



STATS GROUP
Managing Pressure, Minimising Risk

Pipeline Blockage Removal Methods – Invasive Options

Pipeline Blockage: Causes



- ❖ Gradual changes in pipeline contents (Temperature, Flowrates, Pressure, Chemistry)
- ❖ Production upsets (Chemical Injection)
- ❖ Operational changes – pigging frequency
- ❖ Insufficient pipeline preparation / cleaning and geometry proving for In-line Inspection
- ❖ Overzealous progressive pigging campaigns
- ❖ Incorrect selection and application of type of pig. e.g. using a non-bypass pig for pipeline dewaxing

Pipeline Blockage: Composition



- ❖ Wax /Asphaltenes
- ❖ Scale
- ❖ Debris
- ❖ Hydrates
- ❖ Pigs or pigged tools such as inline inspection tools becoming stuck



Image Courtesy of London Centre for Nanotechnology

Pipeline Blockage: Consequence



- ❖ Reduced or total pipeline production
- ❖ If the blockage cannot be removed, then the pipeline (or a section of it) need to be replaced





To enable blockage removal the location and extent of the blockage needs to be determined.

Pipelines blockages can be located by:

- ❖ Pressure pulsing – can detect a blockage and in some cases disassociate and remove a blockage
- ❖ Density change scanning tools / Flooded Member Detection (if the pipeline is unburied)
- ❖ Pig detectors trackers – if transponders were included in the pig that has stopped moving
- ❖ Pressurisation / Depressurisation timing

Pipeline Blockage: Remediation



The options available to remove a blockage are highly dependent on what the blockage is comprised of, the location and extent of the blockage, pipeline length / diameter / depth / contents etc

Blockage remediation methods:

- ❖ Depressurisation can lead to hydrate dissociation
- ❖ Reversing flow and high-speed flushing
- ❖ Deploying various types of pigs (bypass pigs, shunt pigs, foam pigs)
- ❖ Pressure pulsing of high frequency low amplitude pressure pulses can in some cases disassociate and remove a blockage – better suited to liquid lines, limited to approximately 8km

Pipeline Blockage: Remediation



- ❖ Coiled tubing inserted into the pipeline can remove blockages - limited to approximately 16km
- ❖ Injecting high pressure water / diesel / chemicals to remove debris such as wax, scale, sand, asphaltenes
- ❖ With a fishing tool attachment could recover a stuck pig

