

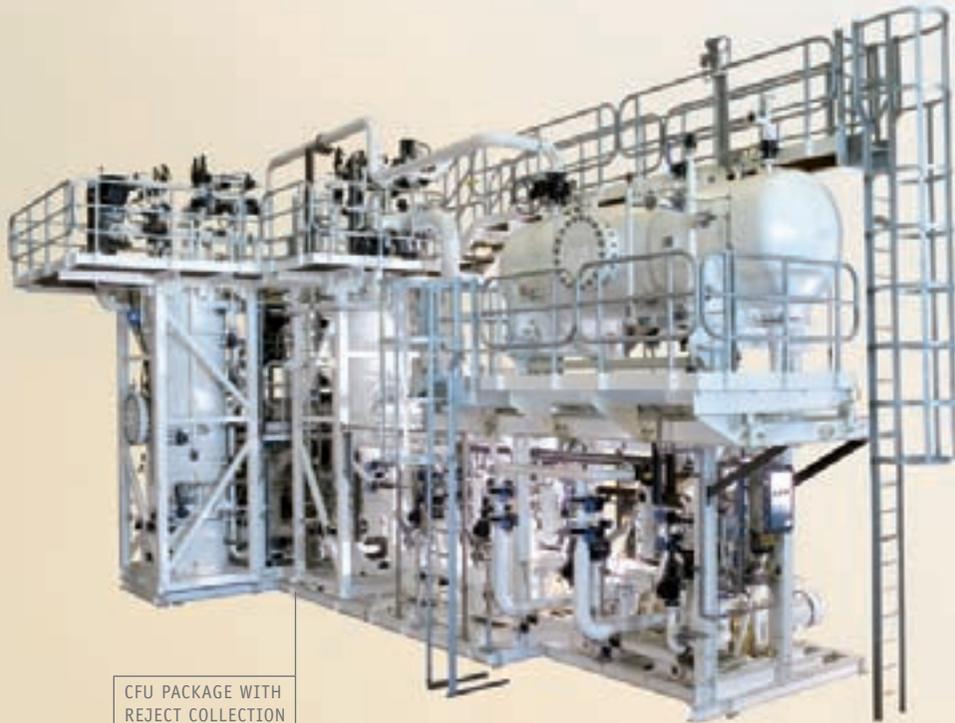
# *TECHNOLOGY*

TECHNOLOGIES DEVELOPED  
TO MEET THE GROWING  
DEMANDS OF THE GLOBAL  
ENERGY SECTOR

resultsdelivered™

 opus

*TECHNOLOGIES DEVELOPED  
TO MEET THE GROWING  
LEGISLATIVE REQUIREMENTS  
OF THE ENERGY SECTOR*



CFU PACKAGE WITH  
REJECT COLLECTION

WHEN OUR ENGINEERS COME UP AGAINST THE LIMITATIONS OF CURRENT TECHNOLOGIES OUR SOLUTION IS SIMPLE – WE INNOVATE AND BUILD NEW ONES THAT DELIVER BETTER RESULTS FOR OUR CLIENTS

**NEW WAYS TO IMPROVE  
EFFICIENCY LEVELS**

This is exactly what we did when existing compact flotation technology in the market didn't deliver. We designed and built a new one that did. From concept to completion the success of Oplus technology resulted in us entering the CFU market and paved the way for new Oplus technologies – all born out of the necessity of achieving better results for our clients.

# PRODUCED WATER TREATMENT

OUR APPROACH TO PRODUCED WATER TREATMENT IS FOUNDED ON THE FUNDAMENTAL PRINCIPLE THAT ALL PHASES IN THE PROCESS TRAIN ARE INTERLINKED.



CFU FOR PEREGRINO FPSO

## COMPACT FLOTATION UNIT (CFU)

The Opus CFU is a multiphase separator that is cost effective and easy to install and maintain. It achieves high oil removal resulting in a reduction of water content down to 10ppm and with its high throughput relative to volume it has proved to be very effective on fixed and floating installations where space is at a premium. It also offers numerous benefits for effective produced water treatment.

