OCEANEERING®

60 YEARS 1964 - 2024

Implementing Rigless Intervention Technology for Enhanced Upstream Production

By Dr. Leyroy Jose

PhD/ DBA

Agenda

Years of
Solving the Unsolvable
#Oceaneeringat60

1. Introduction
2. Oceaneering Project Group (OPG) Overview
3. Oceaneering Angola Overview
4. Intervention Services
5. Q&A

Overview Business Segments

Subsea Robotics

- ROV
- AUV
- Tooling
- Survey & Positioning
- Geoscience
- C-Nav Positioning Solutions
- Drill Support

Offshore Projects Group

- Field Support Vessels
- IMR
- Diving
- Offshore Renewables
- Installation
- Light Well Intervention
- Well Stimulation
- Hydrate Remediation
- Flow Assurance
- IWOCS & RWOCS
- Engineered Solutions
- Decommissioning, P&A

Integrity Management & Digital Solutions

- Integrity Management
- Inspection Services
- Preventive Maintenance
- Data Management
- Engineering Services
- Floating Platform Inspections
- Data Communications
- Maritimes Services
- OceanSMART
- AMIC – Remote Monitoring
- OMV & EDGESmart
- Digitalization

Manufactured Products

- Cable / Umbilicals
- Subsea Distribution
- Subsea Hardware
- Connectors
- Rotator ® Valves
- Grayloc ®
- Pipeline Repairs
- Subsea Pumping Technology
- Entertainment & Animation
- Automated Guided Vehicles

Aerospace & Defence Technologies

- Defence Subsea Tech.
- Governments
- Marine Services
- Space Systems
- Exploration Suit
- Human Space Flight
- Space Robotics

OCEANEERING®

Angola Capabilities and Support Facilities

Oceaneering has been present since the early days of the development of offshore Cabinda and Soyo (mid 1980's). We currently have over 400 local employees working in Luanda, Lobito, Cabinda and at multiple offshore locations.

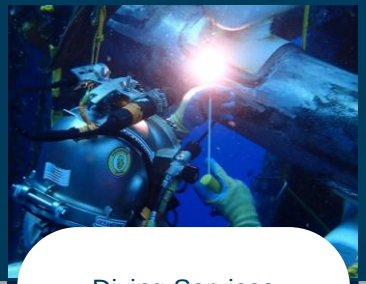
Offshore Projects Group (OPG)

Vessels

Our integrated, complete vessel solutions combine remotely operated vehicle (ROV) systems, project management, installation engineering, advanced technologies, and offshore operational expertise to deliver a best-in-class solution.

Installation Services

We deliver a one-stop-shop solution including vessel and ROV services, tooling, and well intervention packages around the world.



Diving Services

We contract, manage, engineer, and execute projects using our global vessel fleet, advanced technologies, and highly skilled personnel.

