Paradigm Flow Services

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AGENDA

- Flow Assurance Challenges
- Paradigm Remediation Technologies
- Operational Case Studies

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FLOW ASSURANCE CHALLENGES

- Lack of maintenance and pigging regimes in pipeline systems can create reduced flow or in worst cases, full-bore blockages caused by wax, sands or hydrates.
- Lines may not have pigging facilities installed.
- Blockage locations and compositions are often unclear.
- Distant blockages can prevent effective chemical circulation.
- Water ingress of chemical incompatibility can cause problems with control umbilical systems.
- Topsides infrastructure is complex with limited space and access.
- Vessel-based campaigns are slow to organize and require multiple vendors, increasing downtime.

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REMEDIATION SERVICES

pipe-pulse

Paradigm's **Pipe-Pulse®** removes flowline and umbilical blockages using a highly controlled hydro-hammer force for breaking down debris.

Pipe-Pulse® is a non-intrusive method of removing blockages including stuck pigs and production residues.

flexi-coil

Paradigm's **Flexi-Coil®** is a composite neutrally buoyant flexible pipe that is injected from a small equipment footprint into a pressurised blocked pipe/flow-line capable of reaching extensive distances and navigate over 1,000 degrees of bends.

The **Flexi-Coil®** system can operate whilst the pipeline remains in production and incorporates technology to remove the blockage by way of concentrated hydraulic force whilst propelling the pipe significant distance.

