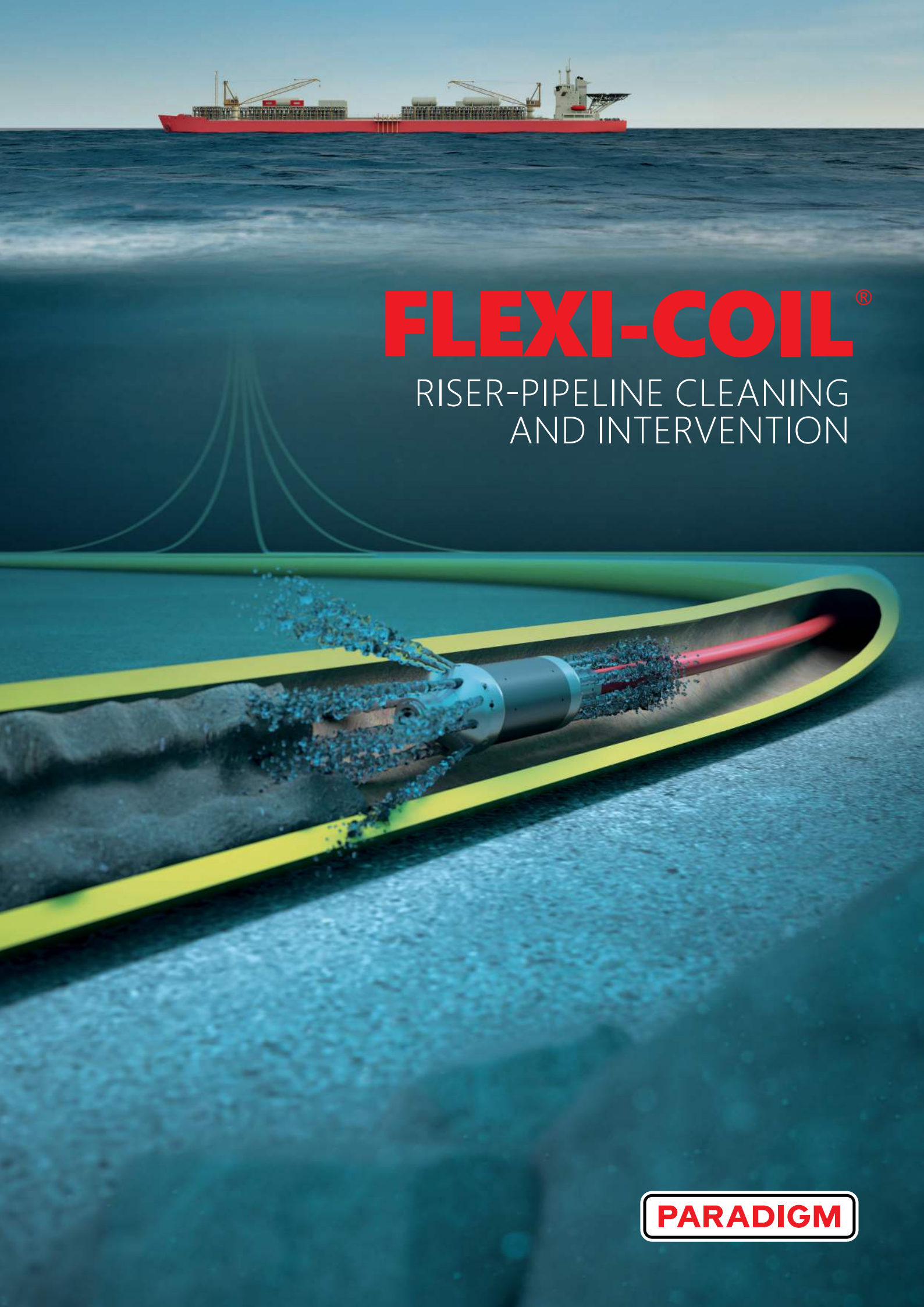


FLEXI-COIL®

RISER-PIPELINE CLEANING AND INTERVENTION

PARADIGM

CASE STUDIES

ONLINE PARAFFIN WAX REMOVAL

A prominent deepwater operator was experiencing paraffin deposition in their facility's 12" oil export pipeline which was estimated to be 50% occluded to around 7,500' from the platform. A chemical solution was expected to be ineffective due to the volume of paraffin, leaving the operator with the prospect of a lengthy field shut-in to cut the pipeline & perform a clean-out using conventional coiled tubing from a DP2 vessel. Flexi-Coil® delivered the platform-based clean-out of the affected section while oil export remained online. Flexi-Coil®'s lightweight & modular hardware design allowed for individual components to be placed under-deck. The flexible work-string was stripped-in against 900psi of oil export back-pressure & through six 90° pipeline bends to the target depth of 7,500'. High pressure jetting was performed with Paradigm's patented JUMP® tool & using fiscally metered export crude as the cleaning medium; a game-changing production enhancement solution.

DEEPWATER SAND BLOCKAGE REMEDIATION

A Deepwater subsea tie back had a significant sand blockage in an 8" Flexible riser and pipeline. After flowing at 5000bbl per day, the well was now at zero production. The host FPSO was unable accommodate any conventional equipment and tools to clean out the riser. The alternative options were extremely high cost and impractical due to their large footprint, high weight and requirement to be positioned at the riser balcony for vertical entry. Over 1,650' of sand was subsequently removed from the line using high pressure water jetting and gel sweeps over a total run-in depth of 2,230'. Production was restarted immediately on completion.

100% PRODUCTION INCREASE

A subsea tie back with waxy crude had high levels of deposition in the riser and flowline as the fluids arrived on the hub platform. The high differential pressure meant shut in of the well with resulting loss of production. No cost effective conventional methodologies to resolve the situation were deemed practical until Flexi-Coil® was considered. Flexi-Coil® plus a full waste management system were quickly rigged up and deployed onsite. Immediate positive results were witnessed with large volumes of returned hard/soft wax. Post cleaning flow trials showed a 100% production uplift after only 7 days cleaning works.

COST EFFECTIVE DECOMMISSIONING

A decommissioning project required abandonment of a single subsea well, flowlines & control umbilical. The tree valves had failed & would require a drilling rig to mill out and clean. Testing had revealed a pressure build up in one of the flowlines indicating loss of primary isolation. Conventional diving intervention approach was deemed unsafe & impractical. An alternative approach using Flexi-Coil® was devised. All work was performed from the host facility. Flexi-Coil® was able to turn through 860° of bends and travel out 3,300' to the subsea tree. All residual oil was flushed back to surface prior to withdrawing & pumping a specialist barrier product to plug the lines which provided an isolation between the platform and reservoir. The safe & efficient operation gave the operator cost savings of over 50%.