### BENEFITS

- > Stable operation with low operator intervention
- > Performance maintained at turndown conditions
- > High flow capacity and cost effective
- > Insensitive to motion, with proven performance on floating production systems
- > Handles high solids loading
- > Robust performance in slugging flow and variable inlet oil content
- > Designed for retrofit onto existing platforms
- > Inter-stage coalescence with the Mare's Tail®



20" MARE'S TAIL

## MARE'S TAIL®

The Mare's Tail® coalescer is our efficient, cost-effective technology to increase the removal of oil from produced water.

It can be easily retrofitted into existing installations or installed as part of a water treatment package for a new installation.

### BENEFITS

- > Tolerant to high solids loading
- > Enhances the performance of existing water treatment technology
- > Unaffected by motion (ideal for FPSO applications)
- > Compact and easy to install and maintain
- > Cost-effective, best available technology
- > Self cleaning



HYDROCYCLONE/MARE'S TAIL TEST-SKID

## HYDROCYCLONES

There is a wide range of hydrocyclones serving the oil and gas market and performance varies across suppliers.

We determine the nature of the process fluids, to recommend the best performing hydrocyclone for the specific needs of the production system. This independent approach best meets our clients' needs, offering the right technology and the best available solution.

Opus has 20 years experience of testing and optimising hydrocyclone technology for retrofit and new build applications. We supply hydrocyclones as part of integrated produced water treatment systems or retrofit improved liners as part of an upgrade project.

Our hydrocyclone test-skid enables us to validate technology in the field to select the best solution.



OPTIMISING HYDROCYCLONE TECHNOLOGY

# PROCESS UPGRADES



## SEPARATORS

When we started business in 1991, it was clear that the designs used to separate high momentum liquid, gas and solids, in transient conditions, were woefully inadequate. This situation is not much different today.

Opus considers all the influences on separation such as the effect of slugging, sloshing and production chemistry alongside system variables such as inlet and outlet pipework. We seek to provide the total solution to separator upgrades, offering bespoke internals arrangements tailored to the specific requirements of the production environment.

### BENEFITS

- > Enhance system performance and operability
- > Increase throughput and product quality
- > Improve produced water quality
- > Improve management of transient conditions
- > Optimise chemical treatment and reduce costs

*OPUS CONSIDERS ALL ASPECTS OF AN UPGRADE PROJECT 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.*



LIQUID-LIQUID COALESCER PACK

## DEGASSERS

Degassers are often the most misunderstood and under-employed vessels in the process stream. They can be undersized and are frequently hindered by turbulence, poor oil skimming and solids drop-out. However, with careful design and operating methods they can be usefully employed to recover oil and provide the last step in effective produced water treatment.

Our process understanding is gained from hands-on experience together with Computational Fluids Dynamics and Physical Modelling. Using these techniques we control turbulence to ensure optimum flow conditions. We design degasser internals to make best use of the vessel's size, using gas from the liquid entering the vessel for flotation, to significantly enhance oil recovery.

## GAS SCRUBBERS

Gas Scrubbers are often designed with a limited operating envelope. As field conditions change, increased gas may result in poor flow behaviour and liquid carry-over. Mal-distribution of gas flow in the incoming pipework is another common feature. For these reasons gas scrubbers often require upgrading.

Opus has a history of maximising gas scrubber performance by carefully investigating the gas and liquid flow behaviour. Computational Fluid Dynamics and process design capabilities enable us to provide internals optimised for effective gas handling and efficient liquid-droplet removal.

## GAS DEHYDRATION

When increased throughput is required on production platforms gas dehydration can become a bottleneck in the production system, resulting in excessive velocities within the vessel's inlet chamber. Mal-distribution of the gas flow through the chimney-tray and packing can result in high liquid carry-over, significantly upsetting gas conditioning.

Rigorous process understanding is required to locate the source of fluids carry-over or carry-under. We provide internals to correct any mal-distribution and remove liquid from the gas to extend the operating envelope. This results in higher gas throughput within export specification.

## FLARE KNOCK-OUT DRUMS

Flare knock-out drums are the final safety device to ensure safe flaring and platform integrity. High gas velocity with entrained liquids can jeopardise the knock-out vessel and flare system resulting in significant mechanical loads being experienced.

