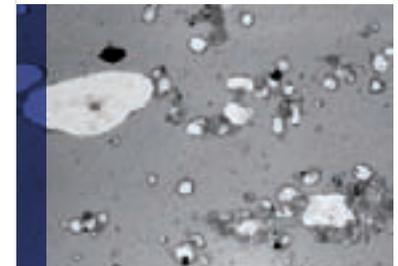
Our trained personnel are fully equipped to interpret data produced offshore on specialist equipment we provide. Our personnel understand results as they are generated, fine-tuning the process to identify and resolve any conflicts and maintain the integrity of the data we collect.

We provide fluids characterisation to clients worldwide for a range of troubleshooting and optimisation purposes. Furthermore our extensive laboratories enable us to undertake hydrocarbon and water analysis, covering a wide range of parameters, all of which enables us to provide:

- > Chemical dosing optimisation
- > Hydrocyclone optimisation
- > Process optimisation
- > Oil quality analysis
- > Produced water analysis
- > Technology evaluation



OIL IN WATER



WATER IN OIL

# TEST FACILITIES

EQUIPPED TO SIMULATE FIELD CONDITIONS, OUR TEST FACILITIES PROVIDE A VERSATILE LARGE-SCALE TEST BED FOR MEASURING THE EFFECTIVENESS OF PRODUCED WATER AND SEPARATION EQUIPMENT. OUR SKILLED ENGINEERS PROVIDE A COST-EFFECTIVE RESOURCE FOR OUR CLIENTS' INITIATIVES.

## TECHNOLOGY DEVELOPMENT

Most of the major oil companies have used our test facilities at some point for the development of new technology, either individually or collectively under Joint Industry Projects (JIPs).

We constantly develop and seek new technologies and innovations embracing all aspects of separation and produced water treatment.



DEMONSTRATING TECHNOLOGY WITH OUR CLIENTS

## TECHNOLOGY VALIDATION

We provide a comprehensive resource for clients wishing to evaluate technology. Our test facilities enable us to demonstrate the effectiveness of a range of equipment under controlled conditions.

Our clients want assurance in their investment decisions and the ability to assess technologies prior to purchase is a valuable resource. Our technology validation services provide an objective means for testing equipment and processes.

Technology suppliers make use of our independent and confidential service for performance testing of their products before introducing them to the market. Our test facilities have also been used for product certification and aiding market promotion via independent trials.



VERSATILE, CONTROLLED TECHNOLOGY VALIDATION

## OILFIELD CHEMISTRY SERVICES

Our experienced chemists offer a range of oilfield chemistry services and consultancy. Our capabilities cover a wide range of services that include:

- > Oil-in-water content analysis
- > Emulsion studies
- > Crude oil characterisation
- > Gas Chromatography/Infrared correlation
- > Particle size analysis:
  - Oil droplet size in OiW emulsions
  - Water droplet size in WiO emulsions
  - Solids size in liquid dispersions
- > Suspended Solids Analysis
- > Whole Effluent Assessment/Toxicity analysis



CRUDE OIL ANALYSIS

*BEST AVAILABLE TECHNIQUES*

*BEST ENVIRONMENTAL PRACTICE*

*(BAT/BEP)*



OIL COMPANIES HAVE SET AMBITIOUS TARGETS FOR THE PREVENTION AND ELIMINATION OF ENVIRONMENTAL EMISSIONS. AT THE SAME TIME OUR CLIENTS SEEK TO MAXIMISE THE OIL AND GAS PRODUCTION FROM THEIR ASSETS.

To answer these needs we developed an approach to separation and produced water management that offers a detailed understanding of the production process and allows us to provide options for improvement that suit the particular demands of the production facility.

Our three-stage methodology ensures our clients gain the full benefit of applying BAT/BEP principles to produced water management. We deliver a range of solutions based on product quality, high environmental standards and prudent investment options, specific to the asset and justified against our thorough process analysis. Our unique tools and expertise enable us to deliver the complete BAT/BEP solution.

We provide a comprehensive resource that considers the intimate relationship between primary separation, produced water and environmental compliance.

**BENEFITS**

- > Improved production
- > Optimum environmental performance
- > Reduce CAPEX and OPEX
- > Capitalise on existing investment
- > Achieve asset-specific solutions
- > Meet environmental targets
- > Reduce downtime



*OUR CLIENTS STICK WITH  
US BECAUSE WE ACHIEVE  
WHAT WE SAY WE WILL  
ACHIEVE, WE RESPECT  
THEIR WISHES & WE ARE  
**EASY TO WORK WITH  
AT ALL LEVELS***

**MAKING A DIFFERENCE**

We welcome any opportunity to discuss how Opus can be involved in delivering results for you and your business.

[www.opus-results.com](http://www.opus-results.com)

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