

Smarter Subsea Handling

Spotlight on Underwater Pipelines

21st February 2024

Removal of pipeline bundles – ‘burying heads in the sand’ or can you meet OPRED requirements for removal and recovery?

Richard Stevens, CEO

Roger Esson, Advisory Board



Agenda

- Introduction
- Regulatory Context and Challenge
- ROVAR controllable buoyancy technology
- Proposed cutting and removal solutions
- Key Points & Asks



Recovery of Pipeline Bundles – The Regulatory Context and Challenge

Regulatory position, background and challenge

- OPRED (Offshore Petroleum Regulator for Environment and Decommissioning) requires decommissioning plans for all pipeline bundles in the UK North Sea.
- OPRED has mandated that the abandonment of pipeline bundles “in-situ” shall no longer be approved, and a “clear-seabed” policy is required.
- Total of 87 pipeline bundles, 315km total length in UK waters
- Longest bundle 7.7km, largest bundle 1.5m diameter
- 80% of bundles <1m diameter, c.1 tonne / metre
- Original install method: coastal site manufacture, tow to destination, flood to seabed
- Reverse install method is not possible: integrity issues, content collapse, and uncontrolled sectioning by reverse reel on-to pipelay vessels

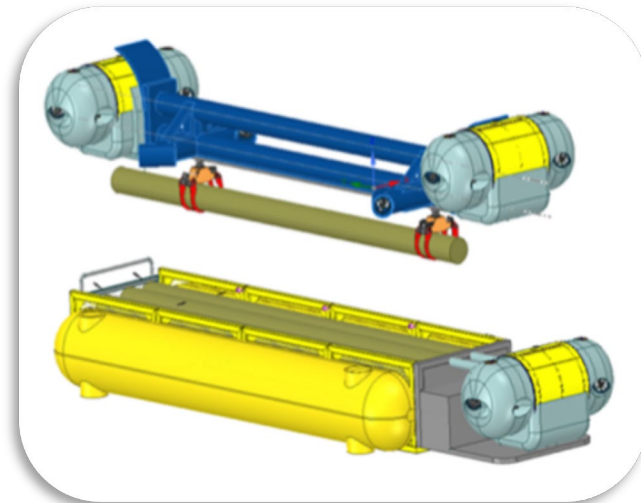
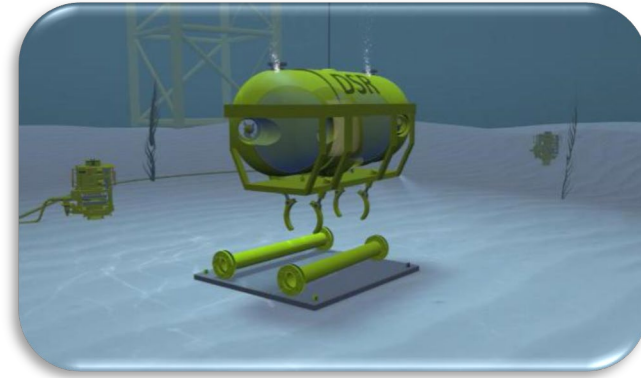
Options and Opportunities

- Credible Options: ‘Bury’ not possible for exposed bundles, Only ‘cut, crimp, lift to surface and recycle’
- Potential Solutions for Lift and Recycle: ‘Cut and Wet Basket’ or ‘Section and Chained Tow’



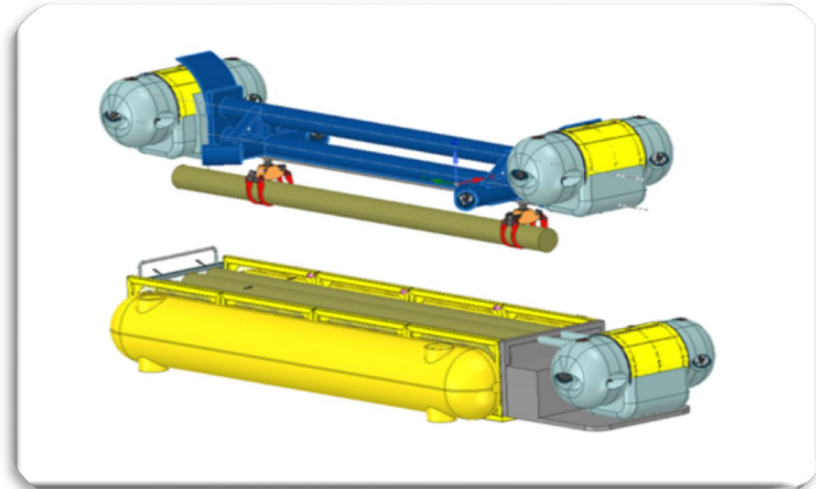
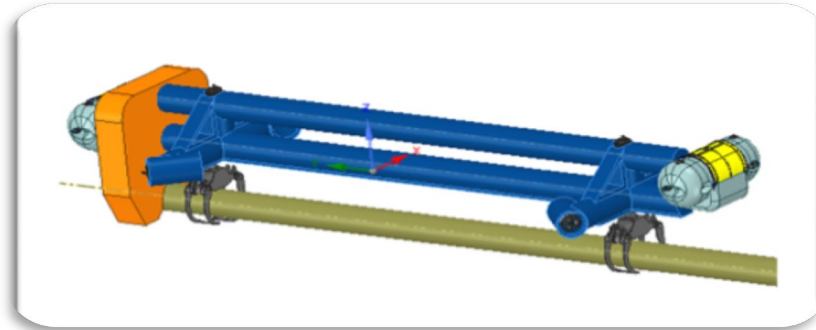
ROVAR Technology – Key Features and Products