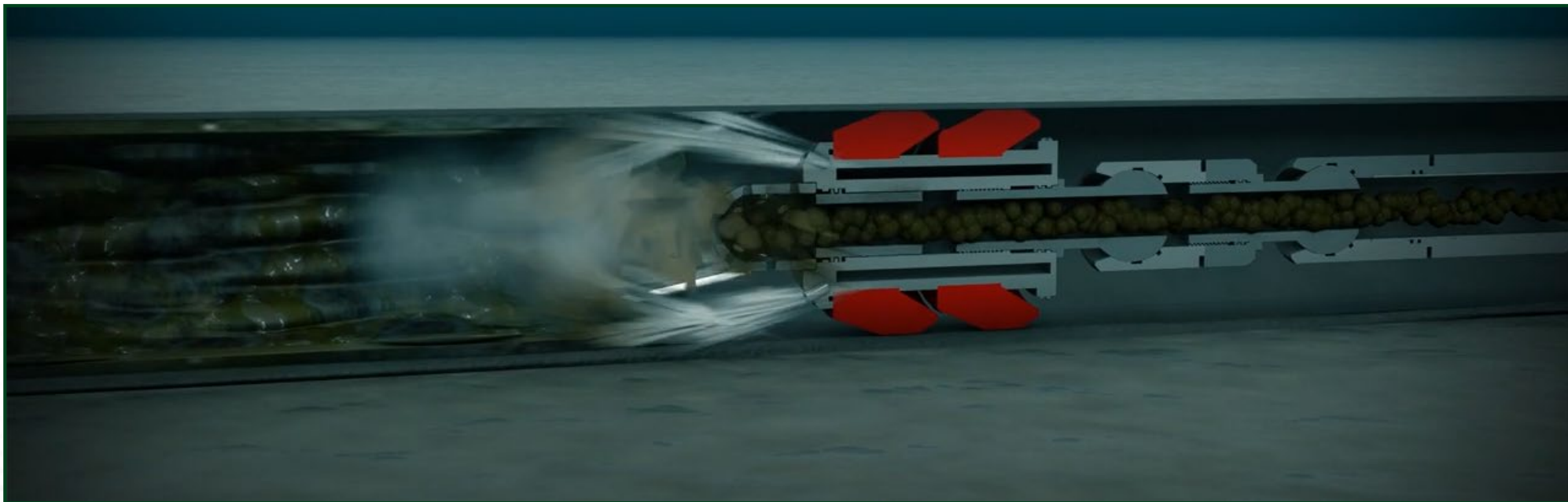


Image Courtesy of Bluefin

Pipeline Blockage Remediation: External Intervention



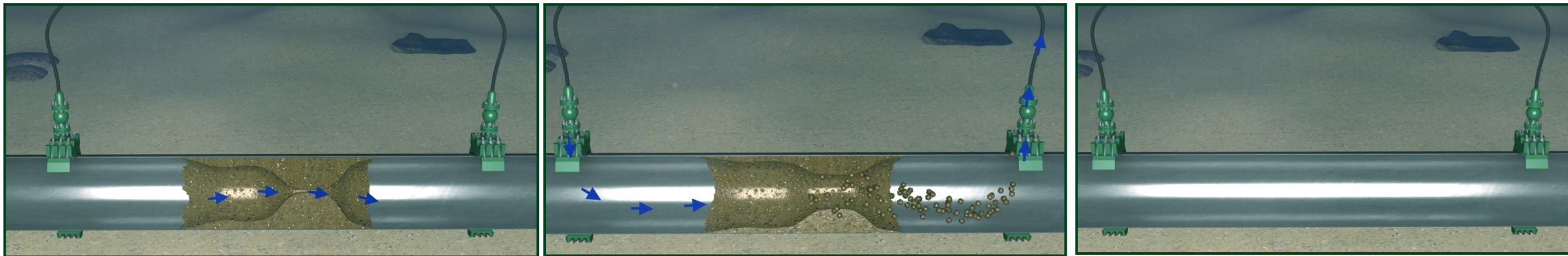
If the less invasive blockage removal methods are unable to remove the blockage then a more invasive remedy may be required, such as

- 1) Locally injecting a blockage flushing product (treated water / solvents / glycol / diesel) via small bore hot taps
- 2) Isolating the pipeline upstream and downstream of the blockage then cutting out, removing and replacing the entire blocked section
- 3) Replacing the pipeline or pipeline section

Pipeline Blockage Removal: Small-Bore Hot Tap Flushing Methodology



Local Injection and Flushing



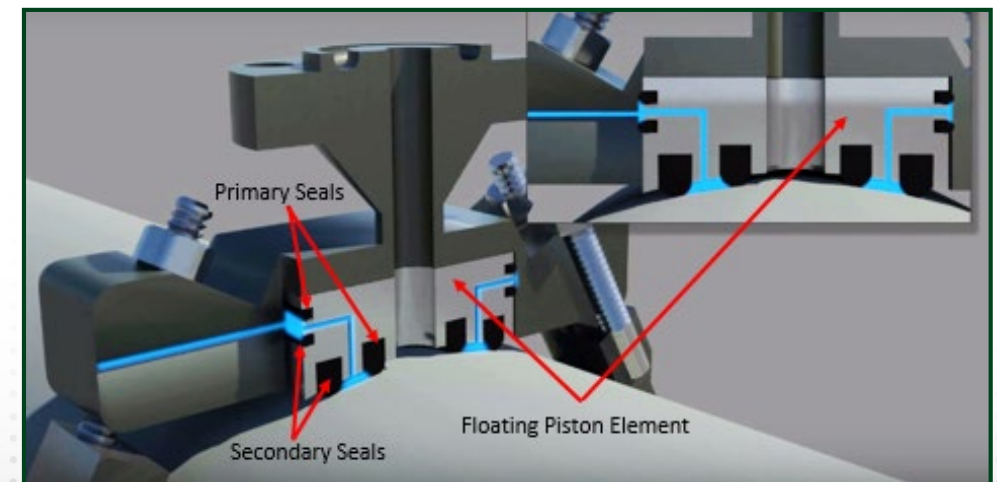
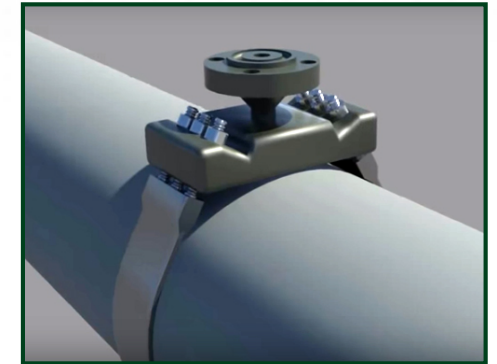
Small-bore hot taps allow local injection of blockage flushing product

Midway, upstream and downstream of blockage

STATS Patented Lightweight Subsea Hot Tap Strap Clamp



- ❖ Fully pressure rated to pipeline design pressure (25yr design life)
- ❖ High pressure sealing with lightweight construction
- ❖ Easily re-configured for a range of pipe sizes by simple change-out of components
- ❖ Both seals fully tested prior to breaking containment
- ❖ Double piston effect design enhances sealing when pipeline pressure is applied to the clamp
- ❖ Easily installed by diver or modified for ROV installation
- ❖ Can be installed over live pin-hole leak, if required
- ❖ Suitable for a wide range of pipe sizes

