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# CRACKING *the* SHALE CODE

**Lessons from the past  
can shape shale's future**



The M/V *Island Venture* is an Ulstein SX165-design multipurpose construction and light well intervention vessel. (Source: C-Innovation)

## A novel approach to a growing problem

A vessel-based approach to surface intervention addresses the issue of retiring deepwater and ultradeepwater pipeline assets.

David Sheetz, C-Innovation

During the 1990s, U.S. deepwater oil production exceeded shallow-water production for the first time. By the early 2000s, deepwater operations produced twice as much as shallow water. In the ultradeepwater sector, production was growing at a rapid pace. More than 20 years on from that initial boom in the offshore industry, pipeline operators are beginning to face serious practical challenges surrounding the decommissioning of these trailblazing deepwater pipelines.

U.S. regulatory and industry requirements state that any pipeline destined for decommissioning must be effectively cleaned and made safe before its abandonment in place. Traditionally, to ensure the retired pipeline is inert and free of product, divers would be called in to access the pipeline to perform a flush or cut the pipe to bring to the surface. However, these techniques were only ever feasible for shallow-water pipelines. The newer, deeper pipelines of the world are beyond the capabilities of any divers, and usually a rig would be required to perform any remedial work on them. As the necessity for pipeline decommissioning spreads from the deepwater Gulf of Mexico (GoM) and the North Sea to the aging Brazilian oil fields and eventually West Africa, the challenges of deepwater decommissioning will become a global issue.

In 2017 a large international operator in the GoM's Mississippi Canyon area approached C-Innovation with an aging deepwater pipeline that exhibited an extensive asphaltene blockage but needed to satisfy the government's decommissioning requirements. Due to its location at a depth of 4,000 ft and access challenges, C-Innovation devised a novel way to remove the blockage and prepare for abandonment. After considering several alternatives to clean it in place while it was on the seabed, C-Innovation's subsea projects team, alongside partner Halliburton, successfully lifted the pipeline off of the seabed. It was threaded through the vessel's moonpool and supported for weeks while a surface intervention was performed.

### Phase 1

The asphaltene blockage was thought to be closer to the upstream/pipeline end termination (PLET) of the flowline submerged under 4,000 ft of water. The flowline was lifted to the surface for surface injection of coiled tubing (CT) to reduce the total distance to the blockage. An adequate hangoff structure, load tested to more than 1 MMB to support the catenary weight, was designed, engineered and installed in-house by C-Innovation with a safe working load of 300 t. A custom moonpool bridging system was designed and built by North American Shipbuilders (an Edison Chouest Co.).

Once the flowline was recovered, a change-out of the interface was required to allow CT injection. An addi-

tional structure was needed to support the rigup of a BOP and injector system and to allow a safe workspace in the vicinity of the equipment. The flowline was lifted and threaded through the moonpool of the *Island Venture*, C-Innovation's flagship intervention vessel.

The full extent of the blockage was unknown at this point. The flowline needed to be flushed to maintain cleanliness after the blockage remediation, which required service vessels at the tension-leg platform (TLP) and PLET. A large capacity of hazardous material storage and offloading to another vessel while on site was needed to handle the substantial quantities of solvent that were required and the anticipated volume of returns from the flowline.

The downstream side of the flowline (on the TLP) required a temporary interface to the riser and nitrogen packing and water flushing systems installed. The nitrogen packing was to provide a positive indication of a breakthrough on the solid blockage, and the water pumping system was to flush the remediated flowline to regulatory cleanliness standards for decommissioning.

However, there was only enough room on the platform for the temporary system that directly interfaced with the riser. All other systems were deployed on a platform supply vessel (PSV) with a flexible hose connecting the systems on the TLP and the system on the PSV.

The flowline was safely recovered and secured, and the interface was changed for intervention. The end of the flowline downstream of the blockage was packed with nitrogen. Asphaltenes blocking the flowline were removed. However, due to conditions more extreme than the client expected to encounter, the removal of all asphaltenes was prevented. The client decided to cease intervention and demobilize with the solution deemed a success.

## Phase 2

In 2019 a Phase 2 solution was undertaken through C-Innovation to continue to complete the work scope safely and without impact on the environment. In this case, the flowline blockage remediation was performed with a **CT tractor system supplied by Houston-based WWT International**. Four vessels were involved: the *Island Venture*, *Island Performer*, *Carol* and *Fast Hauler*. Pipeline communication was achieved to the platform following four CT tractor runs. Finally, a successful flush of the pipeline to seawater was required to enable riser cut and abandonment.

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Once the pipeline was recovered to the vessel, C-Innovation removed the PLET and installed a slip-on wellhead connector. Then a tractor and 30,000 ft of CT were rigged up, which enabled a jetting head to remove and wash the asphaltene blockage back to the vessel. Returns were routed through a shaker to remove solids; gas was vented at a vent boom and liquids were routed to four 500-bbl tanks.

The remaining pipe that still needed to be remediated was raised to the deck of the boat utilizing a ball grab tool. Once at the surface, the pipe was hung off on the support structure and pressure control equipment were connected and tested. The pipeline cleaning process began using a WWT tractor that pulls the CT into the pipeline to enable extended cleanout distances. The first run was 14,500 ft. The tractor was left to run and perform its washout, and then the whole assembly was pulled back out.

Internal well tools were used to set another plug, then pulled out. The pipeline was laid down, the vessel transited 14,000 ft down the line and a cut was performed. Three more tractor CT runs were made, establishing communication through the pipeline.

All segments of the pipeline were flushed and abandoned in place. The whole project was completed to Bureau of Safety and Environmental Enforcement regulations, with no recorded releases to the environment and no HSE incidents.

## Equipped to meet future challenges

One of the main objectives of decommissioning is to prevent the acute and long-term release of trapped hydrocarbons inside a pipeline on the seafloor into the environment. To that end, C-Innovation has joined forces with one of the key vendors involved in this project, WWT International, to devise a new tractor that will reach even farther than before and help reduce the number of cuts required. By reducing the number of cuts, many days of necessary work can be reduced.

By lifting a pipeline off of the seabed, threading it through the vessel moonpool and supporting it while a surface intervention was performed, the client saved about 50% of costs and a significant amount of time that would have been associated with bringing in a rig to perform the same work. Discussions are underway with another two operators for deployment of a pipeline intervention technique such as this one in the GoM. **ESP**