OPTIMUS PLUS
Concept & Front End Specialists
a PD&MS group company

Innovative consultancy and engineering services supporting the energy sector

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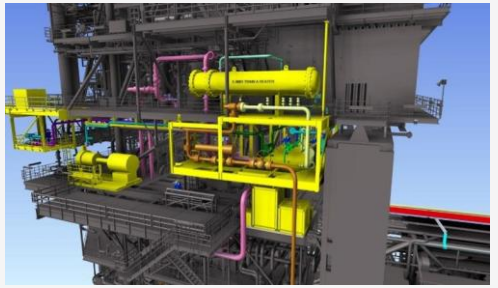
# About Us

Optimus is a well-established, highly experienced, specialist engineering and consultancy company, combining proven expertise and strategic insight to deliver simple, responsive and cost-effective solutions for the energy industry from concept to decommissioning.



Core Services include:

- Conceptual Design / pre-FEED
- FEED
- Multi-Discipline Detailed Design
- Specialist Engineering Services
- Asset Life Extension and Optimisation
- Offshore Survey including laser scanning
- Operational Support including troubleshooting
- Decommissioning Engineering Services
- Structural Analysis
- Pipe Stress Analysis
- Availability/ Maintainability Modelling and Reviews
- Decision and Risk Management
- HAZOP/ HAZID/ SIL/ LOPA assessments
- Safety Studies, including Safety Case Reviews
- Contracting and Supply Chain

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# About PD&MS

## PD&MS has been engineering solutions in the energy industry and beyond since 2002.

In 2022 the PD&MS Group acquired Optimus to enhance its front-end engineering and design capability across the oil and gas and renewables sectors, providing essential consultancy expertise.

In 2023, we confirmed our acquisition by RSK Group – a global leader in the delivery of sustainable solutions.

## Perfectly positioned to support the energy transition

Working closely with Synergie Environ as part of our group we provide specialist engineering, low carbon and cleantech knowledge within the energy sector and beyond.

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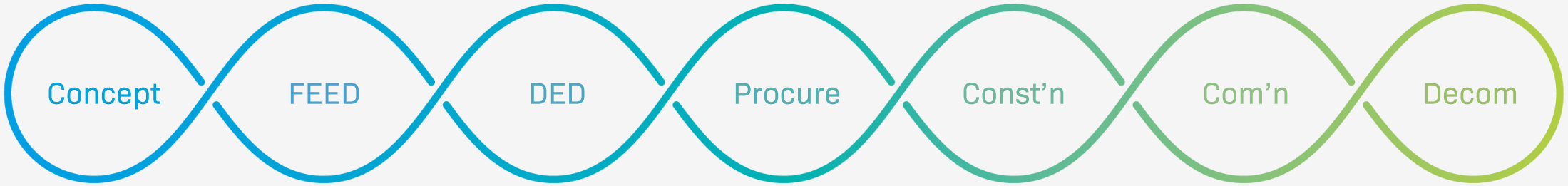
# Optimus Overview




**23**
Years Experience

**80+**
Number of Staff

Front End Engineering specialist

Partner Not Contractor

## Front End Disciplines

- Process
- Structural
- Electrical
- Control & Instrumentation
- Decision & risk
- Piping & layout
- Mechanical
- Technical safety

**7**
Onshore Terminals

**60+**
Installations UKCS

**7**
Offshore Wind Farms

Number of Assets

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# Concept to Decommissioning

## COMBINING ENGINEERING & CONSULTANCY SERVICES FROM CONCEPT TO DECOMMISSIONING

### MULTI DISCIPLINE ENGINEERING

Multi discipline engineers and designers: process, structural, electrical, control, instrumentation, piping and mechanical

### CONSULTANCY – TRUSTED ADVISOR

Technical Authorities and subject matter experts supporting our clients

### FRONT END PROFESSIONALS

Feasibility, Concept and pre-FEED specialists to support both new developments and brownfield modification projects

### SPECIALIST ENGINEERING

Specialists for challenging and complex engineering scopes requiring new solutions and innovation

### STRUCTURAL AUTHORITY

All aspects of structural integrity management and support, including asset models, analysis, integrity assessments, Finite Element Analysis, concept, detail design, construction, 3-D scan surveys and modelling.