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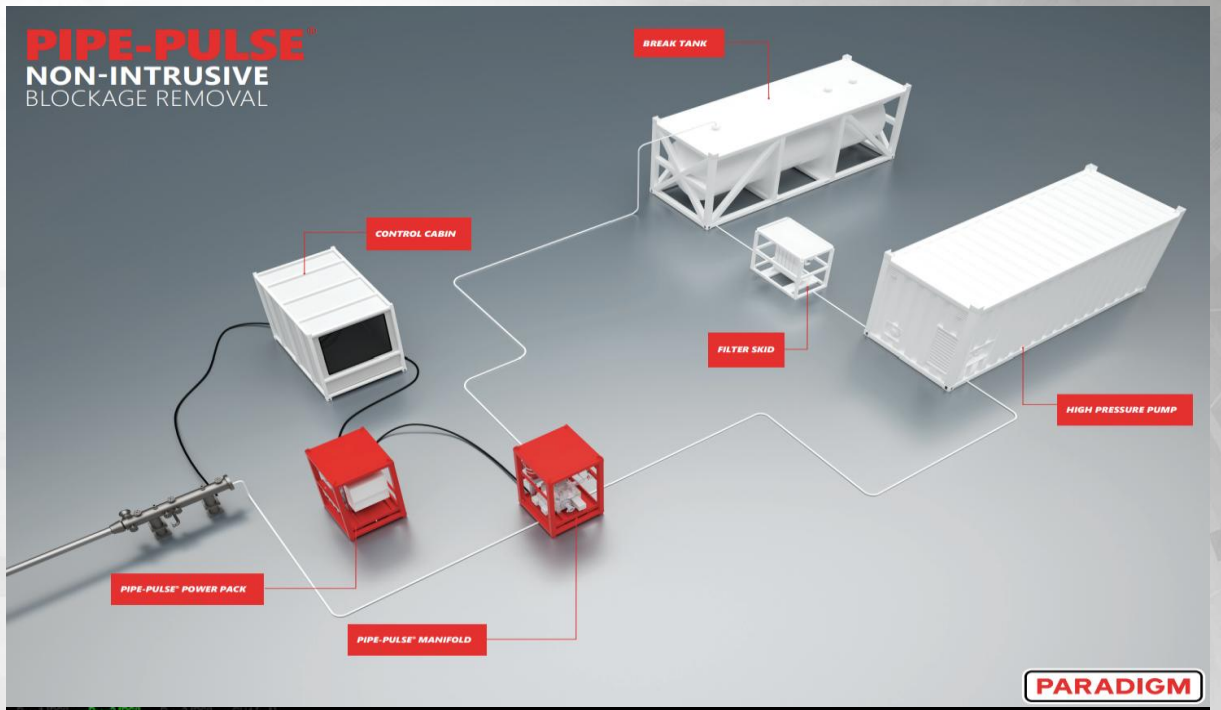
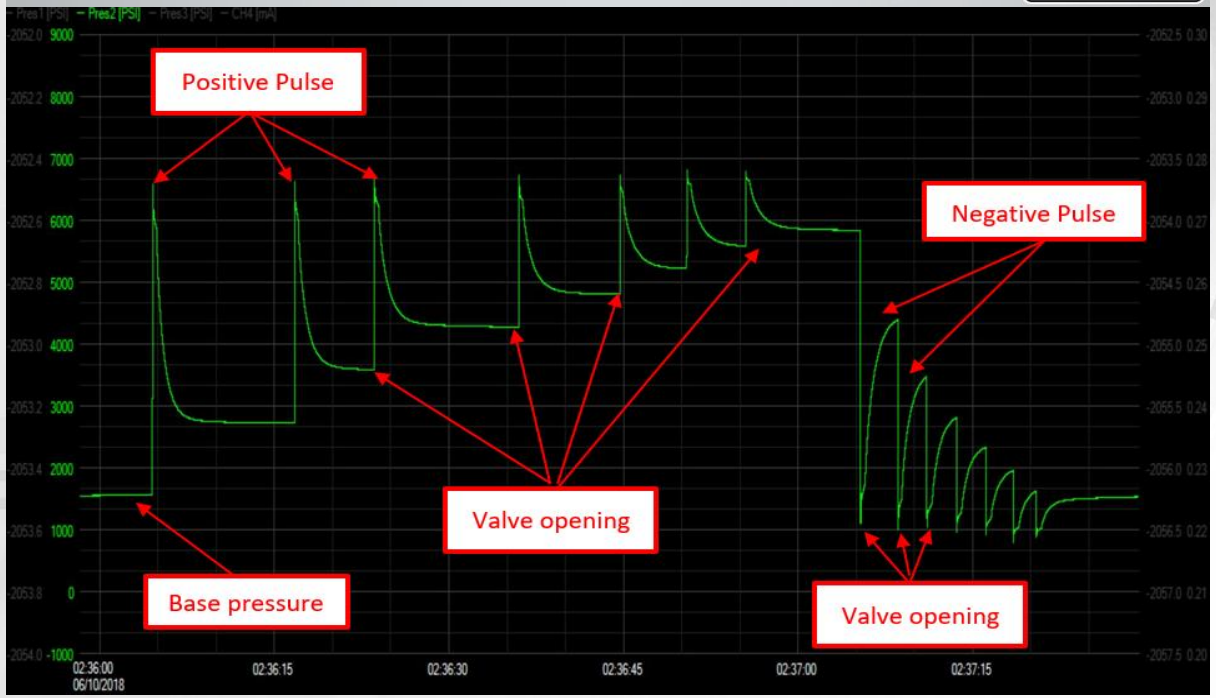
PIPE-PULSE

pipe-pulse

- Non-invasive technology
- Controlled pressure pulses, generating an impulse force at the blockage
- Small footprint, quick to mobilise equipment
- Optimal in high-pressure systems over long distances





