

BOP Tethering System

Key features:

- A complete turnkey package including analysis, engineering, operational planning, hardware, plus fatigue/digital monitoring
- We are a complete shallow water subsea supplier – riser systems, tethering equipment, and vertical support structures
- A modular system that can be configured to suit project requirements – mud mats, ballast, motors, plus dual or single tethers
- Provides significant OPEX cost savings – run and recover from anchor handling vessels, plus modules can be broken down to reduce weight and enable conventional road transport and handling
- Expert in-house engineering team, experienced in BOP tethering deployment

A complete end-to-end project life cycle BOP tethering service that includes:



Analysis



Hardware



Digital Monitoring

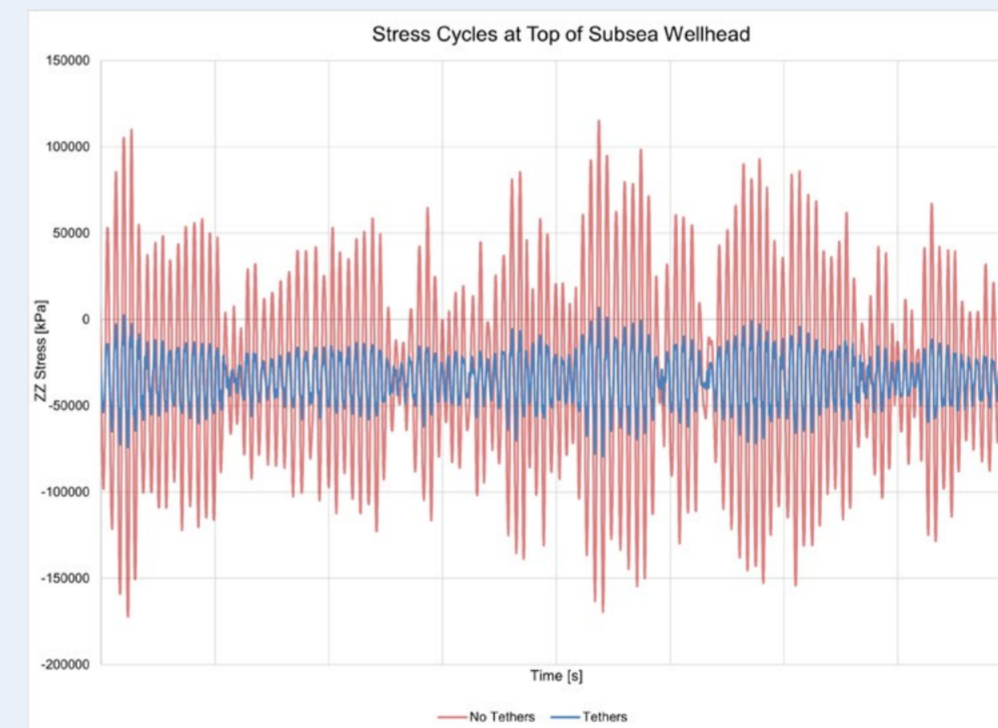
A complete end-to-end service

When re-entering old subsea wells, existing fatigue damage on the subsea wellhead and top conductor joint is potentially a significant problem. Modern semi-submersibles have taller, heavier subsea BOP stacks that are subjected to more environmental loading, and consequently increase stresses in the areas of concern. Using a subsea BOP Tethering System can help prevent this problem, by reducing the motions of the BOP and also the stresses in the subsea wellhead and below.

The resulting fatigue accrual while re-entering can be two to three orders of magnitude less than it would be without BOP tethers. This reduces the risk of fatigue failure of the wellhead or conductor system which could lead to a fluid control issue, and allows the BOP to stay connected for longer in order to complete the work program.