### EMISSION REDUCTIONS & ENERGY TRANSITION

Reducing emissions from existing assets and supporting the transition to offshore renewables, carbon capture & storage and hydrogen.

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# Capability

From front end and conceptual study work, to detailed design, late life asset management & decommissioning services, we have your bases covered.

## Process & Technical Safety

- Field Development
- Feasibility / Concept
- FEED
- Detailed Design
- Commissioning
- Close Out
- Technical safety engineering
- Safety studies
- HAZOP and HAZID
- SIL / LOPA assessment

## Structural Engineering & Integrity Management

- Full detail design capability
- Finite Element Analysis
- Architectural Design
- Fatigue assessment
- Corrosion Protection Design
- Hydrodynamics & Naval Architecture
- Dynamic Analysis
- Computational Fluid Dynamics
- Structural Integrity Management Services

## Electrical & Instrument Engineering

- Concept and FEED studies
- Brownfield modifications
- Greenfield Projects
- Specification of long lead and bulk items
- 3D modelling (equipment / cable routing)

## Piping & Mechanical

- Brownfield modifications
- Dimensional surveys
- Repair orders
- Overstress and vibration analysis
- Concept and FEED Studies
- Valve selection, specification and delivery management
- Technical assurance
- Pipeline modifications (topsides)

## Decision & Risk

- Risk & Opportunity Management
- Numerical Modelling
- Decision support
- Facilitation & Training

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# Process


- Concept selection
- FEED studies
- Development engineering
- Flow assurance

- Detailed design
- Operations / maintenance support
- Technical due diligence / asset integrity review
- Commissioning

- Brownfield studies
- Process modelling and optimisation
- P&IDs – development and as-building

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# Technical Safety

Our specialist engineers and consultants deliver authoritative advice and technical solutions.

- Technical safety engineering
- Safety studies
- Safety management systems
- Safety case / COMAH support
- Thorough reviews
- SC Regulation 5 audits
- HAZOP and HAZID
- SIL / LOPA assessment
- Risk assessment (including QRA, ORA, Bow Ties)
- Fire & Explosion Assessment
- Dispersion modelling
- HSE assurance for life of field
- ALARP workshops
- Asset integrity review
- Process Safety and HAZOP training
- Incident investigations

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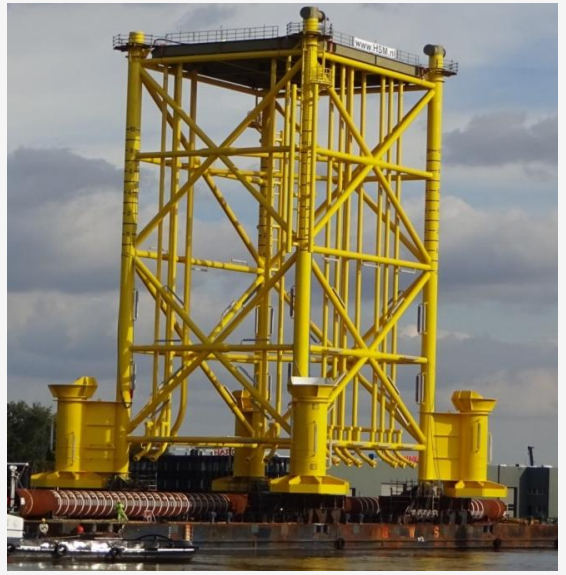
# Structural Engineering

We provide a full range of structural services including foundations and topsides design, greenfield design and analysis through to detail design of brownfield modifications and temporary works

Specialist skills include:

- Full detail design capability
- Hydrodynamics & Naval Architecture
- Finite Element Analysis
- Architectural Design
- Fatigue assessment
- Corrosion Protection Design
- Dynamic Analysis
- Computational Fluid Dynamics (CFD

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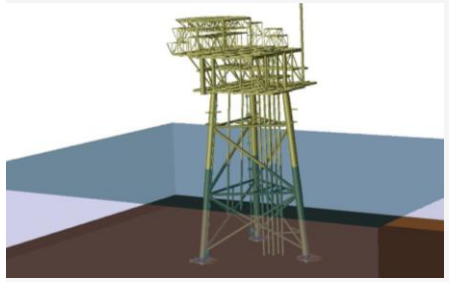
# Structural Integrity Management

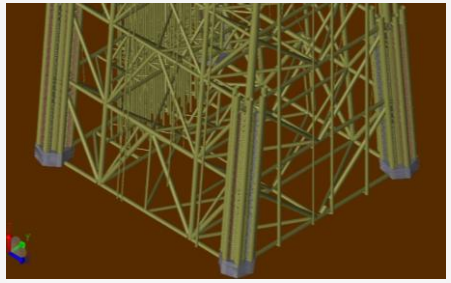


## Topside Assessment / Analysis Support Services

- Lifting from uncertified steelwork assessments & support
- Detailed structural assessment & support (Topside & Caissons)
- Model management & emergency support
- Assistance with design verification activities
- General integrity support as required

## Subsea Inspection Support Services

- Structure inspection planning support
- Workscope reviews
- Subsea anomaly referrals
- Subsea Inspection Scheme (SISc) updates

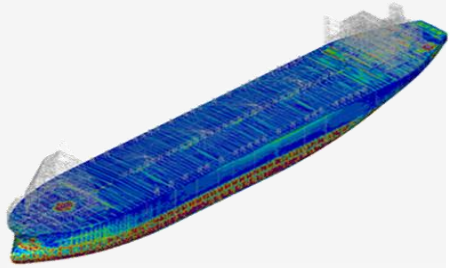


## Structural Integrity

- Technical Notes (TN)
- Support to facilities for uncertified steelwork lifting activities
- Management of structural integrity models
- Input to Subsea RBI reviews
- Subsea structural inspection and remedial work plans
- Root Cause Analysis (RCA)
- Asset structural life extension studies

## Detail Design

- 3-D Laser scanning capability
- 2D and 3D draughting team
- Team of experienced engineers with brownfield and greenfield expertise
- Module design
- Caisson Replacement
- Equipment Change out
- RO and minor modifications capability



## Floating Assets

- Detailed Asset Life Extension (ALE) study and recommendations
- Study and FEED for asset relocation onto new field
- Hull strength and fatigue assessment
- Third party review and verification
- Obsolescence reviews and action plans
- Mooring line strategy
- Technical Authority services

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# Electrical & Instrument

## Optimus offer a complete range of E&I engineering and design services

### ELECTRICAL

- Power system analysis
- Protection level settings
- Generation sizing
- 3D modelling
- Intelligent switchboard design and procurement
- UPS design and procurement
- Cable sizing
- Lighting calculations
- Earthing system design

### INSTRUMENT

- Fire Detection and Protection Systems
- Emergency Shutdown Systems
- SCADA
- Telecoms
- Public Address Systems
- Field mounted Instrumentation

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# Piping & Mechanical

## ENGINEERING & DESIGN

- Piping engineering consultancy
- FEED / layout studies
- RO / MCDR projects
- Multi-discipline brownfield modifications
- New build / greenfield projects
- Materials & corrosion engineering
- Valve and in-line piping equipment engineering
- Procurement package & fabrication management
- Full suite of engineering design deliverables to suit client requirements

## PIPE STRESS & FINITE ELEMENT ANALYSIS

- Static & dynamic analysis:
- API 579 Fitness for Service Assessments, Levels 1 to 3 capability