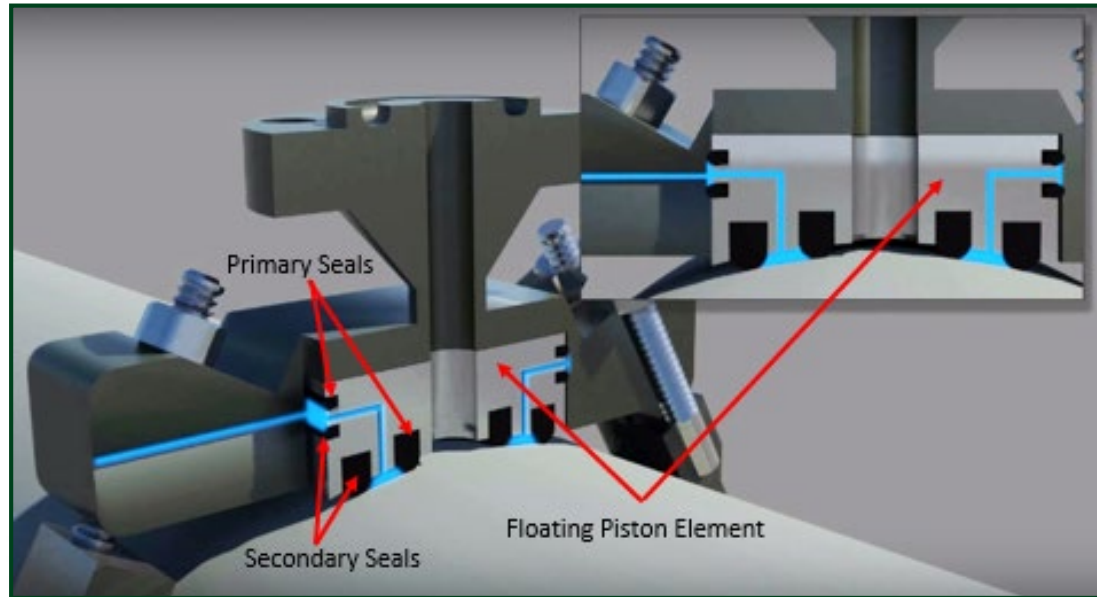




Lightweight Strap Clamp: Dual Seal Testing

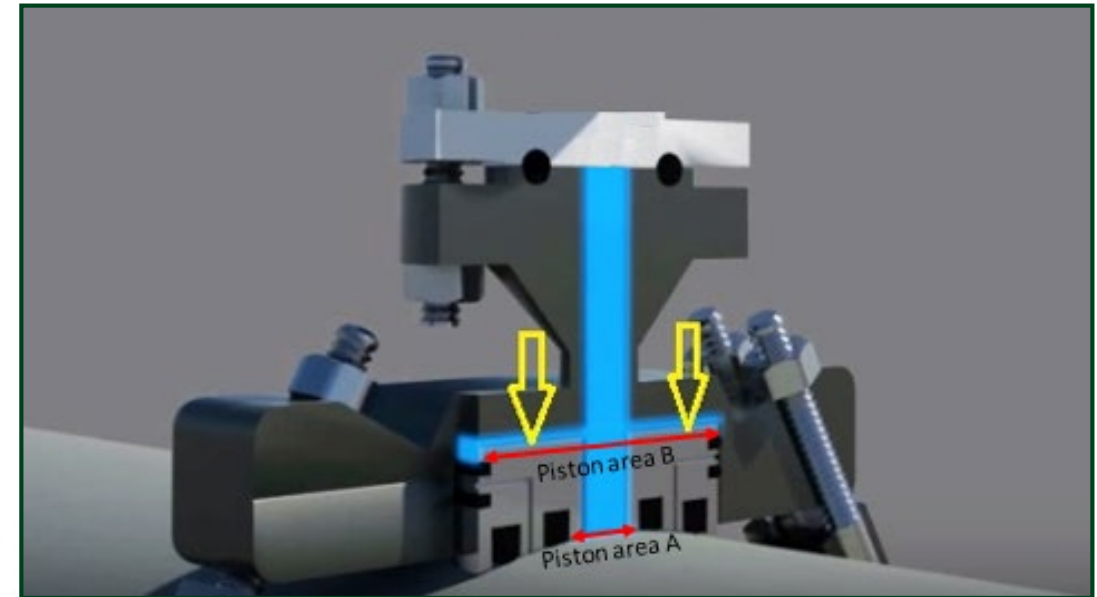
Secondary Seal: Leak-Off Test

Pressurising and locking in the annulus test pressure and monitoring for pressure decay proves Secondary Seal