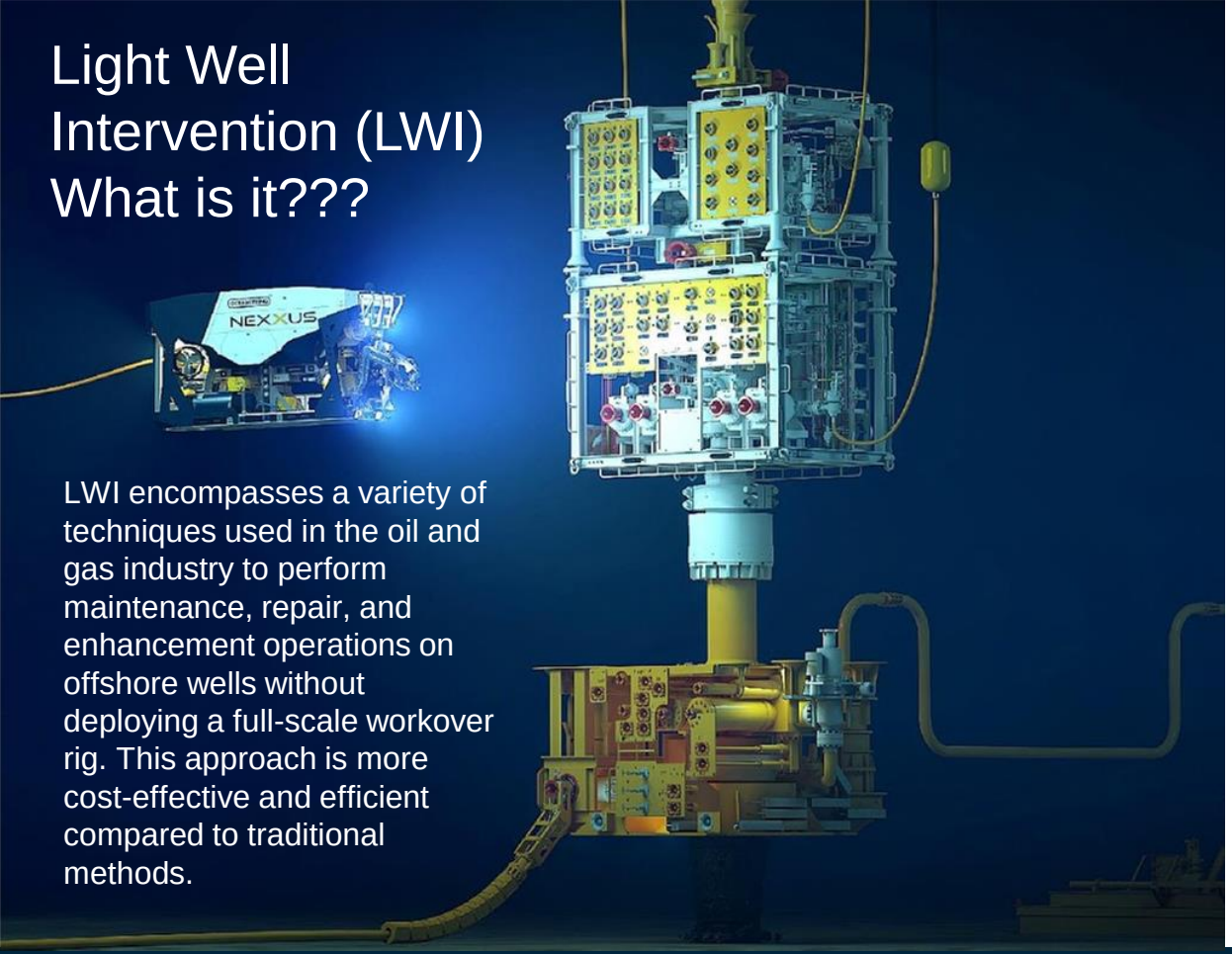
Renewable Energy

We deliver innovative solutions for the toughest renewable energy project challenges. We are ideally positioned to serve global offshore wind, hydrogen, carbon capture and storage, nuclear, and electrification projects with facilities in key regions, such as the U.K., the U.S., and Brazil.

Inspection, Maintenance, and Repair (IMR)

We ensure uptime and mitigate the effects of unplanned repairs with our comprehensive inspection, maintenance, and repair programs. Our services cover the full life cycle model of production monitoring, inspection execution, engineering criticality assessment (ECA), maintenance planning, and scheduling.

Light Well Intervention (LWI) What is it???



LWI encompasses a variety of techniques used in the oil and gas industry to perform maintenance, repair, and enhancement operations on offshore wells without deploying a full-scale workover rig. This approach is more cost-effective and efficient compared to traditional methods.

Key aspects of LWI include:

- Utilizing smaller, maneuverable vessels and specialized equipment (e.g., well control packages, wireline, coiled tubing).
- Performing tasks such as well logging, perforating, setting/retrieving plugs, changing downhole equipment, and conducting stimulation treatments.

Benefits of LWI:

- Optimizes production and extends well lifespan.
- Minimizes downtime and reduces costs.
- Lowers environmental impact compared to traditional interventions.

Light well vs Traditional (Rig)

CONS

- Technology awareness of services regionally.
- Reduced pumping capacity.
- Slightly longer initial mobilization/demobilization that dedicated vessel, significantly shorter than rig.
- Cannot provide Coiled Tubing intervention (presently).
- No tubular handling capability.

PROS

- Reduced effective spread rate.
- Flexible vessel configuration for client utilization.
- Full suite of subsea & intervention related services; Pumping, Hydrate remediation, Intervention, Construction, IWOCS, Flotel.
- E-line offering covers significant portion of todays intervention scopes.
- Proven equipment capability to 100% global well depths.
- Vessel uptake / induction times reduced.
- Frees up rig to focus on drilling.

OCEANEERING®

Mechanical Intervention

- 10 Operators
- Two Regions (GOM, West Africa)
- 2 Systems Available
  17 Well successfully completed over the past 4 years
- Riserless operating depth of 2,560m (8,200’)
- Operated Sucessfully in Angola

OCEANEERING®

Multi Operator Benefits

Cost Savings / Benefits

- Proactive Well Intervention of Subsea Wells.
- Non-working time minimised thru reduced mobilisation & vessel service offering.

Engineering (Pre-job / offline)

- XT interface engineering.
- Well Specific Operating Criteria & Riser Analysis.
- Well Specific Operational Procedures.
- Sea-fastening calculation.

Equipment change-out Scope

- TRT - Our system has the ability to be easily interfaced with the TRT via X-Over.
- Bore selector – should Production and Annulus access be required a Bore Selector can be installed between the TRT and the IRIS system to allow efficient change between production and annulus bores. Alternative option is to have an Annulus X-Over.
- MQC, HFL & EFL jumpers – necessary jumpers for control of the subsea asset.