- Global patented cryogenic variable buoyancy system
- **ROVAR**: “Remotely Operated Vehicle for Assets Recovery”
 - Vapourised liquid nitrogen displaces seawater for buoyancy
 - Buoyancy controlled through gasification system, relief valves to retain / release gas in caissons, positioning control system, and axes sensing
 - Bespoke tooling and thrusters for handling and lateral positioning
 - Lift repeatability varies with dewar caisson sizing, load and depth
 - Intellectual property across patent families in Europe, Americas and China
- Standard system, **ROVAR-20**: 20Te lifting and handling underwater vehicle specifically designed as vessel backdeck equipment for mobilisation during decommissioning and construction support across all offshore energies sectors
- **ROVAR-BB** (Buoyancy Beam) designed to handle and spread the load of long structures underwater such as cables, pipeline bundles, umbilicals and tubulars
- **ROVAR-WB** (buoyant Wet Basket) is an adapted seabed basket with integral buoyancy, designed to provide the means of both delivery and recovery for multiple items with independent and controllable lift



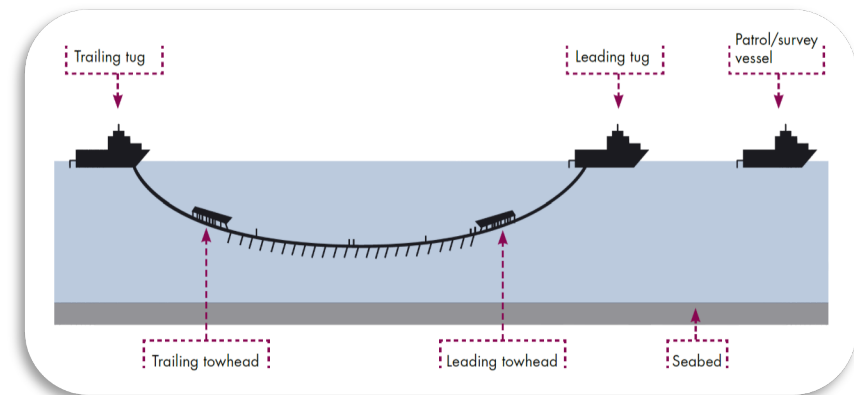
ROVAR Wet Basket Solution

- The *Wet Basket and Cutting Solution* has *ROVAR* in two complementary configurations.
- A *ROVAR-BB* unit operating as a cutting and handling beam for c.20m pipeline section.
- A *ROVAR-WB* unit operating as a variable buoyancy wet basket.
- The operating sequence would be for *ROVAR-BB* to segment c.20m sections and handle them into the *ROVAR-WB* baskets.
- The buoyant baskets would then be floated to the surface for transfer to a submersible barge, and subsequently the barge tug towed to land.



ROVAR Chained Tow Solution

- The *Chained Tow* Solution sections longer bundle lengths for direct tug tow to the coastal recycle yards.
- This solution uses a *ROVAR-BB* cutting unit and several *ROVAR-BB* lifting units to section c.100m lengths of pipeline bundle, crimp the ends of the pipeline sections and then lift to the splashzone.
- *ROVAR-BB* cutting units remain onsite to continue sectioning.
- Once at the splashzone, conventional modular fixed buoyancy units would be fitted to each section which would then be chain-linked as multiple sections for tug tow to coastal recycle yards.
- On arrival at the yards, the chained sections would be lifted by quayside crane for processing and recycling.