Primary Seal: Pressure Build-Up Test

Pressurising the clamp body and monitoring the annulus for pressure build-up proves the Primary seal in the correct direction



Double Piston Effect - Sealing Enhancement

Due to the difference between piston areas A and B
Piston effect on the floating seal cartridge increases the sealing efficiency of the clamp to pipeline seals

Pipeline Blockage Removal: Small-Bore Hot Tap Flushing Methodology



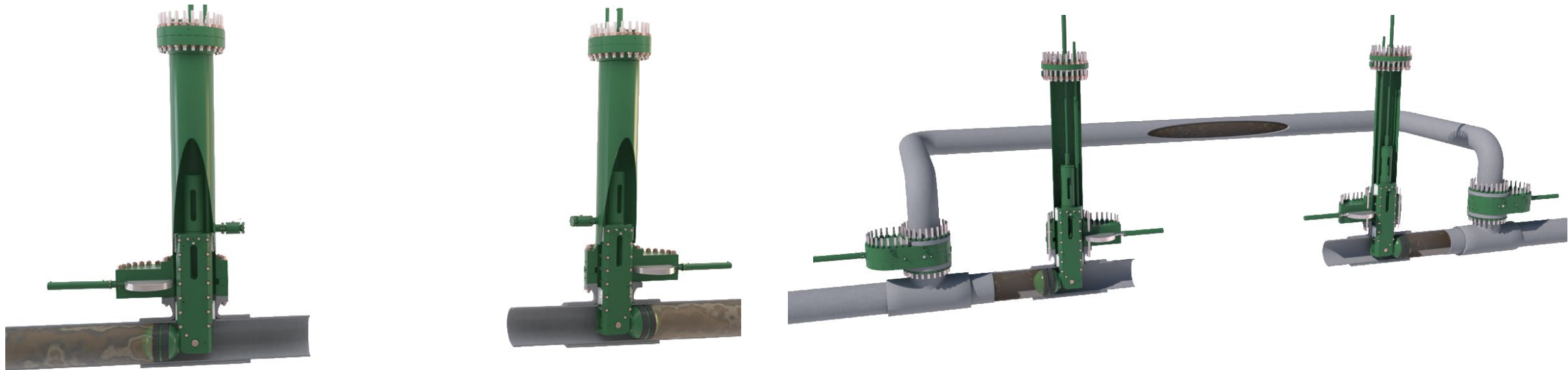
Minor Intervention - Animation



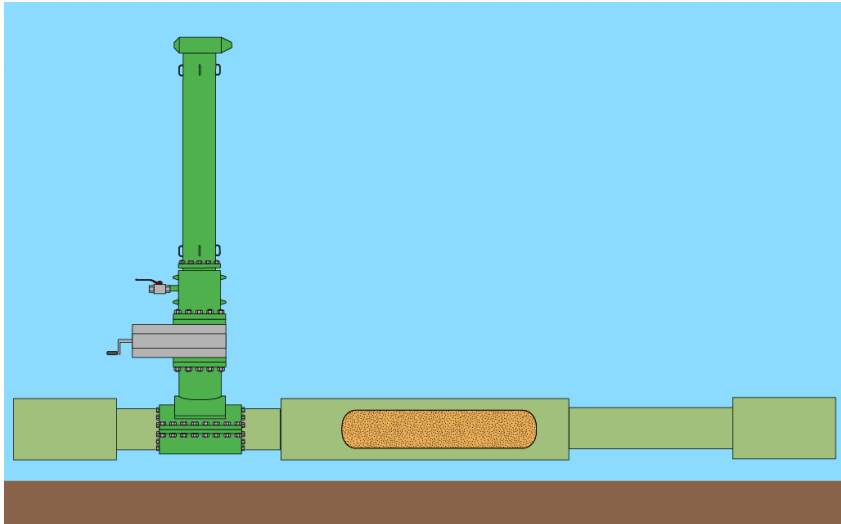
Pipeline Blockage Removal – Section Removal Methodology