Tethering Analysis

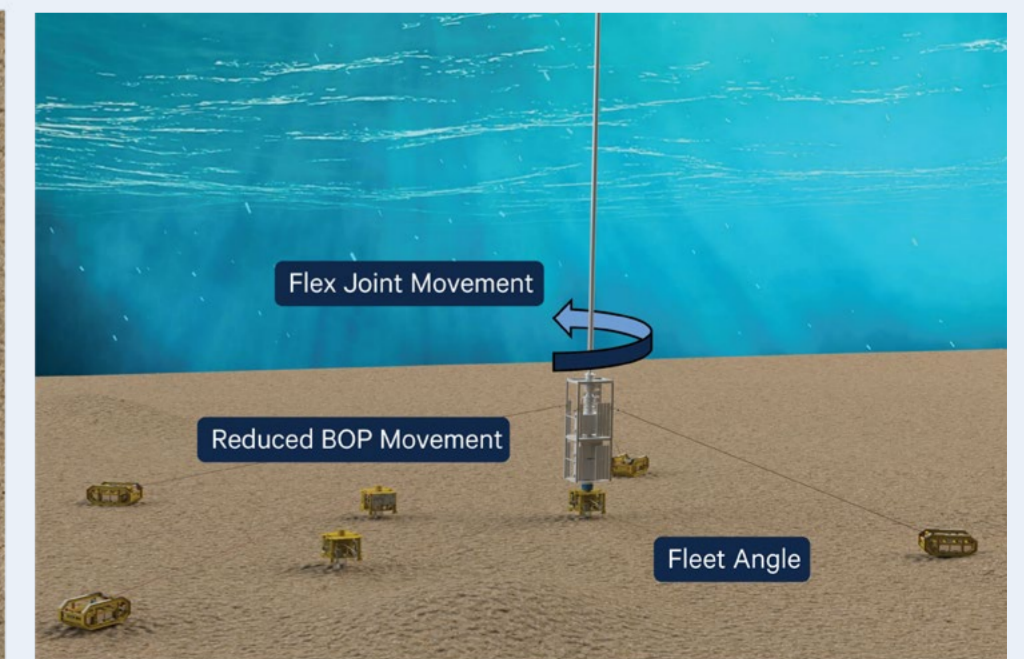
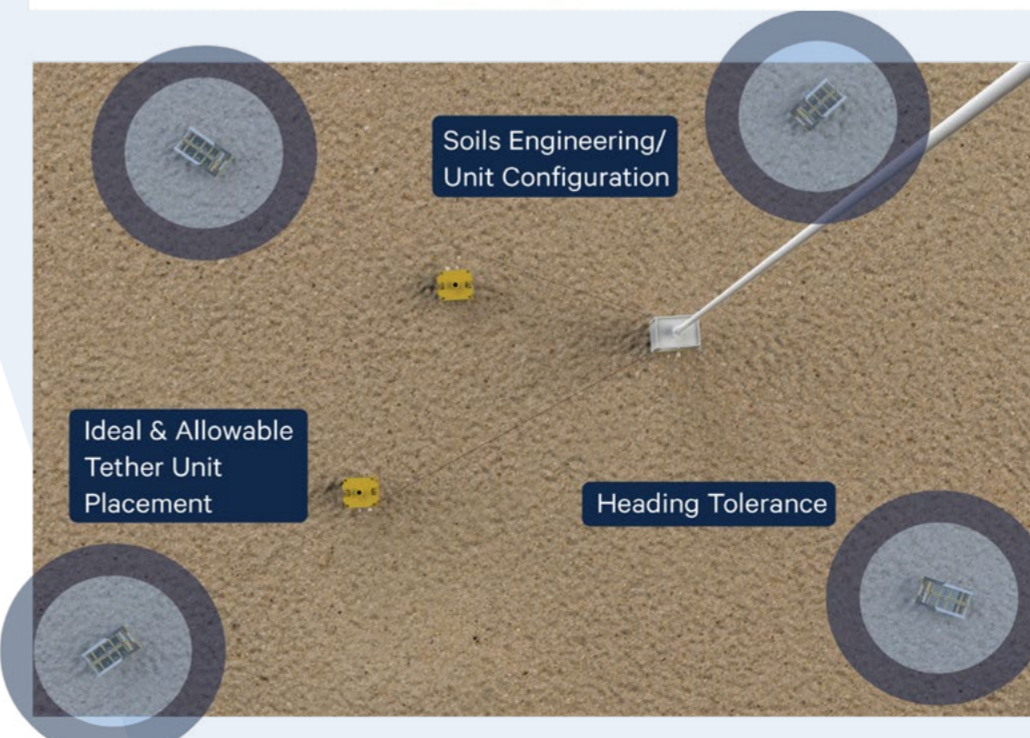
First, we complete initial analysis to determine if a BOP tethering system is needed. If so, we optimise the system to gain the most benefit (such as tether pre-tension, gravity base placement, installation sequence etc.) whilst balancing fatigue against operational requirements (flex joint movement for example).