Key Points & Asks

- Regulatory enforcement – bundle left on seabed not acceptable
- Reverse installation of bundles not feasible – integrity
- ROVAR technology fully scalable and adaptable to removal scenarios
- Technology proven to TRL6+, currently preparing for TRL7
- Two Solutions demonstrate reduce, recycle, remediation principles
 1. ROVAR-BB (cut) and ROVAR-WB (load) to semi-submersible barge
 2. ROVAR-BB (cut and lift) to sub-splashzone flotation and tug-tow
- Partners and Supply Chain Collaboration required:
 - A. Participants for final development & field trials of new UK technology
 - B. Supply Chain / JV Partners (vessels and marine contracting) for gotomarket
 - C. Investing Partners for commercial deployment and scaleup



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Roger Esson, Advisory Board, roger@essonenergy.com, 07702 262539



Pipeline Bundle Removal – use example

	Wet Basket		Tow	
Bundle length	6,000m	20,000m	6,000m	20,000m
Section lengths	20m	20m	100m	100m
Number of sections	300	1,000	60	200
Wet baskets lifts required (6 sections per basket)	50	167	n/a	n/a
Semi-submersible barge trips required	2	30		
Tug tows required (5 lengths per tug)	n/a	n/a	12	40
Lifted cost per metre	£2,300	£1,000	£2,000	£800
Clear-seabed feasibility	✓	✓	✓	✓
Reduced Emissions	✓	✓	✓	✓
Repeatability with smaller, fit for purpose, low-cost vessels	✓	✓	✓	✓
Local content: Use of UK ports for cleaning and recycling	✓	✓	✓	✓



ROVAR Solutions – Core and Additional

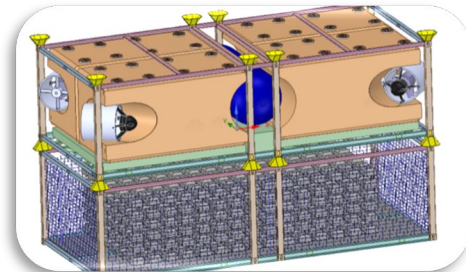
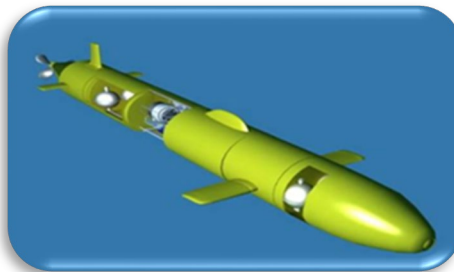
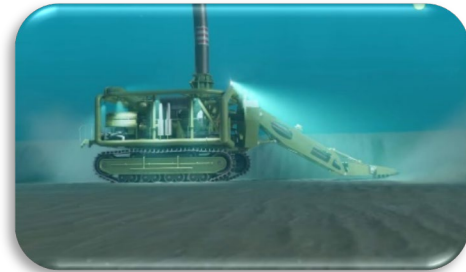
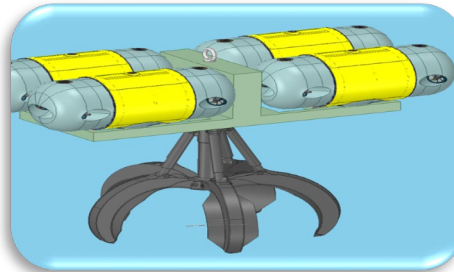
Core Solutions / Decarbonisation & Energy Transition

- Decommissioning for oil & gas congested field clearance, removal and recovery, 10s to 100Tes
- Decommissioning of oil & gas pipeline bundles for cutting, lifting and tow
- Construction support for infrastructure deployment, both offshore wind and oil & gas
- Lifting and positioning of mooring lines, and dynamic cable handling for floating offshore wind



Additional Solutions & Product Variations

- “Pick and Place” and “Hunt and Gather” modes
- Boulder clearance and debris removal
- Seabed vehicle assist for payload compensation in different soil conditions
- Submersible autonomous vehicle variable buoyancy
- Moonpool version for gantry lifts e.g. mattress deployment
- Salvage and recovery of lost and derelict equipment i.e. ghost gear



ROVAR Team - Smarter Subsea Handling

EXECUTIVE



Phil Pritchard
Founder, CTO, Director



Richard Stevens
CEO, Director



Peter Watt
Head of Engineering



Fraser Pritchard
Interim COO & Advisory Board



**Engineering team leaders –
cryogenics and control systems**

ADVISORY BOARD



Prof. Ajit Sheno
Naval Architecture and Lightweight Structures



Eleonora Gatti
Sustainability and ESG



Kimberley Denjean
Commercial Deployment



Roger Esson
Decommissioning and Net Zero



Raffle Chan
Technology transfer, Asia



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