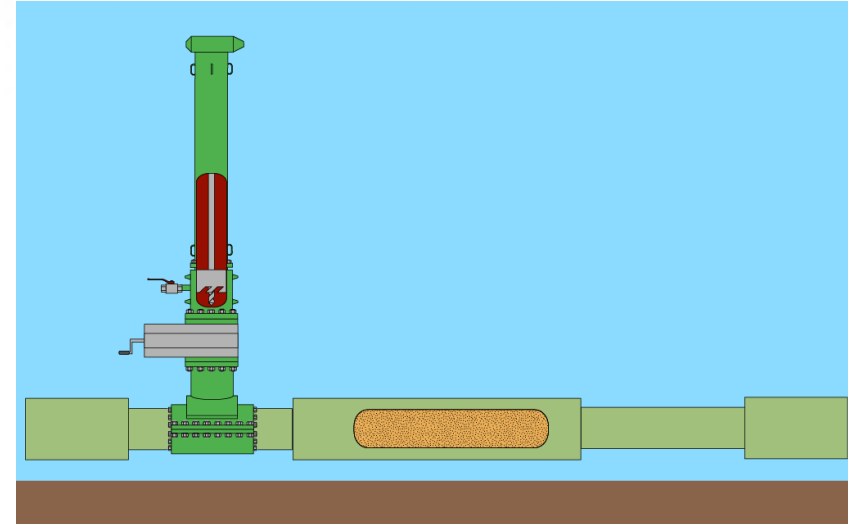
Dual BISEP® Isolation Section Replacement



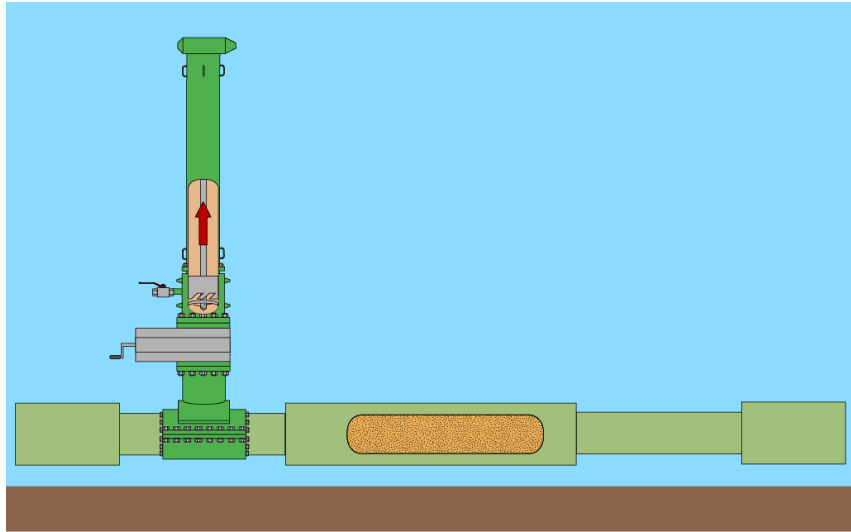
If bypass installed production can resume during sectional replacement



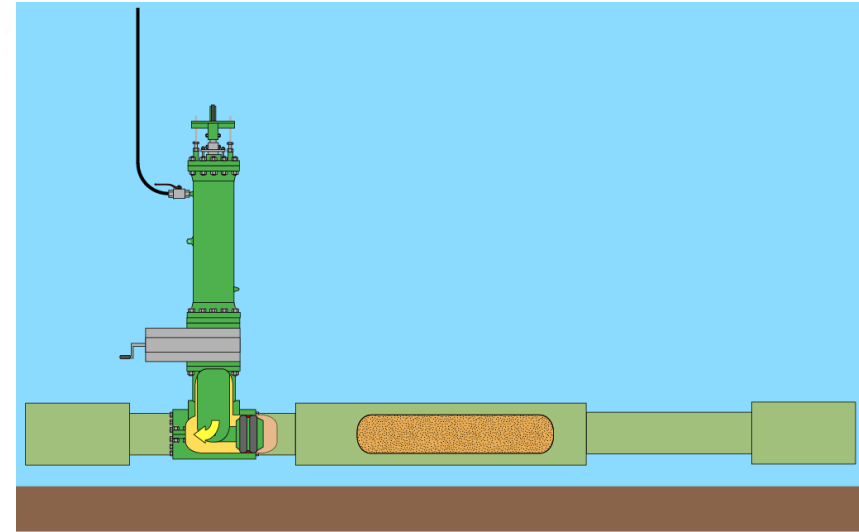
- ❖ Fit Hot Tap Clamp
- ❖ Deployed c/w Slab Valve and Hot Tap machine