To mitigate such problems we use computational fluid dynamics combined with process and mechanical design expertise to determine the operating characteristics of the vessel during gas release. We design optimal solutions for the safe management of these extreme conditions maintaining our client's confidence in flare system integrity.

PROCESS

NEW BUILD



OUR EXPERIENCE AND THE RESULTS WE ACHIEVE IS THE FOUNDATION TO THE TECHNOLOGY WE SUPPLY FOR NEW BUILD PROJECTS.

WE KNOW THAT CUTTING COSTS AT THE NEW-BUILD STAGE OFTEN RESULTS IN INCREASED EXPENDITURE AND LOST PRODUCTION IN THE LONG TERM. THE SUCCESS OF OUR UPGRADE WORK IS TESTAMENT TO THIS.

Operators demand longevity from their production assets, seeking increased versatility and enhanced efficiency.

We assist our clients to meet these objectives and improve the operability and performance of their oil and gas production facilities. The challenge is to design robust process equipment that deals effectively with changing conditions.

Whether multiphase separators, gas scrubbers, flare drums or produced water systems, our integrated approach allows us greater attention to detail when selecting the most suitable technology for the application. This means added value and cost-effective results delivered.

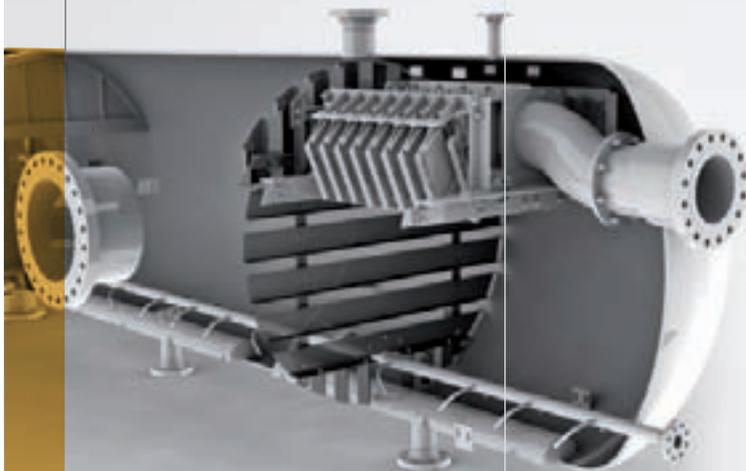
# PROCESS INTERNALS

## SEPARATION

When delivering a stable operation and increased oil production no two separators require the same solution. We understand the complex range of variables that effect separation performance and by considering the wider separation system we can select and design process internals optimised for the specific task. Our process internals deliver improved oil quality and cleaner produced water, adding value for our client's business. We supply a full range of internals for separation including:

- > Inlet devices
- > Motion calming distribution baffles
- > Liquid/liquid coalescers
- > Internals for liquid and foam control
- > Gas and liquid demisting devices
- > Solids removal technology

3-PHASE SEPARATOR



## PRODUCED WATER

Produced water at the secondary stage typically contains residual gas and small droplets of oil in low concentration. Our clients seek to maximise oil in water separation performance to meet overboard discharge requirements. Attention to detail at this stage is essential to design effective process internals for removing small oil droplets from produced water. We supply the following internals for produced water treatment:

- > Inlet devices
- > Gas flotation internals
- > Distribution and calming baffles
- > Liquid/liquid coalescers
- > Oil skimming devices
- > Liquid outlet distributors

PRODUCED WATER DEGASSER



## GAS HANDLING

The primary function of gas handling vessel internals is to remove liquid droplets from the gas stream. Residence time can be limited in these vessels meaning that good inlet device, vane pack and demister design is important for achieving optimal liquid droplet removal. We scrutinise the design in detail to ensure the right technology is applied for achieving our client's performance requirements.

- > Gas inlet devices
- > Distribution baffles
- > Liquid agglomerators
- > Liquid demisters
- > Interface protection baffles

GAS SCRUBBER



# SAND MANAGEMENT

AN EFFECTIVE SAND MANAGEMENT SYSTEM SHOULD REMOVE SOLIDS WITHOUT DISRUPTING THE FLUIDS SEPARATION PROCESS. ALL TOO OFTEN WE HAVE SEEN POORLY DESIGNED SYSTEMS AND SOUGHT TO UNDERSTAND WHY THEY HAVE FAILED. WITH THIS EXPERIENCE ACQUIRED IN THE FIELD, WE HAVE DEVELOPED A DESIGN AND OPERATIONAL PHILOSOPHY TO PROVIDE SAND MANAGEMENT SYSTEMS THAT WORK.