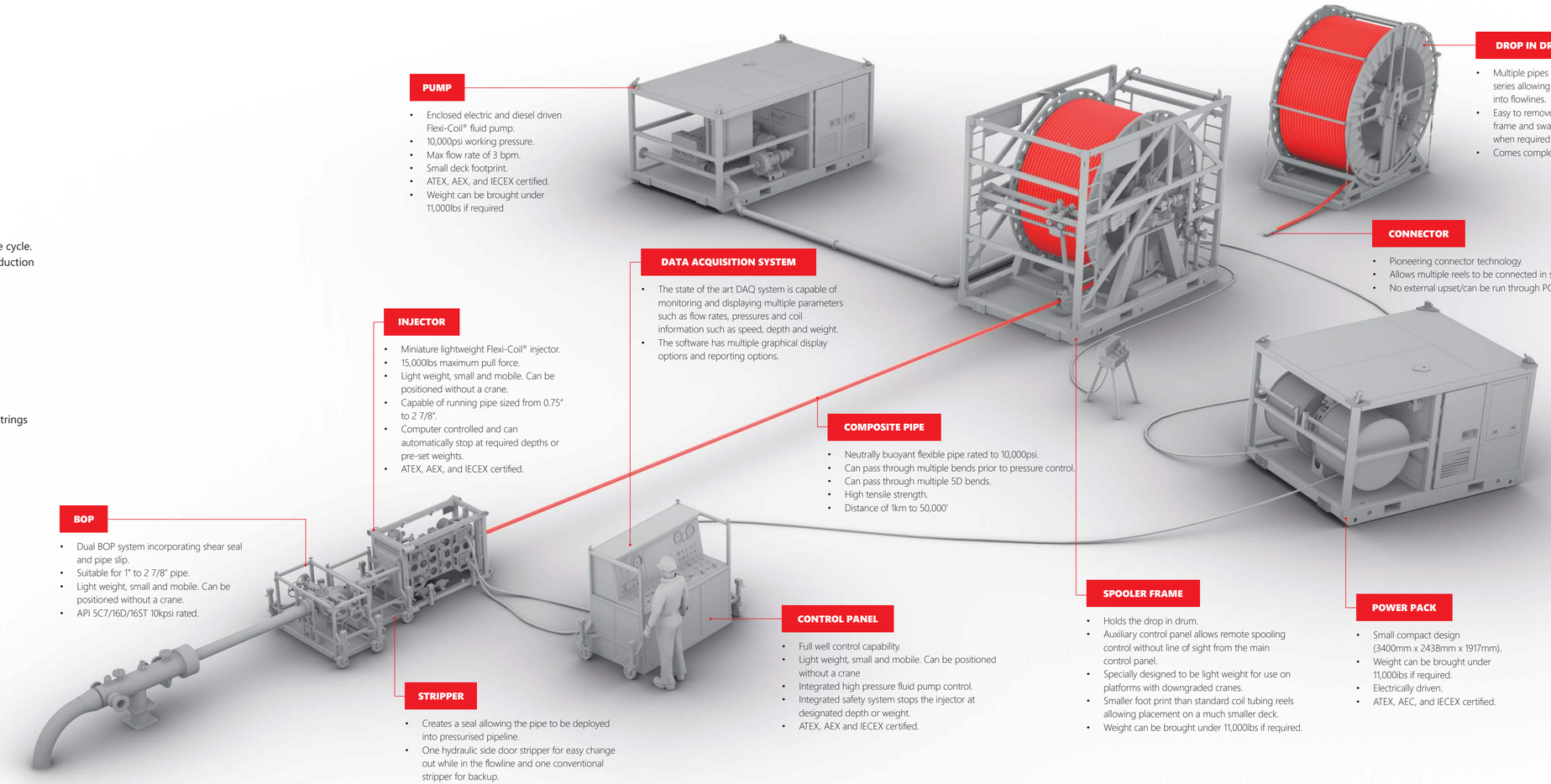
FLEXI-COIL® SYSTEM

The World's first & only flexible coiled tubing technology, designed specifically for platform based riser and pipeline intervention operations.

There are numerous challenges to the productivity of an asset throughout its life cycle. Sometimes, conventional technologies and methods just cannot deliver the production enhancement solutions that are required to maintain profitability in the age of lower for longer.

Flexi-Coil® gives the ability to solve the most extreme challenges:

- Removal of full or partial flow restrictions – Paraffin Wax, Sand, Asphaltene, Hydrates, Scale.
- Back to base metal pre-cleaning for inline inspection tools.
- Injection of chemical and production enhancement fluids.
- Riser-base gas lift & permanent installation of composite riser-base gas lift strings
- De-oil, flush and line plugging prior to abandonment.



PUMP

- Enclosed electric and diesel driven Flexi-Coil® fluid pump.
- 10,000psi working pressure.
- Max flow rate of 3 bpm.
- Small deck footprint.
- ATEX, AEX, and IECEX certified.
- Weight can be brought under 11,000lbs if required

DROP IN DRUM SPOOL

- Multiple pipes can be connected in series allowing deep reach into flowlines.
- Easy to remove from the spooler frame and swap out with a full reel when required.
- Comes complete with base cradle.