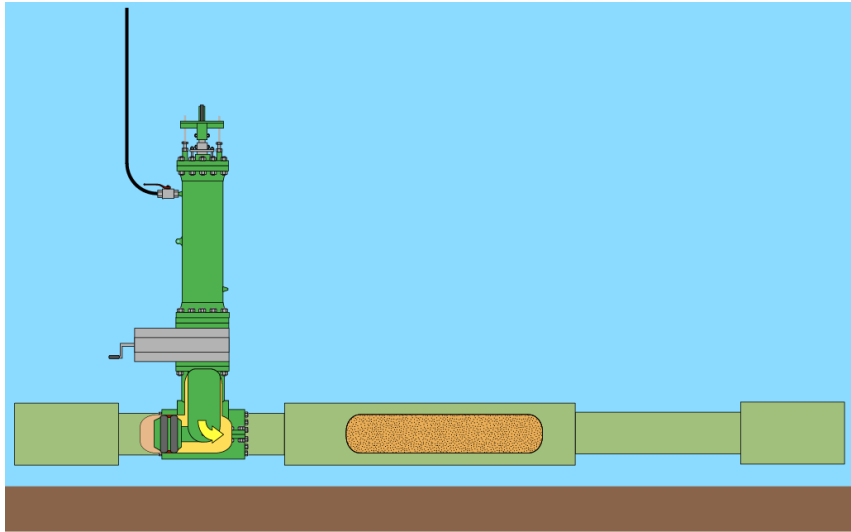
- ❖ Leak test joints, Perform hot tap



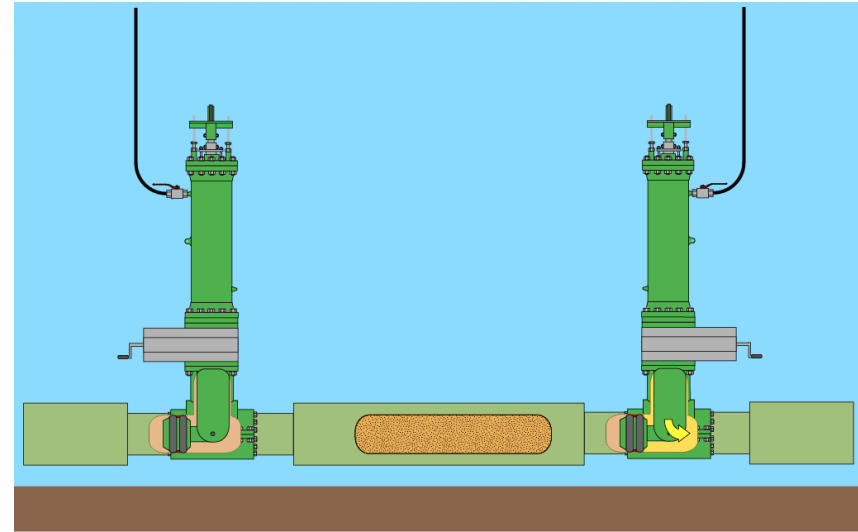
- ❖ Recover coupon into hot tap unit, Close slab valve
- ❖ Remove hot tap machine, deploy and install BISEP launcher
- ❖ Leak test joints, open slab valve



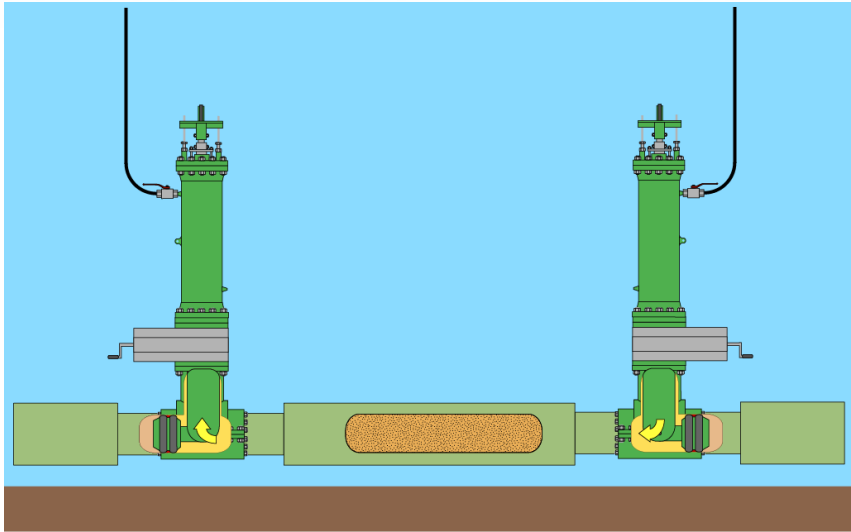
- ❖ Deploy BISEP, set and test seals
- ❖ Inject flushing medium to confirm unrestricted flow through upstream pipeline section



- ❖ Unset, rotate (180 degrees) and redeploy BISEP
- ❖ Test BISEP seals
- ❖ Inject to attempt blockage removal