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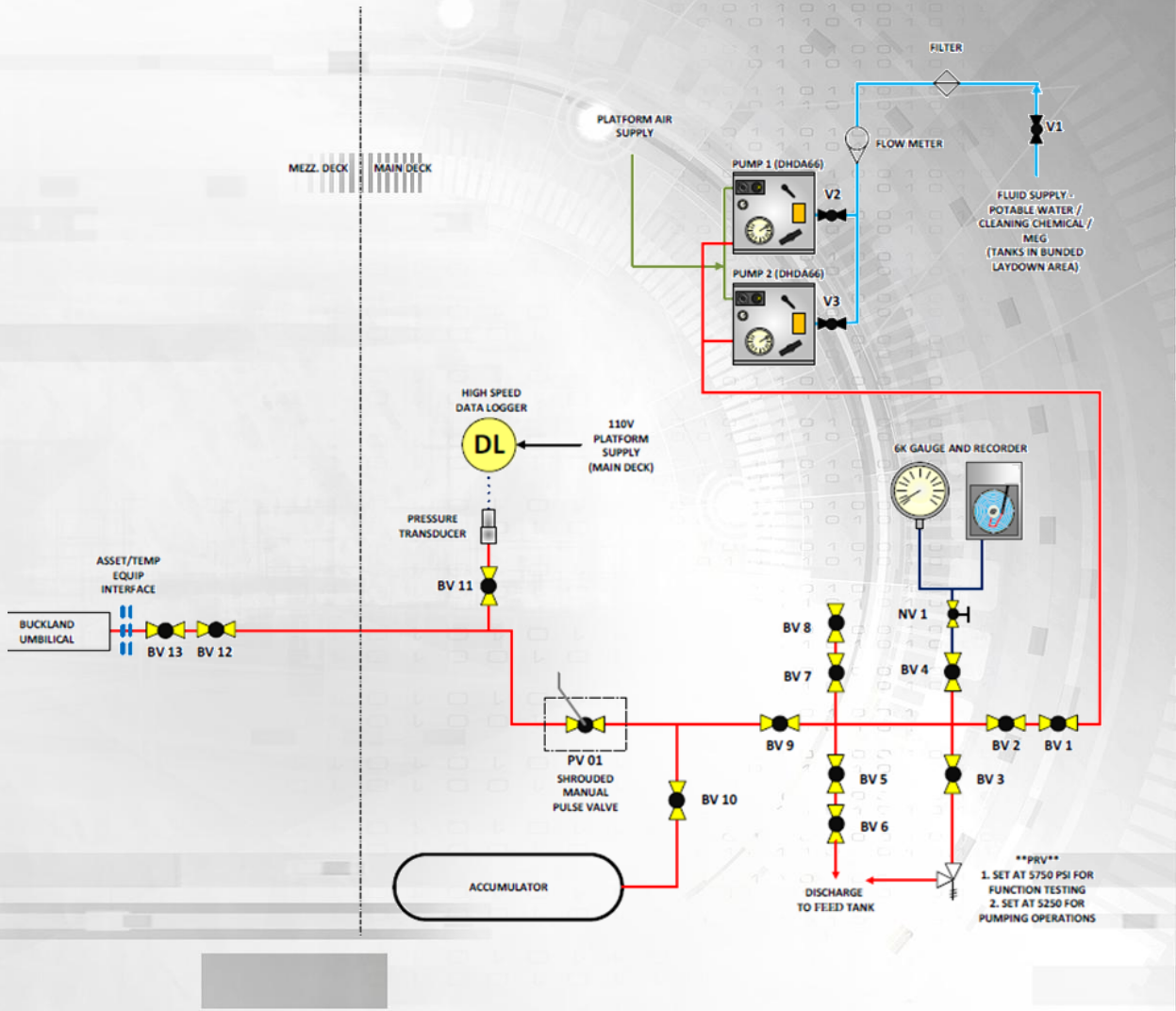
CASE STUDY - UK

- **Facility** – Beryl Alpha, UK North Sea
- **Overview** – Blocked 1/2" scale inhibitor core within production umbilical.
- **Challenge** – Length and blockage type unknown.
- **Solution** – Find Block & Location by volume to locate blockage.
- Pressure Cycling / Pressure Pulsing and locking in at MAOP and monitoring. Blockage located 76m from TUTU.
- On communication of blockage removal, a 1.5-line volume flush at maximum achievable flow rate using MEG was completed.
- **Result** – Successfully cleared umbilical core returning to normal corrosion inhibitor operations.