Mobilisation Execution (~5 days quayside)

- Project specific equipment loading. (TRT, TCRT and TC redress, WL Tooling, ROV Tooling, Chemicals)
- Sea-fastening (TRT Test Stump)

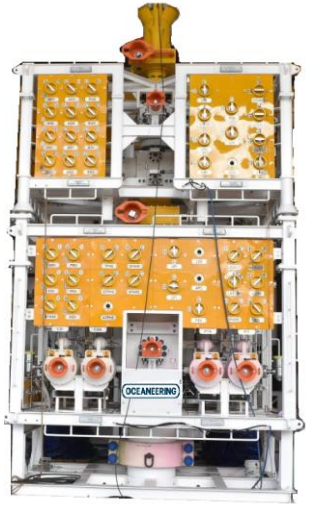
IRIS

- Max Working Pressure: 10,000 psi
- Minimum Internal Bore Diameter: 7-1/16”
- Maximum Water Depth: 10,000 ft (3000m)
- Well Barriers:
  - Two Inline T3 Gate Valves
  - Two Auxiliary ATV Gate Valves
  - Single TOT Shear/Seal Ram
  - Valve Specs: API 6A-PLS3, API 16A API 17G
- Direct Hydraulic Controls from 21 line IWOCS
- Active and Passive ESD/EQD
- Subsea Accumulation on WCP:
  - Grease: 45 gal
  - Control Fluid: 60 gal

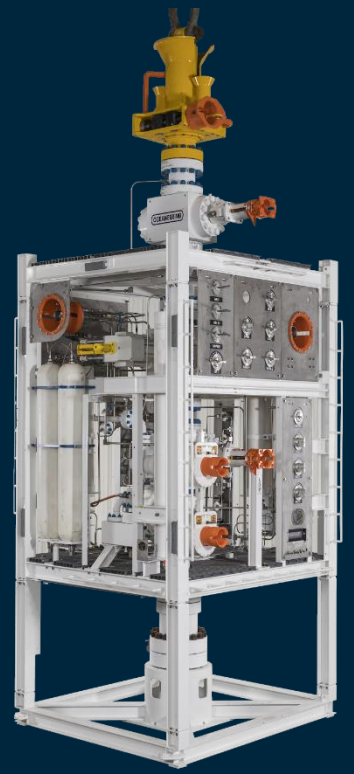
v/s

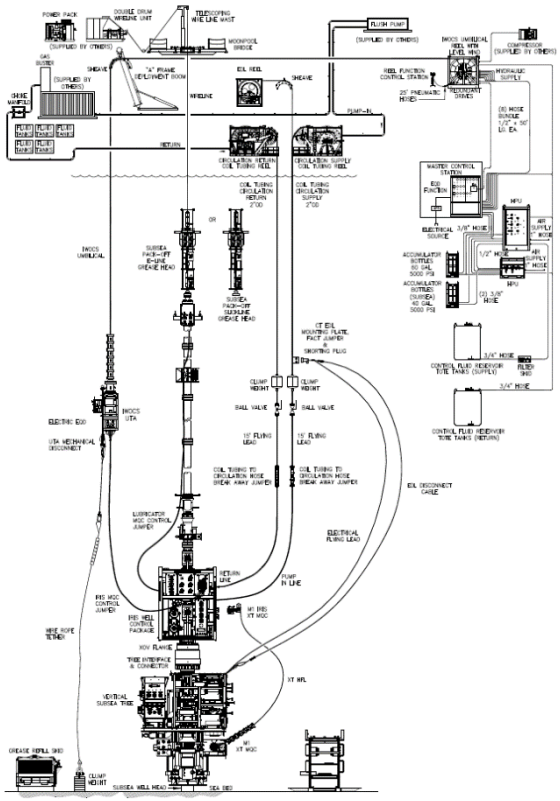
BORIS

- Max Working Pressure: 10,000 psi
- Minimum Internal Bore Diameter: 7-1/16” (LWCP has 13- 5/8” Flange/bend cap.)
- Maximum Water Depth: 10,000 ft (3000m)
- Well Barriers:
  - Two Inline T3 Gate Valves
  - **Four (two sets)** Auxiliary ATV Gate Valves
  - **Two** TOT Shear/Seal Ram
  - Valve Specs: API 6A-PLS3, API 16A, API 17G
- **MUX Electro-Hydraulic Controls** 2- 16 valve PODS with Controls Skid (SCS)
- Active and Passive ESD/EQD
- Subsea Accumulation WCP:
  - Grease: 45 gal
  - Control Fluid: **90 gal**



OCEANEERING®





Mechanical Light Well Intervention

7 1/16” ID, 10ksi WP

World Record depth @ 2560m/8200’ – GoM

Up to 22m/72’ tool strings

Enables:

- Slickline & Digital Slickline services
- E-line & Tractor services
- Supports in-well needs thru life cycle
- XT install, recovery & replacement
- Well mechanical Integrity & repair
- Well reservoir monitoring & optimization
- Well flow assurance
- Well lower kill & suspension during P&A