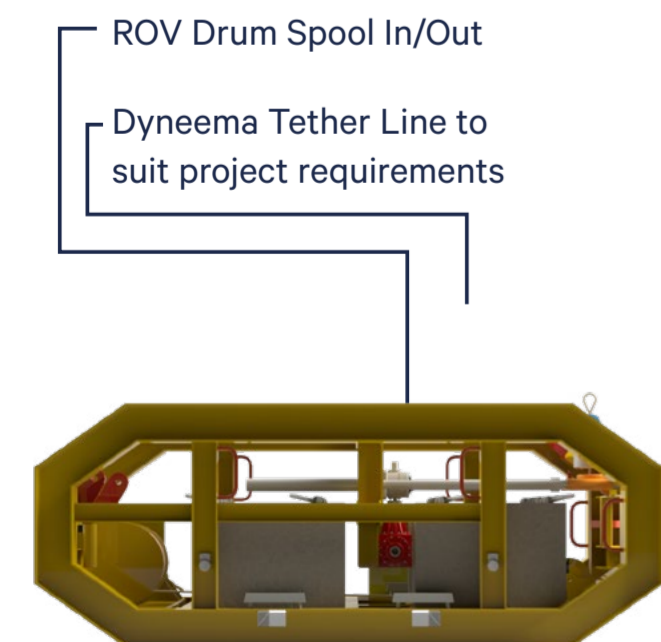
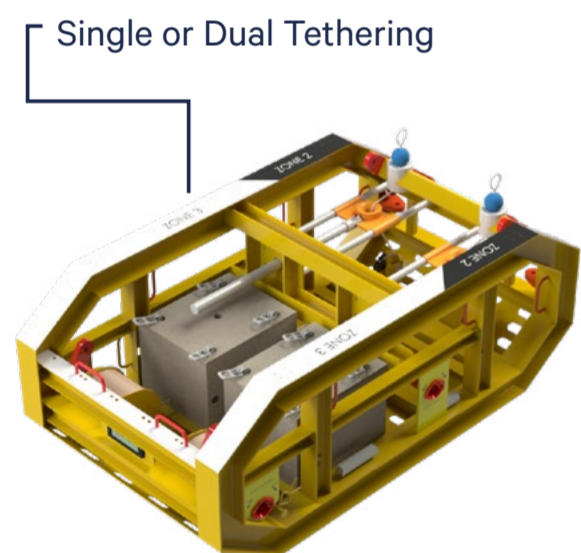