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FLEXI-COIL

Restore & increase production by removing flow assurance challenges via riser intervention

Enhance production via in-riser gas lift or velocity string technology

No vessel or **subsea intervention** requirement

Compact design, minimal deck space requirements and suitable for air freight

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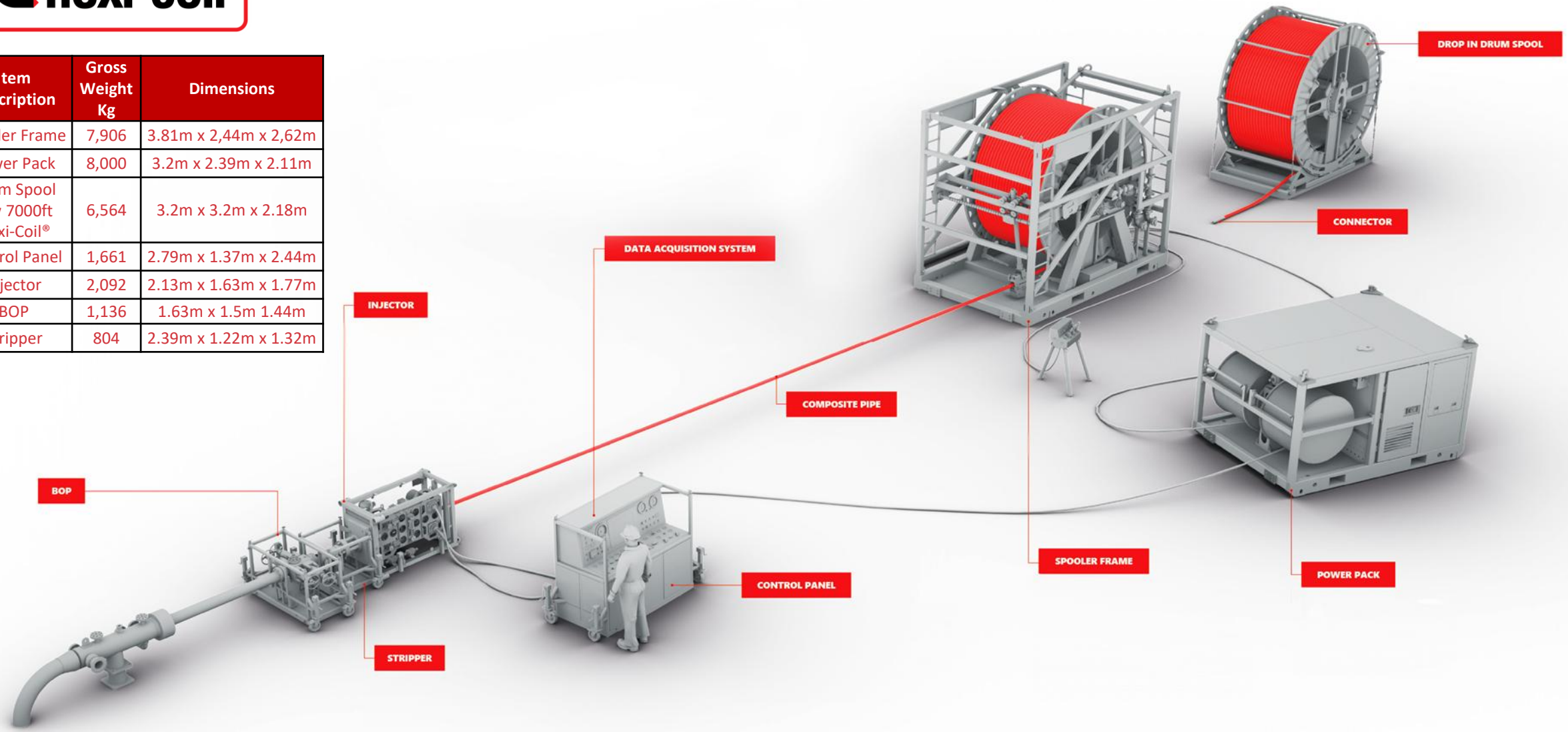
flexi-coil