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# Decision & Risk

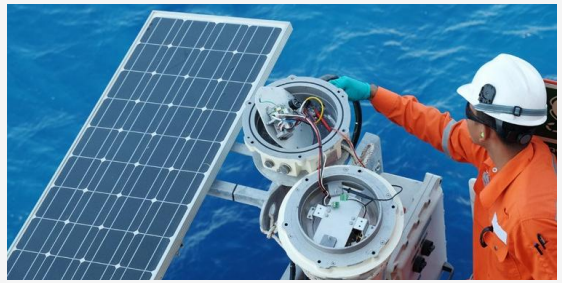
## FRAMING, DECISION AND RISK

### Risk / Opportunity Management

- Risk workshops
- Preparation and management of risk and opportunity registers
- CSRA (Cost and Schedule Risk Analysis)
- Development and implementation of guidelines and procedures

### Decision Support

- Decision and Risk Analysis (D&RA)
- Option selection (deterministic and probabilistic)
- Management consultancy



### Numerical Modelling

- RAM modelling and reporting
- Justifiable spend
- Obsolescence modelling
- Decommissioning liabilities estimates

### Facilitation & Training

- Structured workshop and meeting facilitation
- Lessons learned workshop facilitation
- Risk management training
- Decision and risk analysis training

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# Case Study

## CO2CIRCULAIR B.V.

Smart DAC – Sustainable Membrane Absorption & Regeneration Technology For Direct Air Capture

DURATION: Ongoing

### SCOPE OVERVIEW:

Optimus are part of a consortium which secured funding as part of the the Greenhouse Gas Removals (GGR)Innovation Competition.

### KEY ACHIEVEMENTS:

- Part of consortium which received funding from BEIS.
- Optimus executed FEED study.
- Site footprint drastically reduced.
- Phase 2 ongoing.

### SCOPE:

The novel SMART-DAC technology uses membrane gas absorption and membrane electrolysis regeneration to capture and separate $CO_2$ from the air, creating a continuous absorption cycle. Using wind circulation to push air through the system and being powered using green energy, SMART-DAC is a cost-effective, zero-emissions solution providing continuous $CO_2$ capture. The $CO_2$ captured can be reused as a carbon source for sustainable chemicals and synthetic fuels to replace fossil fuels and create a short carbon cycle or stored to remove $CO_2$ from the atmosphere permanently.

Optimus were engaged to undertake FEED, Detailed Design, Procurement and Construction support for the pilot-scale Direct Air Capture process facility, being part of a consortium formed by CO2CirculAir, Process Design Consultancy (PDC), Heriot-Watt University, B9 Energy and the Net Zero Technology Centre.

The consortium secured the funding as part of the Greenhouse Gas Removals (GGR)Innovation Competition. It will support the construction of a pilot plant that will begin testing in spring 2023, capturing a minimum of 100 tonnes of $CO_2$ per annum. The plant will be situated in Larne, Northern Ireland, at the B9 Energy Storage offices, where B9 will draw on nearly 30 years of renewables sector experience to develop this technology to the next stage and potentially incorporate it into their existing portfolio of projects.

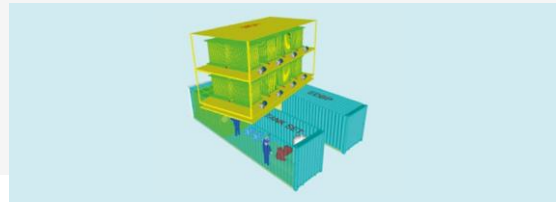
Phase 1: FEED study was executed as part of phase 1 of the project. Phase 1 objectives were to generate engineering, procurement, and construction cost estimates, to define further the processing system and equipment requirements, define key discipline requirements, instrumentation and control requirements, generate FEED level layout of piping, vessels, mechanical equipment and structure and ensure safety by design.