IRIS Subsea Equipment
OVERVIEW

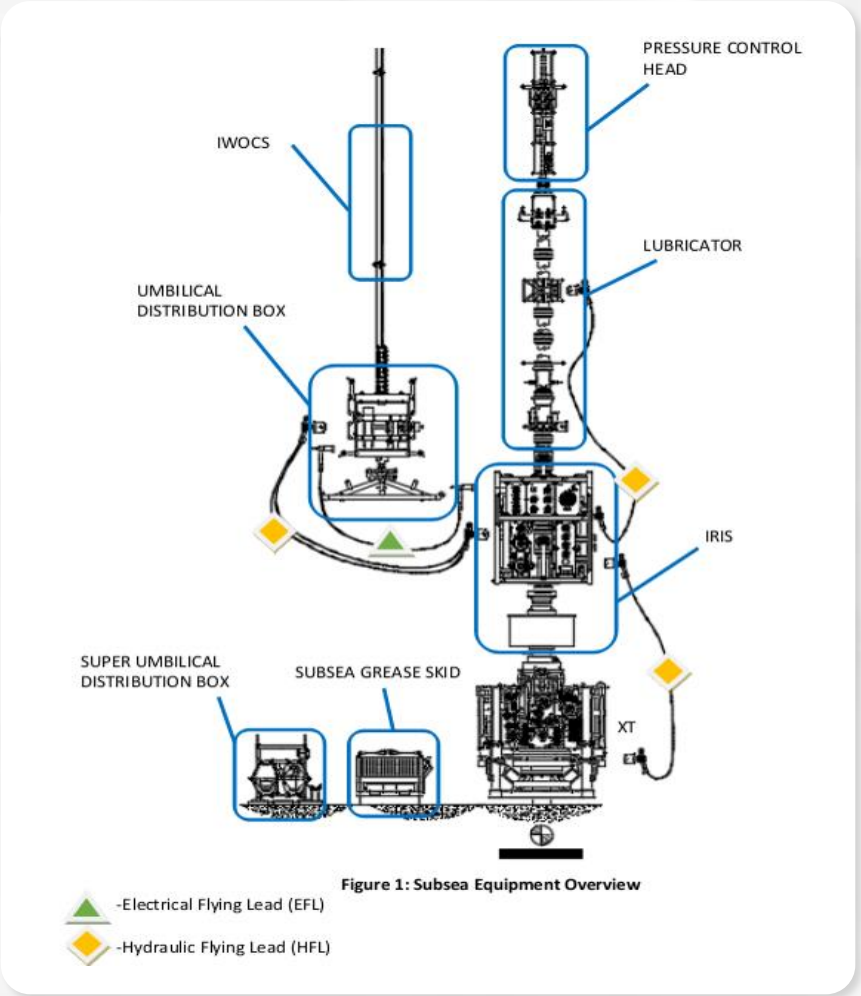


Figure 1: Subsea Equipment Overview

BORIS Subsea Equipment
OVERVIEW

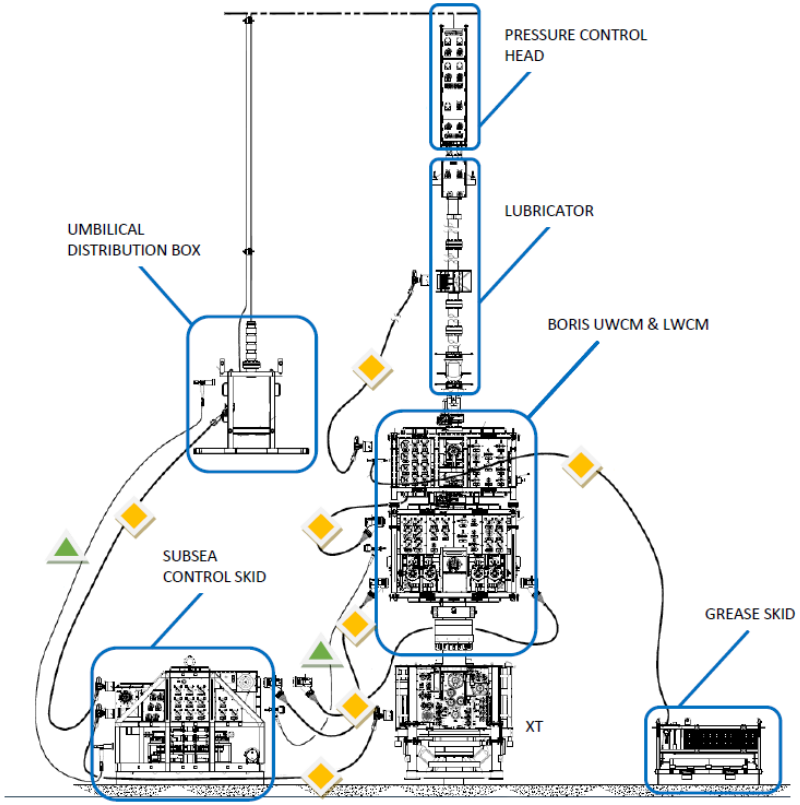


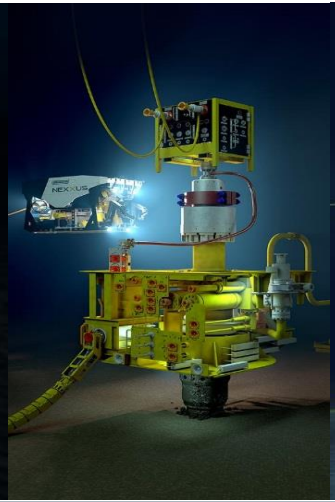
Figure 1: Subsea Equipment Overview

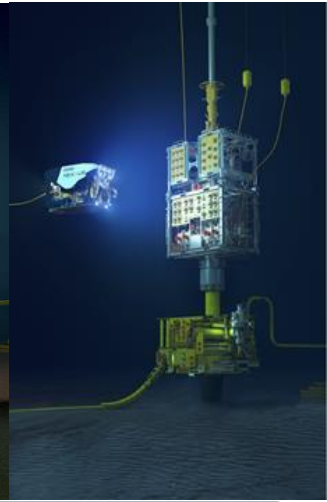
-Electrical Flying Lead (EFL)