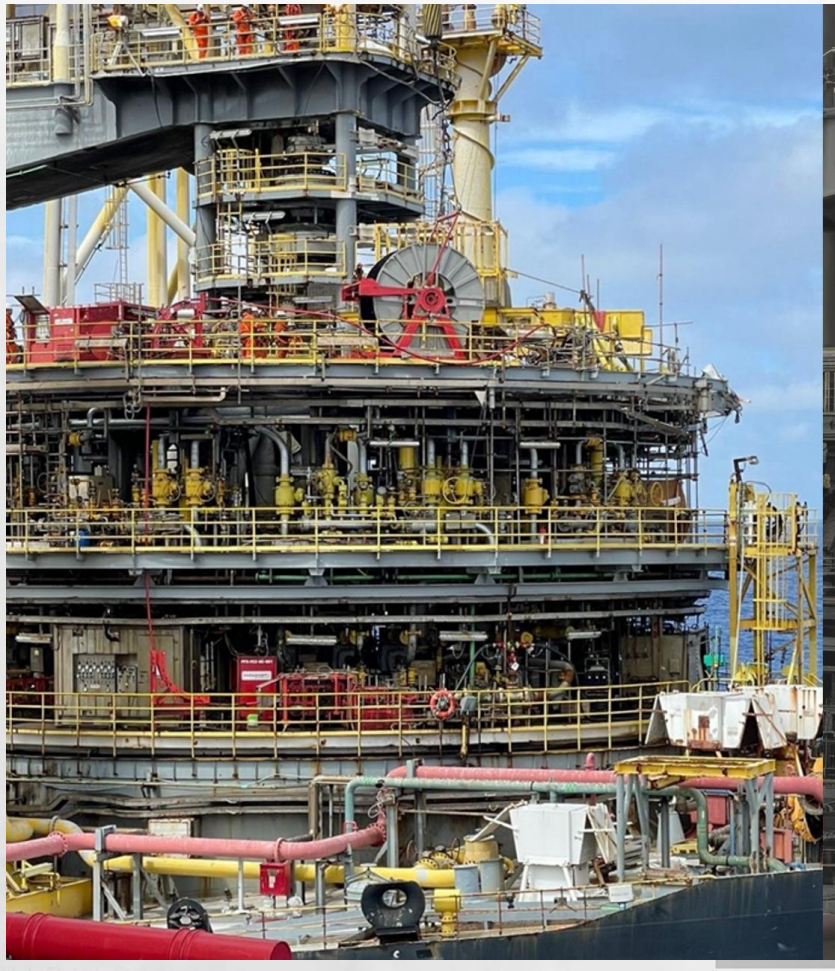
Item Description	Gross Weight Kg	Dimensions
Spooler Frame	7,906	3.81m x 2,44m x 2,62m
Power Pack	8,000	3.2m x 2.39m x 2.11m
Drum Spool c/w 7000ft Flexi-Coil®	6,564	3.2m x 3.2m x 2.18m
Control Panel	1,661	2.79m x 1.37m x 2.44m
Injector	2,092	2.13m x 1.63m x 1.77m
BOP	1,136	1.63m x 1.5m 1.44m
Stripper	804	2.39m x 1.22m x 1.32m



Personnel	Quantity	Working Duration
Supervisor	2	24 Hour Operations
Technician	4	24 Hour Operations

FLEXIBILITY IN DEPLOYMENT

- Adaptable surface layout
- Direct Vertical Access (DVA) to riser not required
- Line of sight to riser not required



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CASE STUDY: 12” EXPORT PIPELINE – G.O.M.