Phase 2: this phase of the project is mainly focused on completing the engineering package prepared during phase 1, supporting the consortium in the Procurement of equipment, and during the manufacturing and construction of the pilot plant.

### RESULTS:

Phase 1 of the project was successfully completed. Main findings and support were given from Optimus to the consortium:

- A process rationalization was conducted to simplify and reduce costs, resulting in a substantial reduction in equipment and therefore plant size and cost.
- A preliminary layout for the pilot plant was developed and refined as the process improved. This resulted in a substantial decrease in plant equipment and attendant facilities. The site footprint has dramatically been reduced due to this exercise.
- Plant cost estimation has been based on a combination of engineering, procurement and construction costs from Optimus and the lead consortium team.
- Lead time to build the plant has also been estimated, including long lead items (pumps / EDBP package / MGA unit / Control System).
- Phase 2 of the project is still ongoing, with significant changes in Optimus scope, based on the new approach of the lead consortium to split the work into small working packages that should support the project delivery on schedule and according to the current budget constraints. The project has been split into 7 working packages, and suppliers have been already selected by the lead consortium team. Optimus scope in this phase would be:
- Generate engineering deliverables that support the scope for each working package (preparation of drawings, 3D models, layouts, and specific technical reports).
- Prepare a set of the statement of requirements by working package, for the lead consortium team to use as the main specification for the suppliers selected, ensuring compliance with British standards.
- Execute technical safety reviews to ensure the pilot plant will run safely during the operating period and comply with local regulations.
- Provide technical support during the procurement and construction phase.



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# Case Study

## RAMPION OFFSHORE WIND LIMITED

Offshore Wind Substation J-tube Installation

DURATION: Approx 10 months

SCOPE OVERVIEW:

Optimus were requested to develop a procedure for installation of an additional j-tube to allow a new export cable to be installed with minimal disruption to the platform operations.

KEY ACHIEVEMENTS:

— Managed multiple interfaces with the installation contractors.

— Delivered on time.

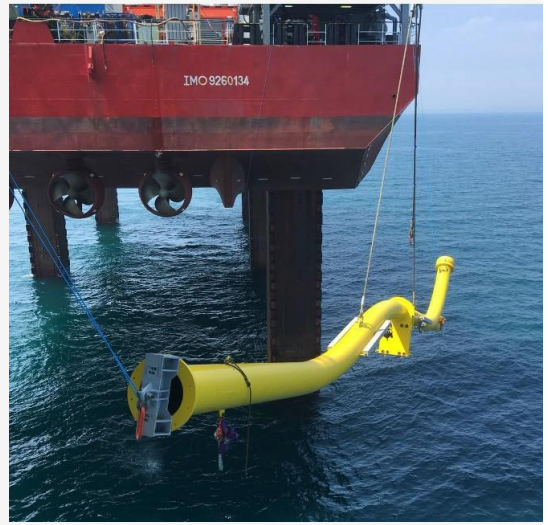
SCOPE:

The project was for an Offshore Wind Farm located in the English Channel in approximately 20m of water. A single 400MW Offshore Substation Platform (OSP) for the wind farm comprises a 4 leg steel jacket supporting the topsides, housing all of the electrical equipment along with refuge, workshops and control/protection rooms. The topside comprises an equipment deck (at El .+28.5m LAT) with an integral cable deck approximately below. All electrical equipment is housed on the main deck with the cable deck supporting an oil dump tank and cable pulling winch.

The OSP jacket supports an array of twelve incoming j-tubes on the south and west faces and two export j-tubes on the northern face. The 2 export cables were damaged during transport and/or installation and Optimus were requested to develop a procedure for installation of an additional j-tube to allow a new export cable to be installed with minimal disruption to the platform operations.

The delivery timescale was driven by client commitments to diving support vessel and so Optimus enlisted 3 local fabricators to complete fabrication of the various elements, j-tube, clamps and temporary installation steelwork in parallel. This required regular detailed expediting visits by the Optimus team to ensure control and delivery to the fixed deadline.