-Hydraulic Flying Lead (HFL)

BORIS

Premier Riserless Hydraulic Stimulation Service





- More than 100 wells stimulated over a 15-year span
- 11 different operators
- Two different regions (3 tools in operation)
- Average timeline for a 1 well campaign used to be 14-16 days
- Average time for completion today 10-12 days

OCEANEERING®

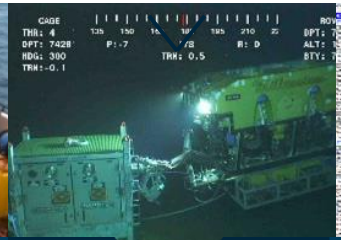
Offshore Projects Group (OPG)

Vessel of Opportunity

- MSV: Bourbon 804
- DP3
- 150 MT crane
- 10,118 ft^2 / 940 m^2
- 2 work class ROVs
- Stimulation Vessel: STIM STAR
- DP2
- 15K psi & 62 bpm
- ESD & EQD

MSV Topside

- Coiled Tubing: Dual 2” x 6,600ft x 10K
- Electrical tree control from vessel
- Circulation pumps
- Push button ESD
- Frac hanger for coflex hose from stim vessel

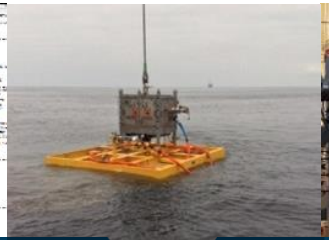


Subsea

- New Gen 3 Well Stimulation Tool W/mudmat base
- 15K psi & 25 bpm
- ESD & EQD
- MARS injection tool
- Dual HFLs & EFLs
- Well Jumper

Project Duration

- Mob: 3 days
- Offshore: 20 days
- Demob: 1 day



Well # 1

- W/D: 3,438 ft
- Max Flow Rate: 6 bpm
- Total Volume: 11,400 bbl
- Max Surface: 4,200 psi
- Max Tree: 2,500 psi