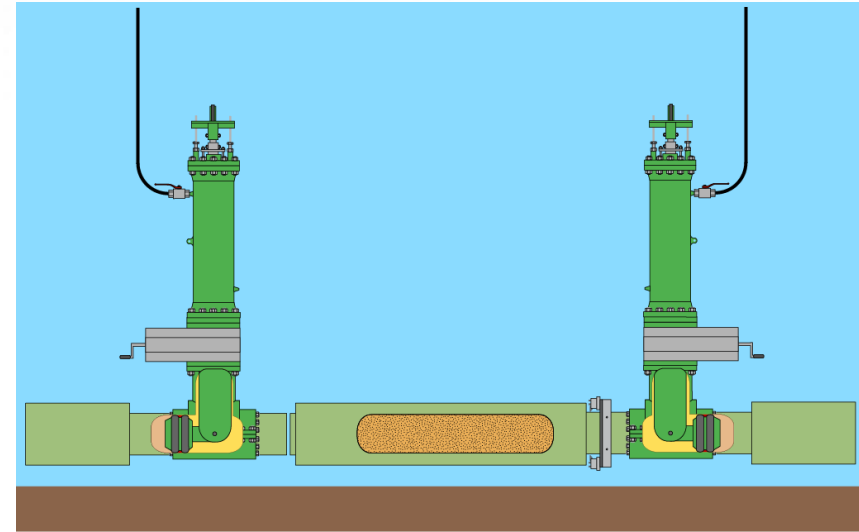
- ❖ If blockage removal is unsuccessful, install downstream BISEP
- ❖ Confirm unrestricted flow through downstream pipeline section



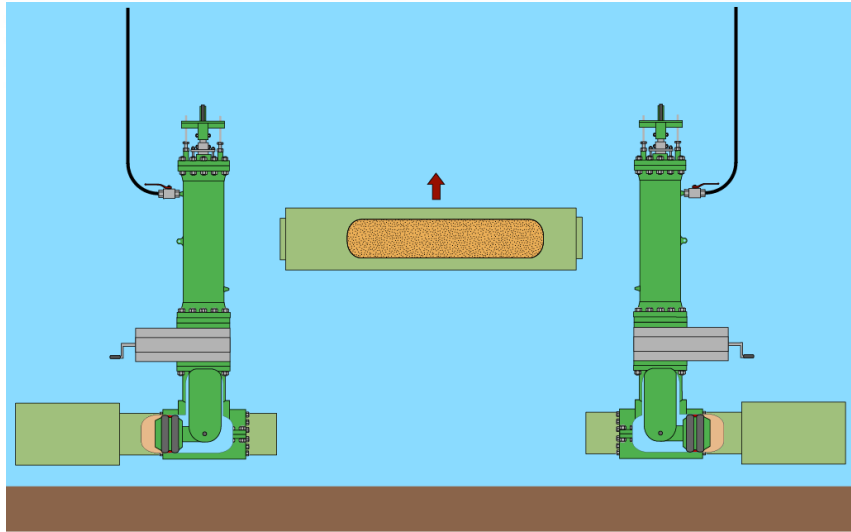
- ❖ Unset, rotate (180 degrees) and redeploy BISEP
- ❖ Prove Double Block Isolation of both BISEPs

Fully Proved Double Block & Bleed Isolation

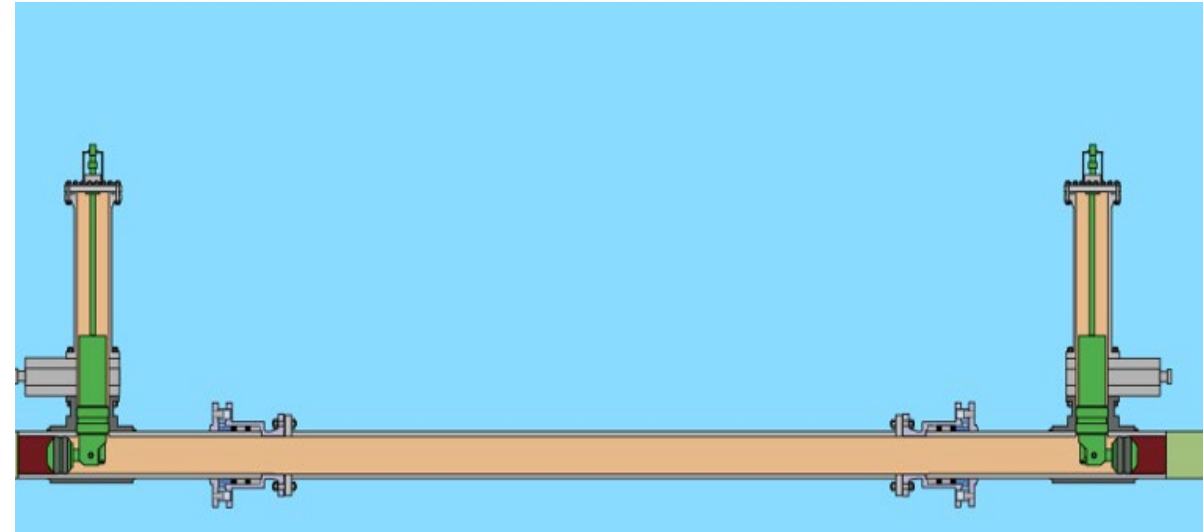
- ❖ Inject to attempt blockage removal



- ❖ Proceed with cutting the block section of pipeline



- ❖ Remove blocked section



- ❖ Replace pipeline section
- ❖ Leak test new connections – against rear of BISEPS