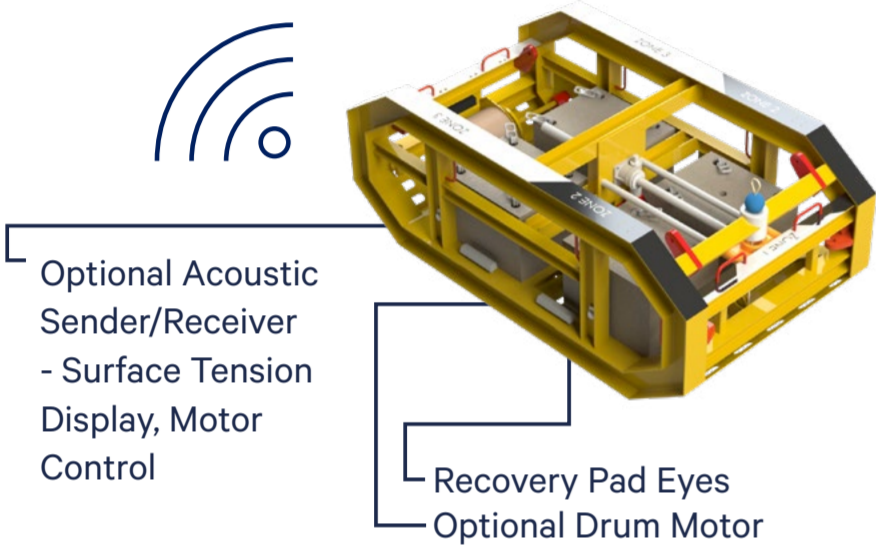
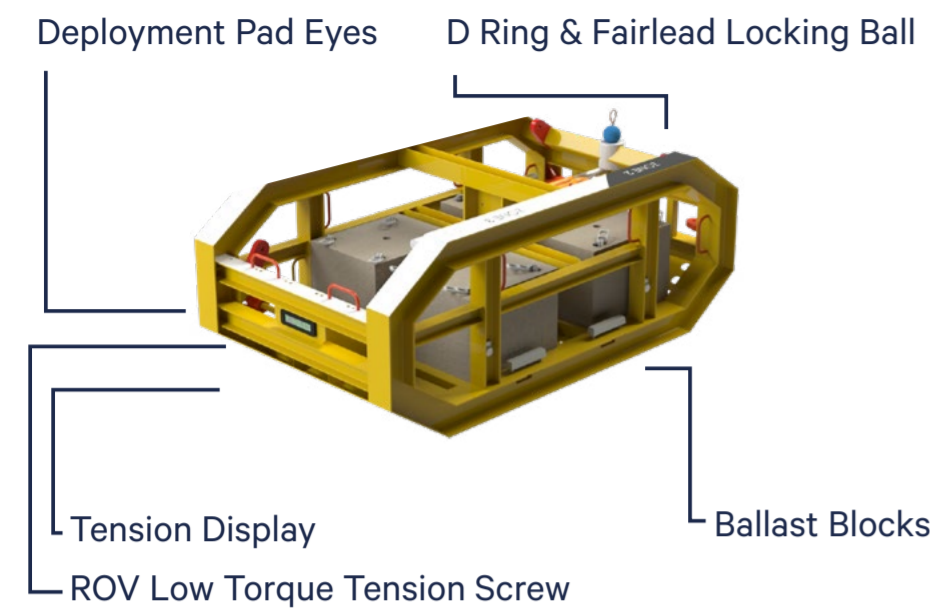
Tethering Hardware