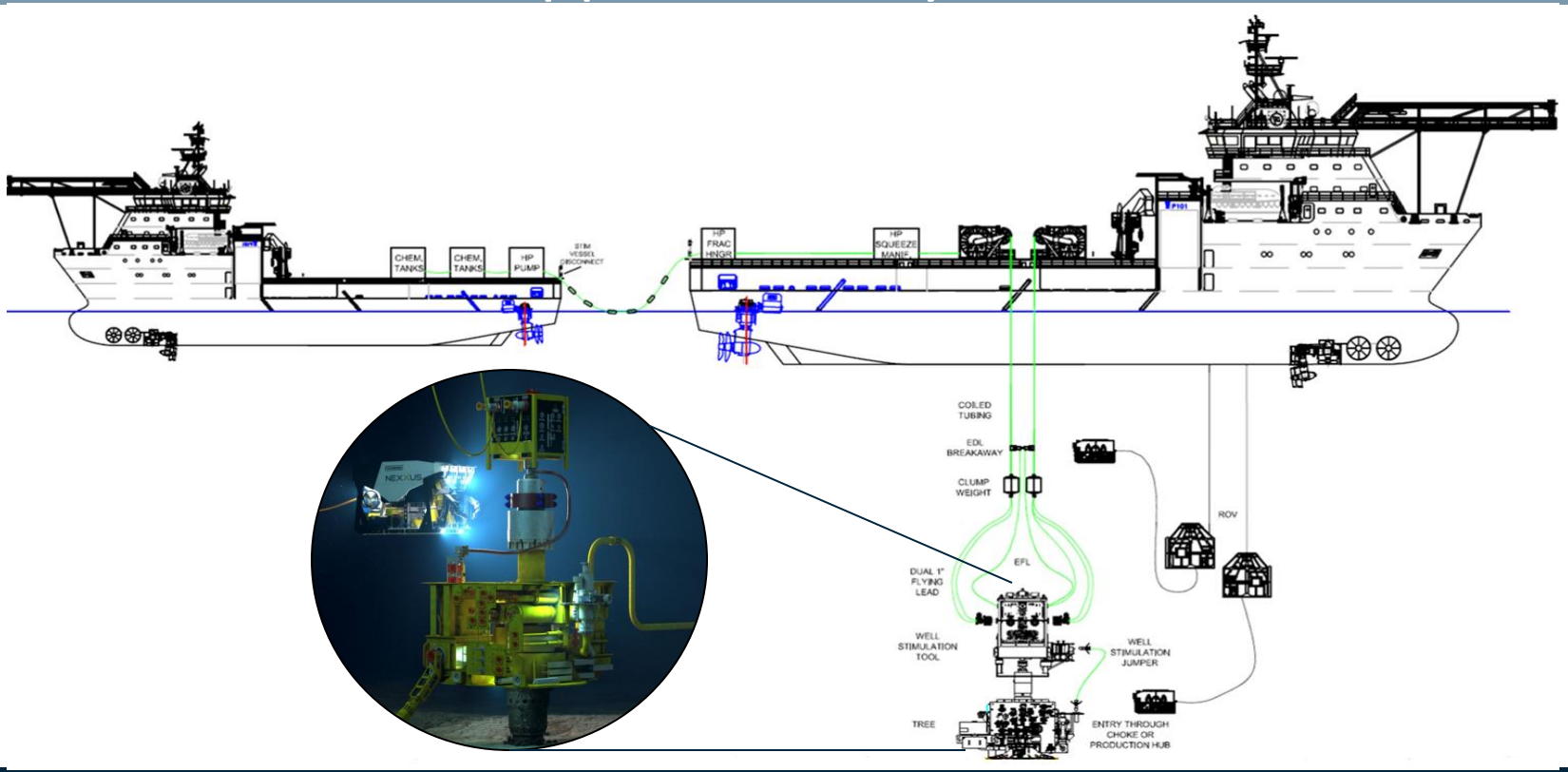
Well # 2

- W/D: 1,723 ft
- Max Flow Rate: 4 bpm
- Total Volume: 2,830 bbl
- Max Surface: 2,700 psi
- Max Tree: 1,500 psi