- ❖ Remove both BISEPS and prepare to install completion plugs with the hot tap machine





- ❖ Install completion plugs
- ❖ Remove slab valves and install permanent blinds

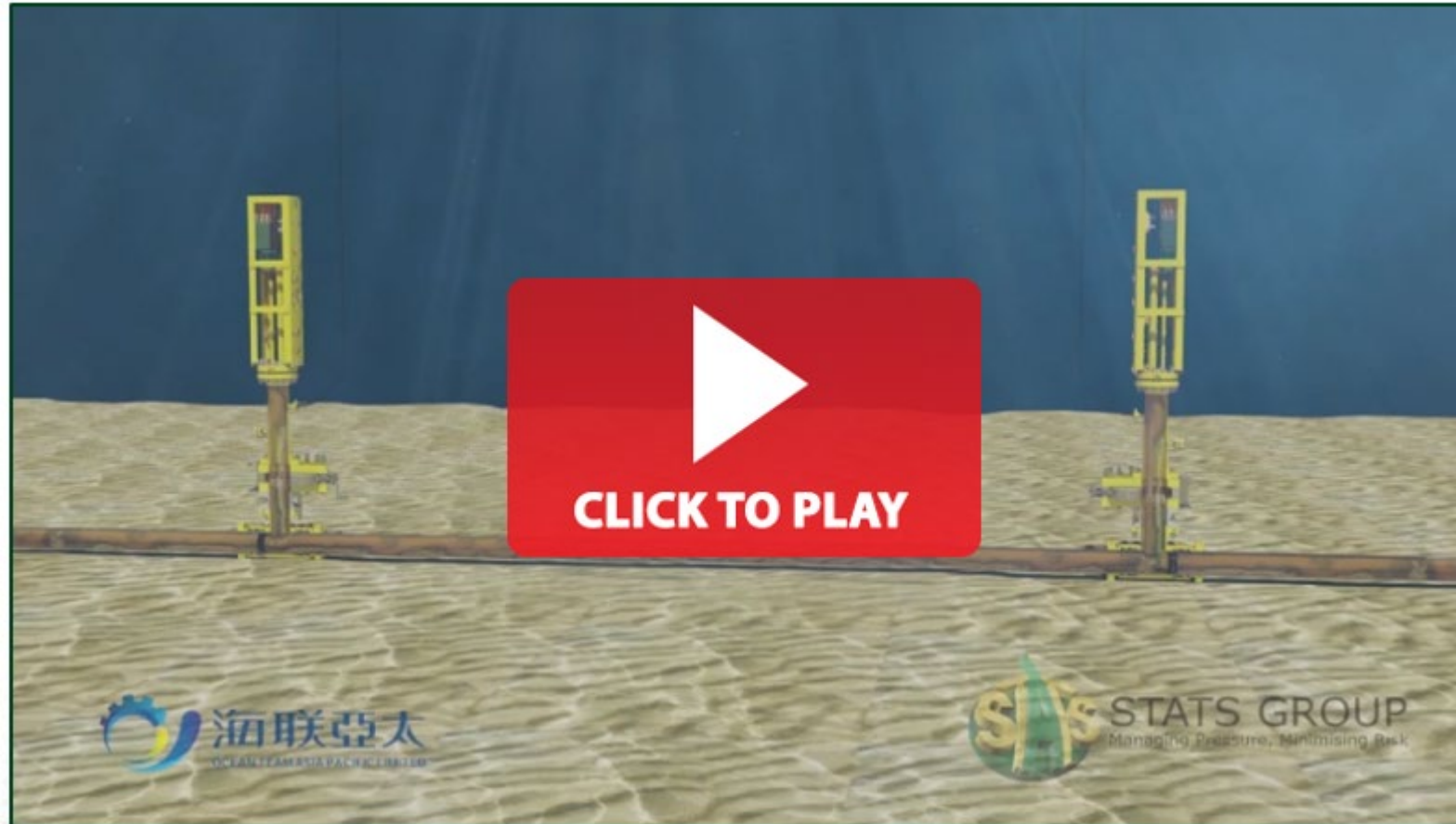




- ❖ Remove slab valves
- ❖ Install blind flanges c/w ½" NPT test ports
- ❖ Leak test blind flange connection
- ❖ Blockage removed - pipeline service resumed



Major Intervention – Section Replacement Animation





Thank You For Your Attention
Questions?



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