Each j-tube section required cross-hauling under deck using dedicated lifting points supported on the cable deck. The 23m long swan neck section of the j-tube was threaded through the jacket bracing and rotated into position requiring divers and topsides rope access teams to work seamlessly together, Optimus managed multiple interfaces with the installation contractors to ensure that method statements were well understood, fit for purpose and fully integrated with responsibility handovers. The installation was timely and safe, testament to the design and working practices employed throughout.



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# Case Study

## CONFIDENTIAL CLIENT

FPSO Vessel Integrity Program

DURATION: 30 months

VALUE: £346k

SCOPE OVERVIEW:

Optimus were contracted to review the FPSO Vessel Integrity Program (VIP), then revitalize the VIP.

KEY ACHIEVEMENTS:

— Approx 3500 manhours.
— Contracted to revitalize the FPSO VIP.
— Follow on work awarded.

SCOPE:

The FPSO was launched in 1998 and following the installation of the topsides was on location in April 2000. To support field life extension from 2020 to 2026, the client initiated the original Vessel Integrity Program (VIP) in 2007. The VIP comprised two phases:

Phase 1: Unit assessment: detailed analysis to assess the condition of the vessel and detect critical areas.

Phase 2: Solutions Analysis - For areas of concern identified in Phase 1 investigations and further analysis were to be developed to determine the best practical, long-lasting solutions.

The VIP had largely remained dormant since 2010 with Phase 2 of the original project only being partially completed.

Optimus was contracted to review the VIP and develop a Decision Support Package (DSP) to support a go/no-go decision with regards to the revitalisation of the dormant VIP initiative. During this review Optimus located accelerometer and strain gauge data recorded on the vessel as part of the original VIP.

Following recommendations made in the DSP Optimus were contracted to revitalise the FPSO VIP.

A staged approach was proposed, comprised of the following stages:

Stage 1 – Data Review and initial benchmarking of original hydrodynamic analysis;

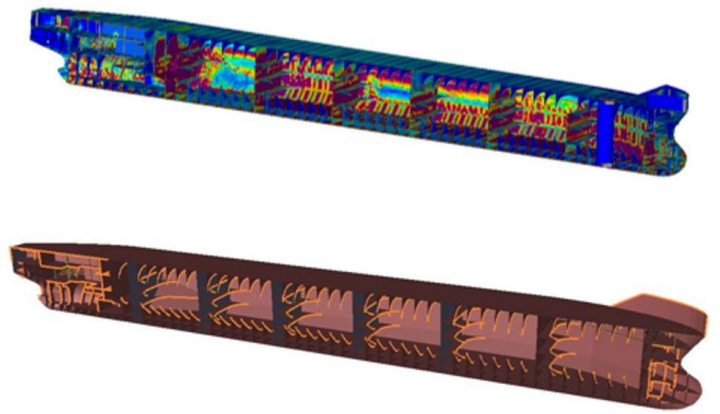
Stage 2 – Updated structural analyses, both strength and fatigue;

Stage 3 – Benchmarking of revitalised analyses against previously recorded vessel behavior.

Optimus has more recently, also completed an update to the Vessel FPSO fatigue assessments.

This work has been undertaken to support a Safety Case update for continued operation beyond the original design life of the asset. The updated fatigue assessments captured changes in the following parameters:

— Metocean data
— Loading Plan
— Deadweight
— Mooring Stiffness



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# Case Study

## CONFIDENTIAL CLIENT

Closed Drains Pumps Failures

DURATION: 5 months

VALUE: £128k

SCOPE OVERVIEW:

Optimus investigated solutions for retaining the existing pumps whilst improving operational performance and also the spatial effectiveness of the installation so that these may be compared directly with pump replacement options.

KEY ACHIEVEMENTS:

- 1185 manhours.
- Carried out an onsite survey, initial engineering and a desktop materials study.
- Identified an alternative cause of pump failures.
- Progressed from FEED to Detailed Design.
- Delivered on time and on budget.