OCEANEERING®

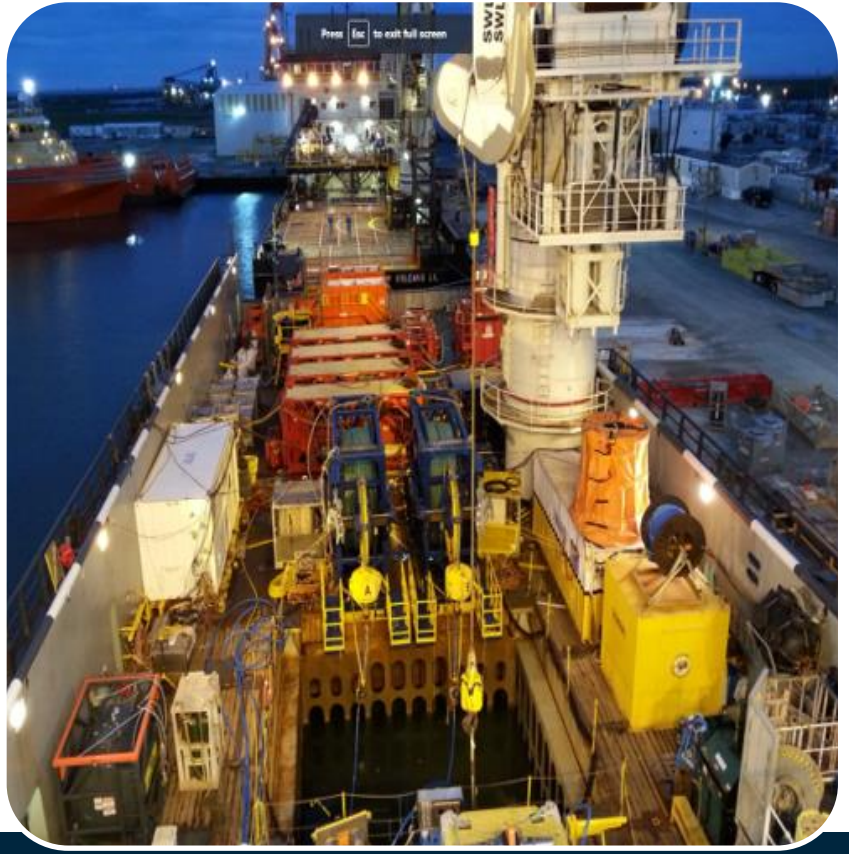
Stimulation

Application Layout



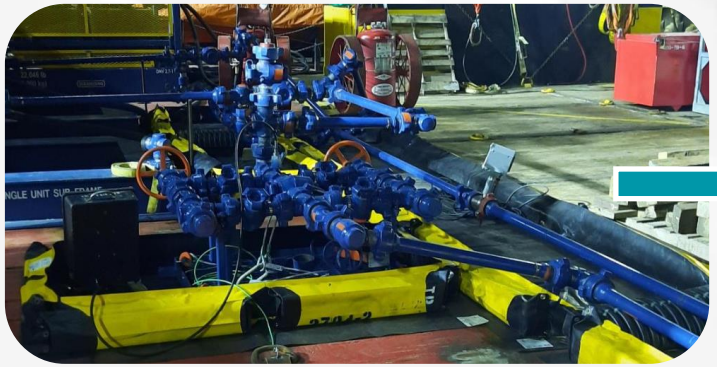
OCEANEERING®

Past Projects – Back Deck Configurations



OCEANEERING®

Dual Vessel Process



Dual Coiled Tubing Reeler System

Wells Applications

- Stimulations
- Remediations
- Interventions
- Flushes
- P&As

Available Coil Size and Maximum Length	
1.5-in-OD coil at 10, 000 psi	13,100 ft (4000 m)
1.75-in-OD coil at 10,000 psi	11,500 ft (3505.2 m)
1.75-in-OD coil at 15,000 psi	11,500 ft (3505.2 m)
2.0-in-OD coil at 10,000 psi	8,800 ft (2686.2 m)
2.0-in-OD coil at 15,000 psi	8,800 ft (2686.2 m)
2.375-in-OD coil at 10,000 psi	6,000 ft (2011.7 m)
2.375-in-OD coil at 15,000 psi	6,000 ft (2011.7 m)

Complete System	
Component	Quantity
Dual coiled tubing reels	2
Work platforms	4
Hydraulic power unit	1
Remote control stand	1
Hydraulic interconnect hoses	18 (assorted lengths and internal diameters)
Tie-down plates	16
Certified lifting slings	3

Flowline Remediation System

- **What is FRS?**

Consists of a subsea separator, a subsea pumping system (either an Intervention Skid or a Subsea Hydraulic Power Unit), two strings of coiled tubing, EQD System (Emergency Quick Disconnect), and topside fluid & gas handling equipment

- **What does FRS do?**

Allows for quicker depressurization and de-inventorying of longer and larger deepwater flowlines by being able to separate solids, fluids and gases. This allows for quicker disassociation of blockages (e.g. hydrates, asphalts, wax, etc.) and allows the operator to restore production.

- **What is the customer challenge FRS solves?**

When customers identify blockages in flowlines, they need a remediation solution to quickly, efficiently, and effectively restore production with minimal interruption to their operations.