Challenge

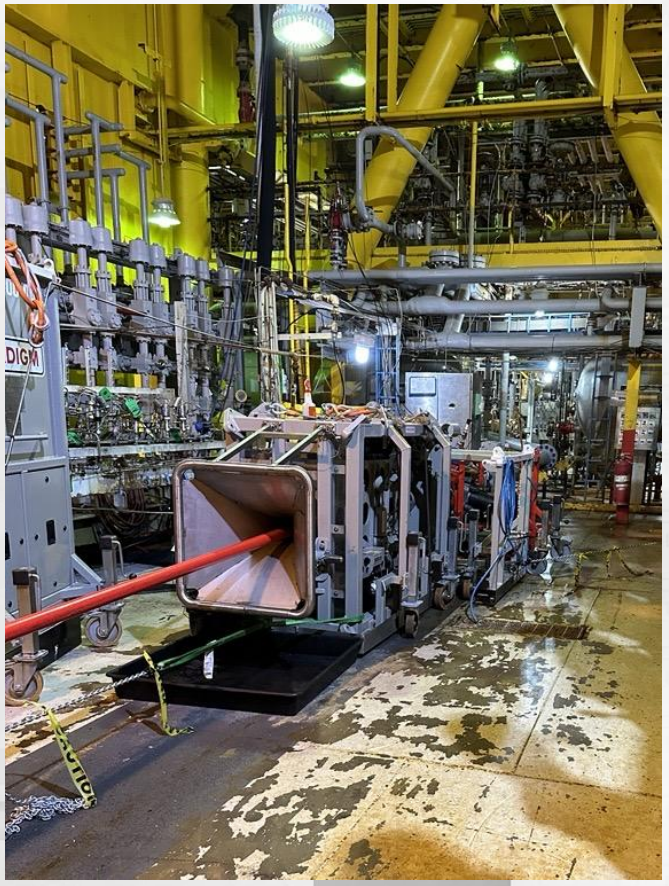
- A full-bore paraffin wax blockage on a main export pipeline in 147 MWD
- Blockage confirmed to be at 1,058m into a 36km pipeline, with the total length being unknown

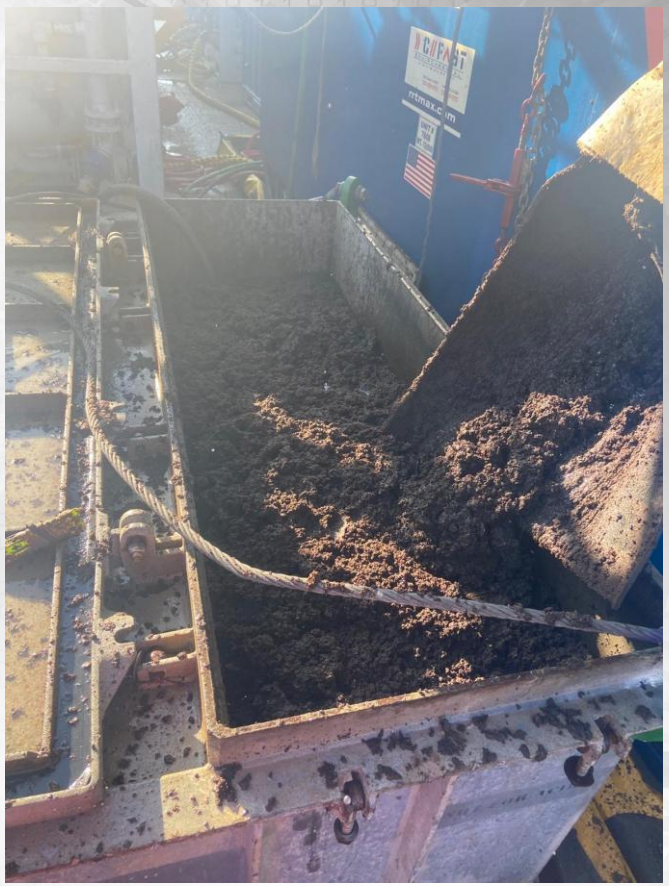
Solution

- Flexi-Coil® deployed to target paraffin wax blockage via high-pressure liquid jetting using water/solvent mix.
- Flexi-Coil® navigated >810° of system bends

Result

- Blockage successfully remediated and production reinstated to service in <3 weeks
- Communication with the receiving facility was established at ~2km into the pipeline (>950m blockage)
- Over 45 cuttings boxes filled with paraffin wax were removed from the system (~255 tons)
- Zero subsea intervention was required





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CASE STUDY : 24" DEAD LEG DECOMMISSIONING