SCOPE:

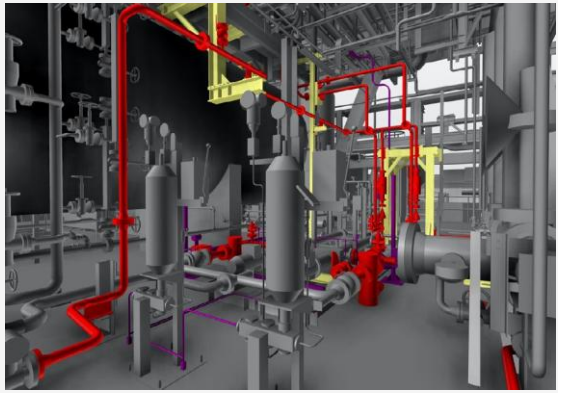
Since installation in 2014, the closed drains pumps on the clients platform caused process upsets due to large adhoc flows to the LP Separator during operation and suffered multiple pump failures. Laboratory tests and previous investigations suggested the failures were in the main due to material incompatibility. To verify the hypothesis and develop solutions the client requested that Optimus carry out an engineering study to inform their corporate decision making process. Optimus investigated solutions for retaining the existing pumps whilst improving operational performance and also the spatial effectiveness of the installation so that these may be compared directly with pump replacement options.

Following an onsite survey, initial engineering and a desktop materials study, the Optimus team proposed an alternative cause suspecting that the failures were mechanical in nature rather than chemical as hypothesised by the client.

Whilst maintaining the original agreed costs, the Optimus team continued their investigation into a holistic solution. Expertise was gathered across the Optimus disciplines including Process, Mechanical, E&I and Piping. The resulting solution proposed improvements in the following areas:

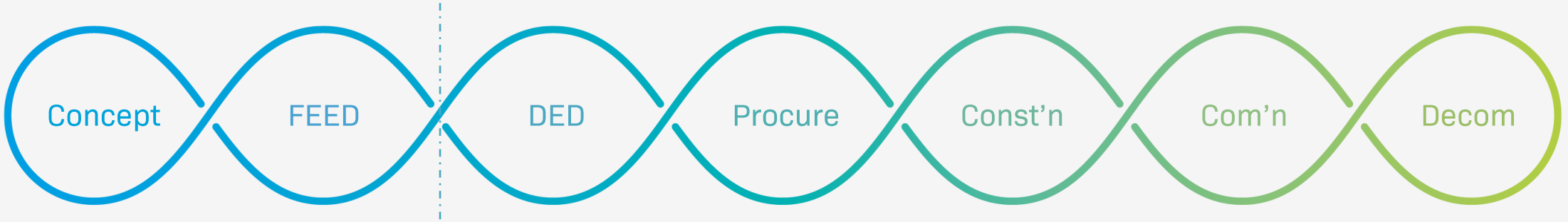
- Maintenance and access/egress reconfiguration
- Pump suction improvements (Mechanical and Instruments) to minimise risk of dry running
- Reassessment of vessel operating levels to maximise head
- Pump flow control
- Gearing modification to optimise pump flow

The additional FEED investigations and solutions were delivered according to the original agreed times and budget. Thereafter Optimus progressed the scope from FEED to detailed design on a fixed price budget completing all multi-discipline engineering deliverables and developing workpacks for client implementation. Furthermore Optimus provided technical and package management support to the client for all project procurement, once again delivering the project on budget and on schedule.



# Optimus Overview

## Full Project Lifecycle (Front End Focus)

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**23**
Years Experience

**80+**
Number of Staff

Front End Engineering specialist

**Partner Not Contractor**

### Front End Disciplines

- Process
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**7**
Onshore Terminals

**60+**
Installations UKCS

**7**
Offshore Wind Farms

Number of Assets

# Thank you for your time

We welcome any questions


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