Our PROten Tank is a modular tethering system that can be configured to suit a range of project requirements. For example, you can add or remove ballast blocks, or configure mud mats or skirts to suit soils.

Our patent pending system can be supplied with single or dual tether line options and is operated via an ROV manipulator, with no additional ROV tooling required. Coarse adjustment is completed by spooling in tether storage drum whilst tension is applied via mechanical screw and turnaround sheave - allowing low torque ROV input to generate large line tension loading. If required, the need for an ROV can be removed by upgrading to battery/motor system to adjust tension automatically, or from a surface control unit.

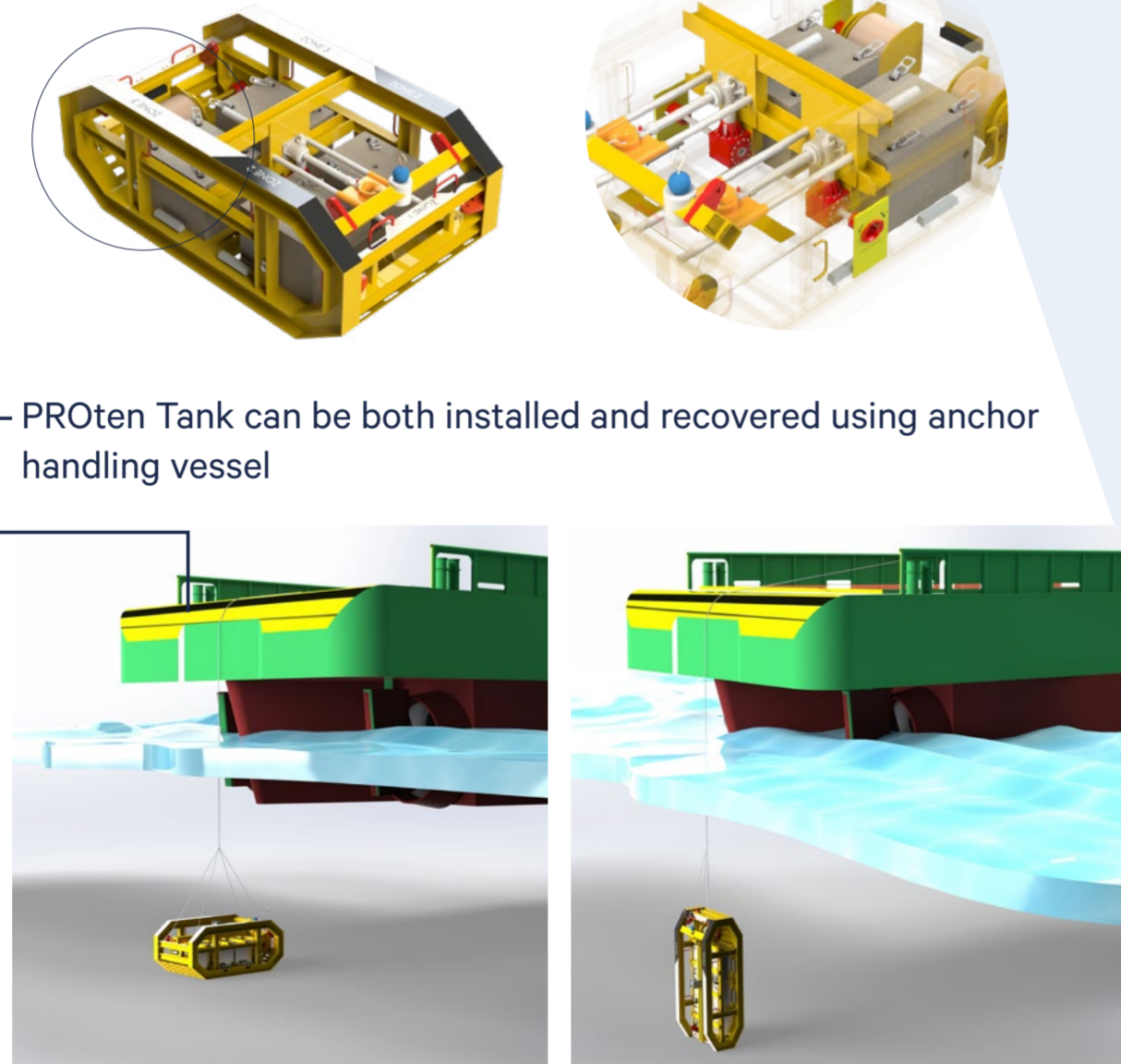


PROten Tank:



Key hardware features:

- Modular system – configured to suit project requirements
- Operated with ROV manipulator, no additional ROV tooling required
- Single and Dual tether line options
- 360-degree fairlead tether angle
- Units are lightweight and can be transported easily – system weighs less than 10Te once ballast blocks are removed
- Ballast blocks for weight and can be installed at Quayside - select required mass to suit seabed, fleet angle and tether line pull (can change density or size)
- Tank shape allows anchor vessel deployment / recovery from boat stern roller
- Can be recovered back onboard the vessel in any orientation (even upside down) - reducing OPEX via the use of standard anchor handling vessel and equipment