Challenge

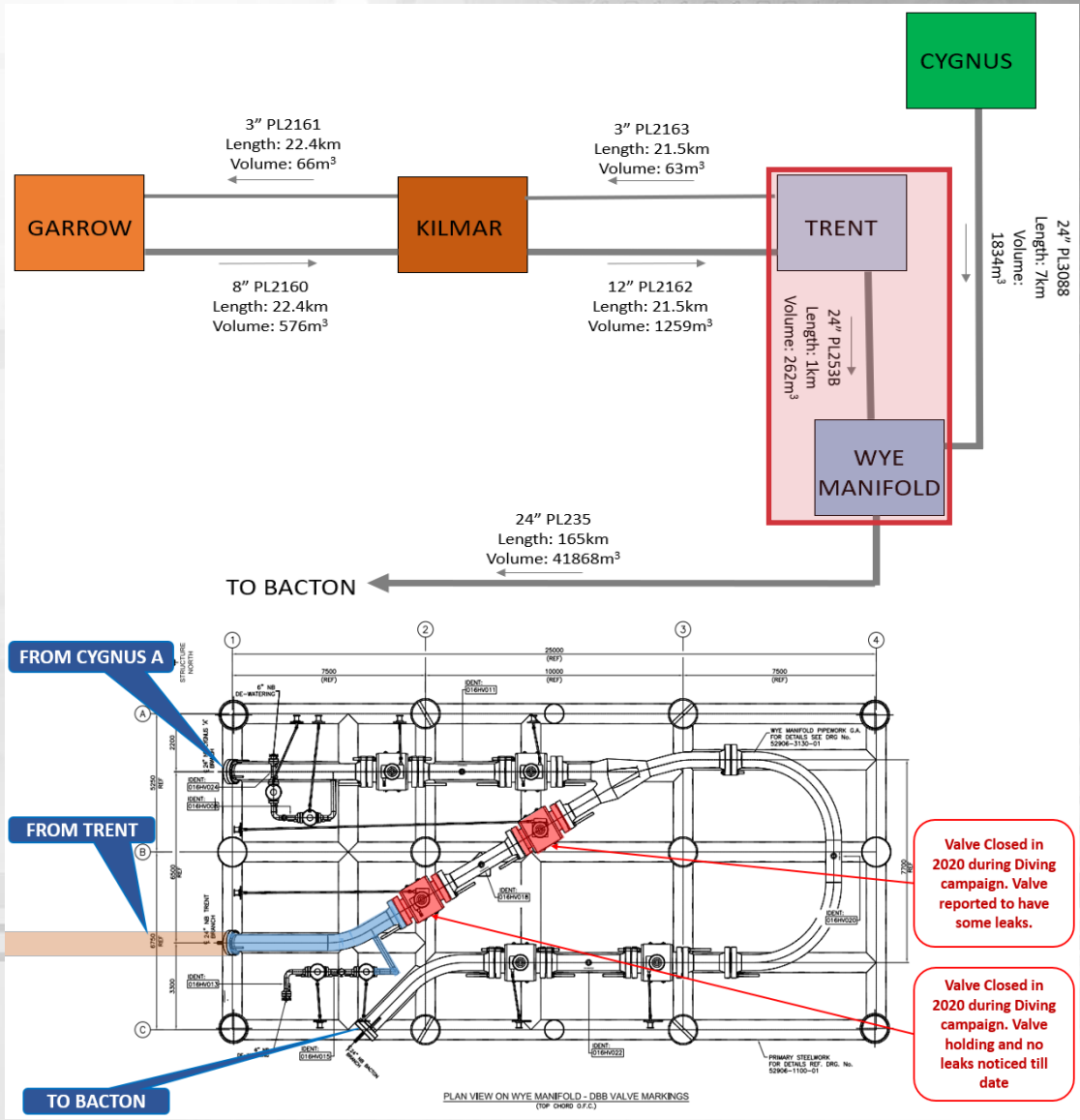
- A UK SNS Operator needed to flush an export pipeline which was connected to a producing trunkline system from Cygnus A to the onshore Bacton Terminal
- The line contained a wye-manifold with two closed valves against the producing system, creating a dead leg with an estimated 150m^3 of condensate

Solution

- Flexi-Coil® was deployed from topsides >1km through 330°of cumulative bends using treated seawater to flush the contents back to topsides and then routed to a disposal well

Result

- Operations to flush the line were completed in < 3 days achieving a cleanliness level of < 30ppm allowing the line to be disconnected
- All operations were completed from the topsides, with zero subsea intervention or environmental impact