CONNECTOR

- Pioneering connector technology.
- Allows multiple reels to be connected in series.
- No external upset/can be run through PCE.

DATA ACQUISITION SYSTEM

- The state of the art DAQ system is capable of monitoring and displaying multiple parameters such as flow rates, pressures and coil information such as speed, depth and weight.
- The software has multiple graphical display options and reporting options.

INJECTOR

- Miniature lightweight Flexi-Coil® injector.
- 15,000lbs maximum pull force.
- Light weight, small and mobile. Can be positioned without a crane.
- Capable of running pipe sized from 0.75" to 2 7/8".
- Computer controlled and can automatically stop at required depths or pre-set weights.
- ATEX, AEX, and IECEX certified.

COMPOSITE PIPE

- Neutrally buoyant flexible pipe rated to 10,000psi.
- Can pass through multiple bends prior to pressure control.
- Can pass through multiple 5D bends.
- High tensile strength.
- Distance of 1km to 50,000'

BOP

- Dual BOP system incorporating shear seal and pipe slip.
- Suitable for 1" to 2 7/8" pipe.
- Light weight, small and mobile. Can be positioned without a crane.
- API 5C7/16D/16ST 10kpsi rated.

CONTROL PANEL

- Full well control capability.
- Light weight, small and mobile. Can be positioned without a crane
- Integrated high pressure fluid pump control.
- Integrated safety system stops the injector at designated depth or weight.
- ATEX, AEX and IECEX certified.

SPOOLER FRAME

- Holds the drop in drum.
- Auxiliary control panel allows remote spooling control without line of sight from the main control panel.
- Specially designed to be light weight for use on platforms with downgraded cranes.
- Smaller foot print than standard coil tubing reels allowing placement on a much smaller deck.
- Weight can be brought under 11,000lbs if required.

POWER PACK

- Small compact design (3400mm x 2438mm x 1917mm).
- Weight can be brought under 11,000ibs if required.
- Electrically driven.
- ATEX, AEC, and IECEX certified.

STRIPPER

- Creates a seal allowing the pipe to be deployed into pressurised pipeline.
- One hydraulic side door stripper for easy change out while in the flowline and one conventional stripper for backup.
- Dual barrier design.
- Suitable for pipe 1" to 2 7/8".
- API 5C7/16D/16ST 10kpsi rated.

flexi-coil

FLEXI-COIL® CLEANING TOOLS

JUMP® TOOL

The JUMP® jetting tool is the Bottom Hole Assembly (BHA) that equips Flexi-Coil® to go the distance; up to 23,000' into an 8" pipeline, while running through 1,000° of bends, to be precise. It has the ability to generate pull forces in excess of 450lbf - five times that of a conventional jetting nozzle - which enables Flexi-Coil®'s neutrally buoyant work-string to be run-in over longer distances on the horizontal plane. The JUMP® tool's patented design also delivers nozzle pressures and flow that are orders of magnitude higher than standard jetting nozzles for superior cleaning performance and debris migration irrespective of string length.

JETTING PIG

The Jetting Pig re-allocates the proportion of hydraulic power that the JUMP® Tool uses for thrust towards cleaning action, creating the ultimate pipeline cleaning tool. Designed for use in open ended or looped systems, the Jetting Pig gives Flexi-Coil® the ability to clean pipelines up to 50,000' in length for a pipeline cleaning solution that has no parallel.

SPIN JET TOOLS

Paradigm also uses a variety of conventional jetting nozzles that are highly effective for shorter distance applications. These tools are regularly deployed in downhole environments as part of conventional coiled tubing BHAs for wellbore clean-up operations. The spinning nozzle heads enable 360deg coverage of the pipe-wall making them particularly well suited for applications such as pre-inspection cleaning during riser or pipeline integrity management or life extension programs.

FLUID OSCILLATION TOOLS

In the correct applications fluidic oscillation tools are extremely effective. The tool works by creating bursts of flow and transient pressure within the pipeline. The rapid cyclic loading breaks the deposit down by rapidly fatiguing brittle material such as scale, and harder paraffins and asphaltenes.

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