PROten Tank hardware specifications

Tethering Analysis Primary Design Code	API RP 16Q; Design, Selection, Operation, and Maintenance of Marine Drilling Riser Systems BS EN ISO 13628-7; Petroleum and natural gas industries — Design and operation of subsea production systems — Part 7: Completion/workover riser systems Dyneema Rope Stiffness Calculations
Fatigue Monitoring	SMART 6G sensor measures tri-axial accelerations recoded at 10 Hz Aquadopp records current speeds up to 5 m/s with an accuracy of ±1% recoded at 10 Hz. 6DOF motion monitoring 3000m depth rated Ethernet download facility Configurable data logging with redundant storage On-board processing for standard or custom algorithms
Subsea to Surface Telemetry	Umbilical – real time, Acoustic – real time, Memory – recorded data downloaded after project
Qualification	Load test, pressure test, functional test and safety system test Dyneema rope seasoning
Applications	Light Weight Intervention Vessels: Category A Heavy Weight Intervention Vessels: Category B Mobile Offshore Drilling Unit: Category C Drilling BOP, Heavy Duty Intervention PCE & Subsea Lubricator PCE
Modular Steel Frame	10Te (bare system with no ballast, for transport) 20Te to 40Te (ballast added)
Modular Ballast	Up to 5Te/M3 Cement mixed with weighted ballast Adds up to 40Te to modular steel frame
Load Rating	10Te Tether Tension , 40Te Spike Loading
Tether System	30Te minimum breaking strain Dyneema rope Single or double tether line Tether line length up to 500m, typically 75m
Fairlead Tensioning Range	3600 degree tensioning range via fairlead doughnut Suitable for tensioning multiple drill centres without the need to reposition units Self-aligning to BOP tether point due to 3600 degree fairlead doughnut
Course Tether Line Adjustment	ROV drum lock / unlock ROV spool in and spool out (out by pulling line on resistance plate) ROV manipulator OR via digital motor and surface control
Tether Line Tension	10Te line pull via ROV manipulator <250 ft/lbs torque OR via digital motor and surface control
Tension Monitoring	ROV readable subsea tension display Optional acoustic surface tension display unit and world wide web application viewer Analysis allowable tension range pre-programmed into alarm system Account taken for fleet angle, heading and position during turnkey engineering support
Corrosion Protection	Marine paint system and Anodes
Temperature Rating	-20°C to 50°C
BOP Interface	Clamp on BOP frame tether post (retro fit)
Handling	Modular system allows strip down for transport and quayside assembly Run and recovery from anchor handling vessel, Semisub or dedicated subsea construction type vessel
Safety Features	Mechanical screw jack system Dual tether line systems available to remove single point of failure Configurable to project – not a one size fits all Soils, analysis and hardware configuration (tensions, fleet angles, heading, location circles) engineered with one team Tension alarms Website enabled application Linked to riser analysis and monitoring equipment