## SAND JETTING SYSTEMS

Sand jetting is the most common technology applied for solids removal. Our designs apply jetting sequentially down the vessel length, using less water and causing less disruption to the fluids. We ensure the correct nozzle design is applied and orientated to achieve good coverage and prevent erosion of the vessel wall.

### BENEFITS

- > Cost effective
- > Can be automated
- > Minimal water requirement
- > Online operation
- > Reliable



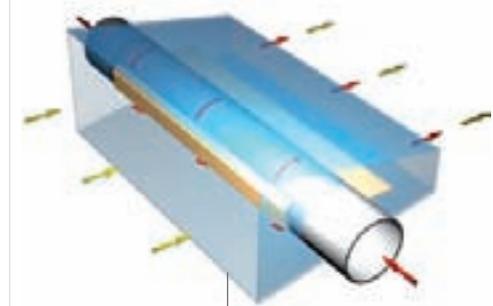
CHECKING NOZZLE COVERAGE

## LINEAR COANDA

The Linear Coanda technology is designed to transport solids continuously down the vessel, using the flow of the fluids in the vessel to reduce the amount of water required. Turbulence is greatly reduced because the design drives accumulated sand in the same direction as the bulk fluids. This patented technology was developed as a joint industry project with major oil companies.

### BENEFITS

- > Continuous operation
- > Reduced water usage
- > No erosion of vessel wall
- > Fluids separation unaffected
- > Low maintenance
- > Evidence of solids cleaning



LINEAR COANDA OPERATION

# IMPLEMENTATION

CLIENT SATISFACTION REMAINS THE MOST IMPORTANT FACTOR IN OUR BUSINESS STRATEGY. A HIGH LEVEL OF SERVICE COUPLED WITH OUR ENGINEERING AND TECHNOLOGY EXPERTISE GOES HAND IN HAND WITH OUR COMMITMENT TO PROVIDING FULLY INTEGRATED IMPLEMENTATION SERVICES.



## PROJECT

### ENGINEERING

The slightest oversights during detail design can prove costly and time consuming at the point of manufacture or assembly. Effective project management, quality assurance and construction implementation is therefore critical at every step and culminates at the installation stage. Our attention to detail and thorough planning provides a smooth transition from design to installation.

We take responsibility for every stage of the project cycle and offer our clients a single and reliable point of contact. This ensures total accountability and the guarantee of completion dates being met.



## CONSTRUCTION &

### INSTALLATION MANAGEMENT

Agreeing an installation strategy with a client's construction personnel at an early stage of a project contributes to an efficient design and cost-effective installation.

Trial assemblies are an important part of the implementation strategy and provide assurance that the final installation will be expertly managed. We also supervise the installation of all our technology to ensure safe and timely project completion.



# RESEARCH & DEVELOPMENT



OPUS HAS A LONG TRADITION OF RESEARCH AND DEVELOPMENT, BOTH ON BEHALF OF CLIENTS UTILISING OUR TEST FACILITIES AND IN PROGRESSING OUR OWN TECHNOLOGIES. THE EXTENSIVE RANGE OF APPLICATIONS AND VERSATILITY OFFERED BY OUR TEST FACILITIES HAS SEEN OPUS INVOLVED WITH A WIDE RANGE OF JOINT INDUSTRY PROJECTS OVER MANY YEARS.

CoSWaSS  
ONE-THIRD SCALE  
SUBSEA SEPARATOR

## FROM VISION TO REALITY

We know that market-led product evolution creates and sustains growth. We combine knowledge gained in the field with our technical expertise, to ensure our clients' requirements stay at the forefront of our thinking when we develop new technologies for improving production.

At Opus we have a talent for bringing innovative technology to the market and are proactive in identifying opportunities for new products and services that deliver results for our clients.



*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)