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CASE STUDY : 24" DEAD LEG DECOMMISSIONING

Flexi-Coil® Equipment Setup for Operations

Pipeline Status Post Operations

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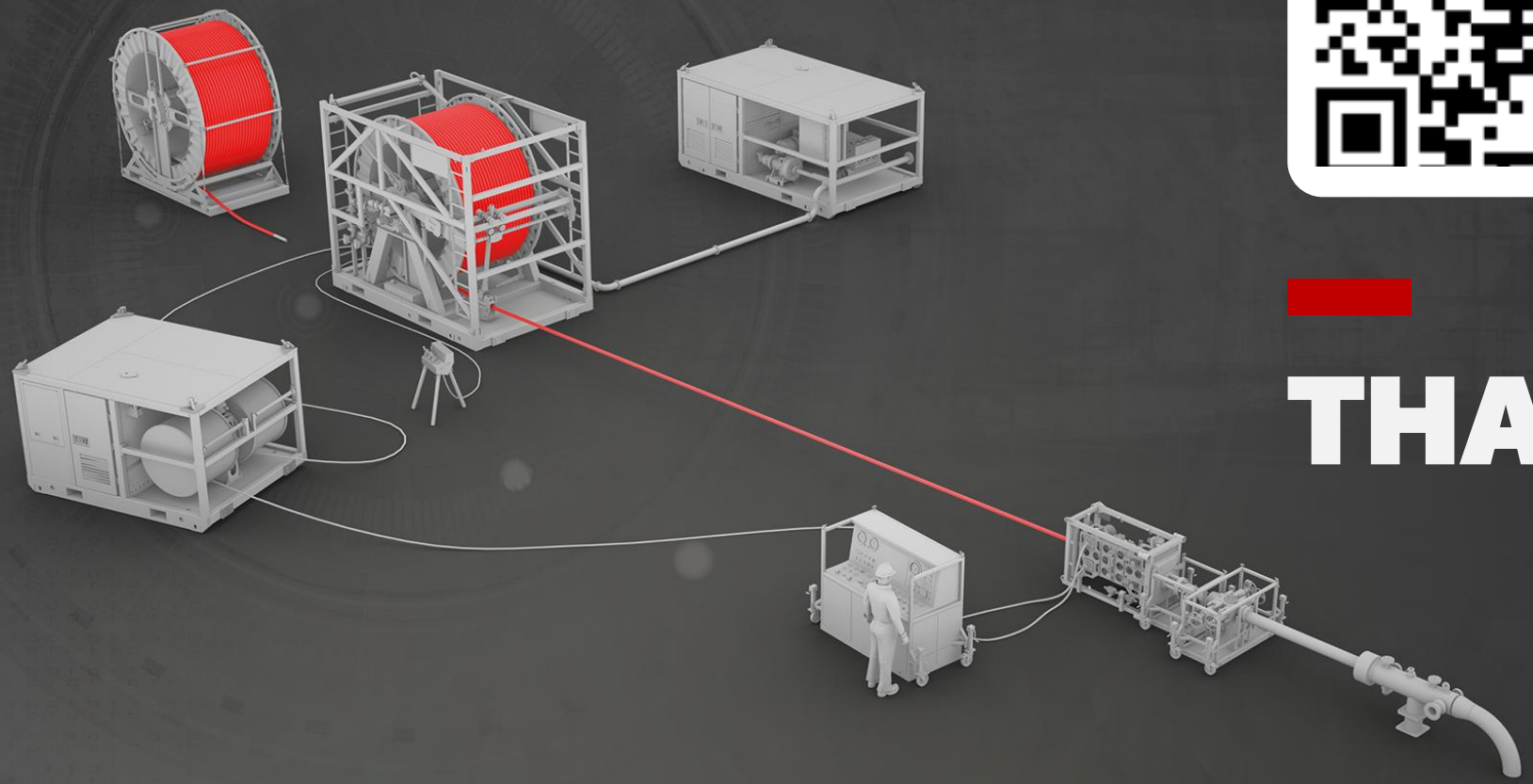

THANK YOU

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