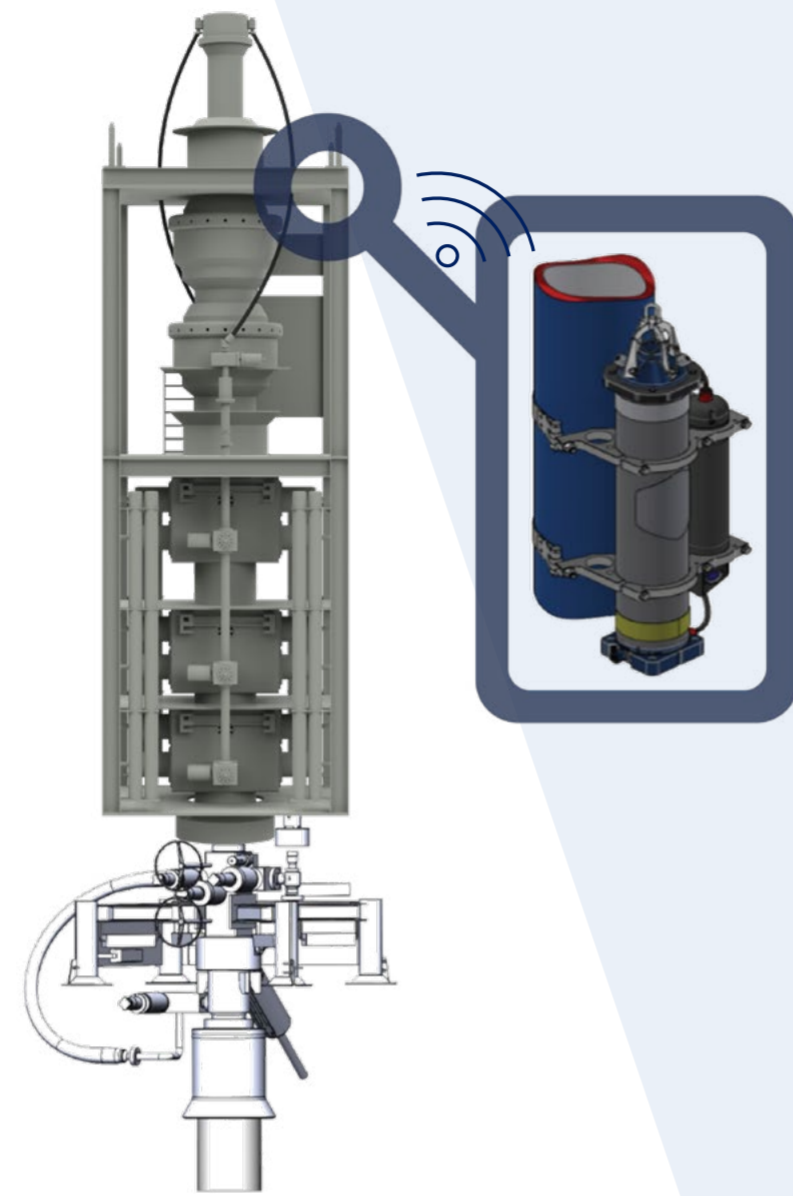
Digital monitoring

Go one step further and fit your BOP tethering system with a monitoring system to record actual accelerations offshore. This digital-first approach eliminates room for error and alleviates concerns about equipment failure.

We repeat the analysis with the monitored data to remove further conservatisms and improve the remaining fatigue life for future operations.

Real time BOP monitoring acts to confirm analysis predictions and allows for adjustment if real world data differs from that predicted. Real time monitoring of tension and/or the BOP provides you with an alarm system should a failure occur - allowing instant action to rectify the problem. This is especially important if dual tether lines are used, as a line failure will only result in a tension loss of 50% on one tether, operational tension can then be re-established by increasing the tension in the remaining line.

Combined with an optional subsea motor each unit is then not reliant on the ROV to adjust tension and tension can be applied uniformly and much faster.



Wireless Monitoring



Subsea Tension Display



Optional Subsea Motor

Related products and services

Subsea Well: LWIV, HWIV & MODU (SEMISUBS)

Item no	Description	10	20
1	Riser & Conductor Analysis	Gyroscopes	Wellhead Fatigue Assessments
2	Completion & Workflow Risers	Aquascope Subsea Camera Systems	BOP Restraint
3	Subsea Connections - NT2, H4 & AQC	Rig & Riser Monitoring Systems	BOP Wellhead Fatigue Mitigation Assessment
4	VIV Suppression Systems	Hydraulic Power Units	Abandonment Support Frame
5	Subsea Protective Structures	Structural Engineering	Mudline Centraliser & Drill Bushing
6	Subsea Drill Templates	Instrument & Controls Management	Flareboom Handling, Installation & Load Testing
7	Cement Top-Up Systems	Subsea Heavy Lift Equipment	Tree Handling & Heavy Lift Assessment
8	Conductor Whipstock	Bespoke Offshore Structures	3rd Party Interfaces/Deck Layout/ Grillages & Sea Fastening
9	Trash Caps	Tree Crossover & Tree Running Tool	
		Subsea Jumper Deployment Frames (SJDF)	