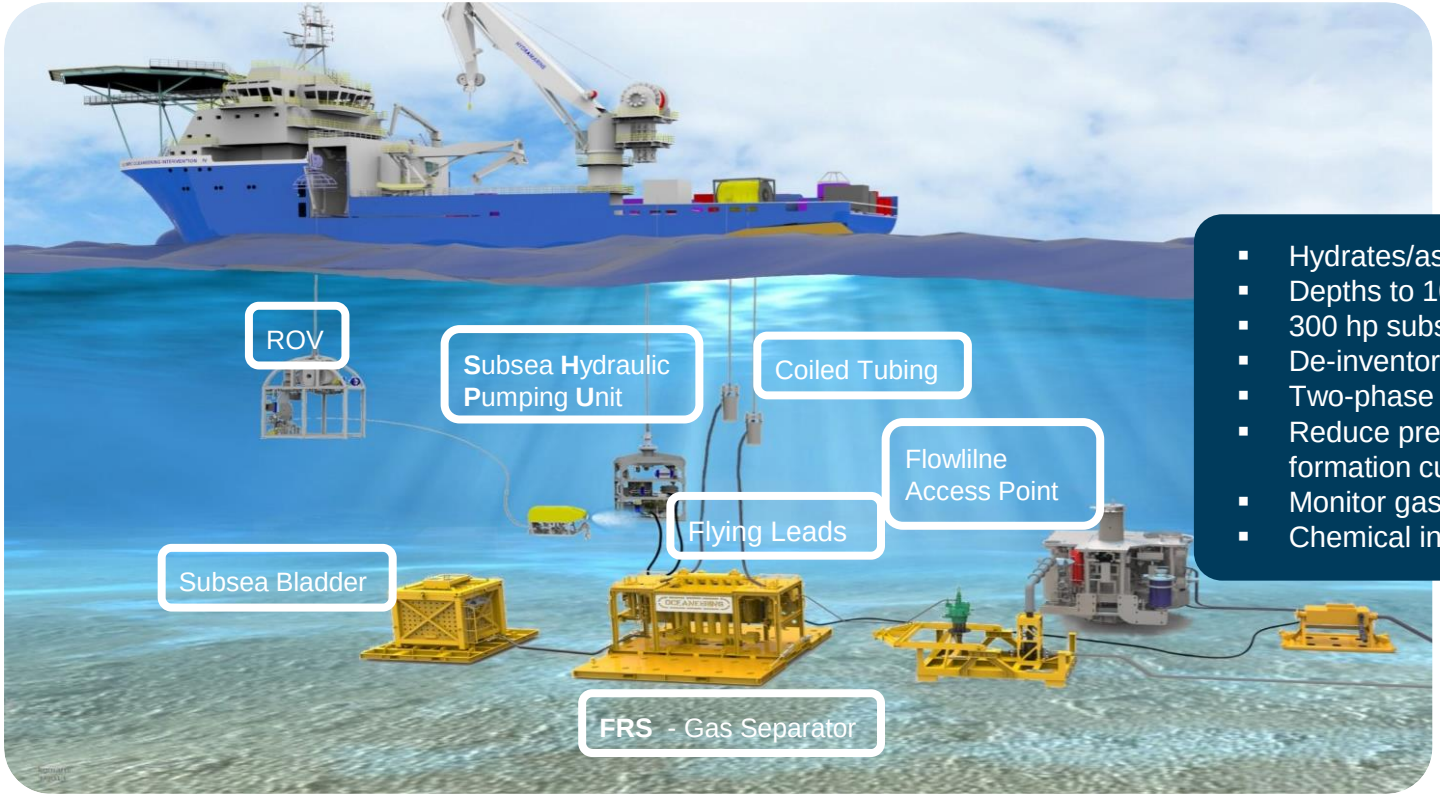
OCEANEERING®

Flowline Remediation System

- Large scale Flowline remediation System
- Multi project campaigns
- Subsea pumping with liquid & gas separation at seabed
- With OII CT lines for conduits to surface
- Application in repair, remediation and decommissioning
- Smaller ROV mounted Hydrate remediation skids

OCEANEERING®

Flowline Remediation System (FRS)



- Hydrates/asphaltenes/paraffins
- Depths to 10,000 fsw
- 300 hp subsea pumps
- De-inventory ~30 bbls / hour
- Two-phase subsea separation
- Reduce pressure below hydrate formation curve
- Monitor gas and liquid pressures
- Chemical injection

Intervention Skid

- **What is an Intervention Skid?**

An intervention skid is a ROV mounted skid that uses hydraulic and electrical power from the ROV to perform certain repair and maintenance activities on subsea infrastructure.

- **What does an Intervention Skid do?**

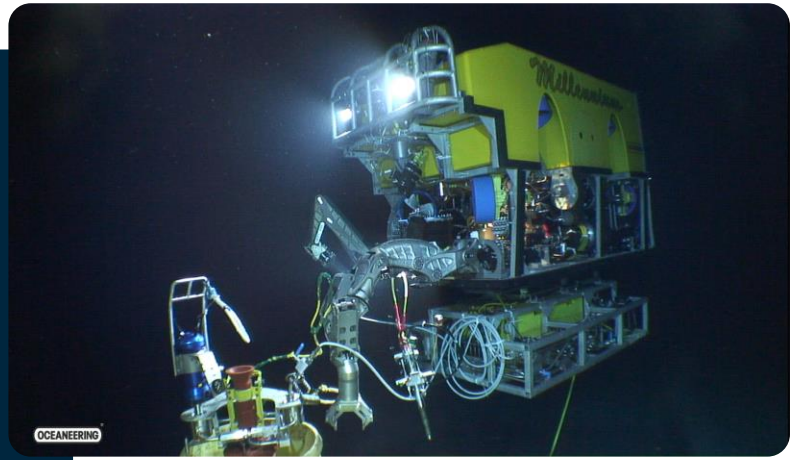
Removes blockages (e.g. hydrates, asphalts, wax, etc.) to quickly and safely restore subsea infrastructure to operational status. Perform flushing and testing activities of all subsea infrastructure. Capable of completing valve operations on subsea trees, PLETs, and manifolds. Can be configured to meet any operational challenge

- **What is the customer challenge an Intervention Skid solves?**

An intervention skid can be used to solve most issues at the subsea level of the infrastructure which can not otherwise be solved via the topsides control platform.

ROV – Hydrate Remediation Skid

- For small volumes & flow
- Used to supplement LWI Operations - Hydrate removal below XT Cap and barrier verification using Logging capability: Pressure & Flow, volume totalizer for precise fluid amounts
- Servicing Plugged umbilical line, control lines, rigid or flexible jumpers
- Repairing leaking control lines via Seal-Tite injection
- Commissioning Leak testing, valve testing, formation isolation valve operations



Intervention Value Add

- Extend Life of Field
- Reduce personnel offshore
- Reduce vessel days
- Reduce carbon footprint
- Optimize related OPEX
- Innovative technologies

60 YEARS 1964 - 2024

OCEANEERING®

Benefits of Interventions

- Production Enhancement without rigs
- Efficiencies of Local in country services
- Significantly increased production
- Faster execution due to repeatable operational excellence

OCEANEERING®

Status of Systems

- IRIS –In Angola preparing for Q4 Ops
- BORIS – refurbished – in Houston, Texas. Preparing for Deployment
- Well Stimulation – Angola, recent successful work in 2023. Firm Projects for 2024.
- GOM completed stimulations for Shell, Occidental, Chevron and for Hess so far this year.
- F/L remediation System – in Angola, recent successful hydrate projects for Multiple Major Operators.

OCEANEERING®


Thank you
OCEANEERING®
Connecting What's Needed With What's Next™

For more information contact us

NATASHA CARDOSO

Business Development Manager
Cell: +244 940 180 446
Tel: + 244 222 635 489
Email: ndcardoso@oceaneering.com

RANDY KANHAMA

Business Development Specialist
Cell: +244 940 132 237
Tel: +244 222 635 440
Email: rkanhama@oceaneering.com