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Process & Pipeline Integrity Solutions

EPRIS (Emergency Pipeline Repair Isolation System)

Isolation Technology Developed to Facilitate Repair of Unpiggable Defects

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Presentation

Pipeline Damage Examples and Consequences

Preparedness Options and Benefits

Recent advancements in Isolation Technology – unpiggable pipeline solutions

EPRIS case study

Short Animation

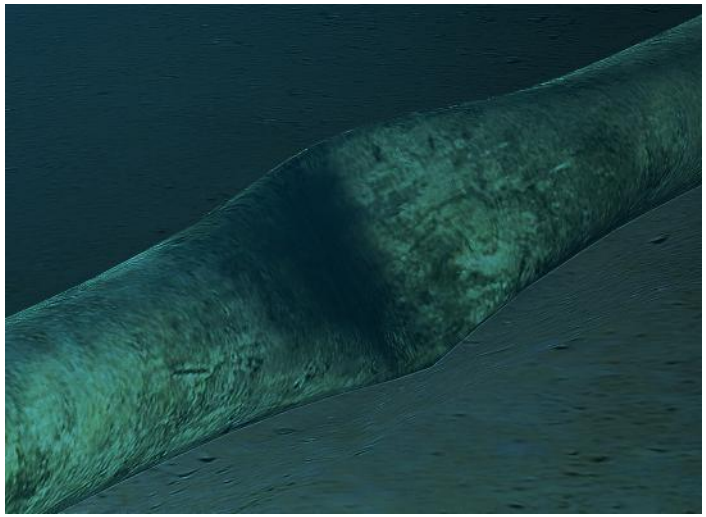
Q&A

Pipelines Damaged

Despite good pipeline design and integrity management schemes pipelines can and do get damaged and need to be repaired.

Large Diameter Incidents in last 5 years: (excl. GoM)

- 36” CATS trunk line
- 30” Kvitebjorn line
- 2 off 24” North Africa lines
- 30” ADMA Oil export line
- 20” and 26” Trans-Med. lines



NOTE: At least 12months from incident to resumed operation (except CATS)

Damage Mechanisms: Dragged anchor / landslide / iceberg / fatigue / stress cracking…

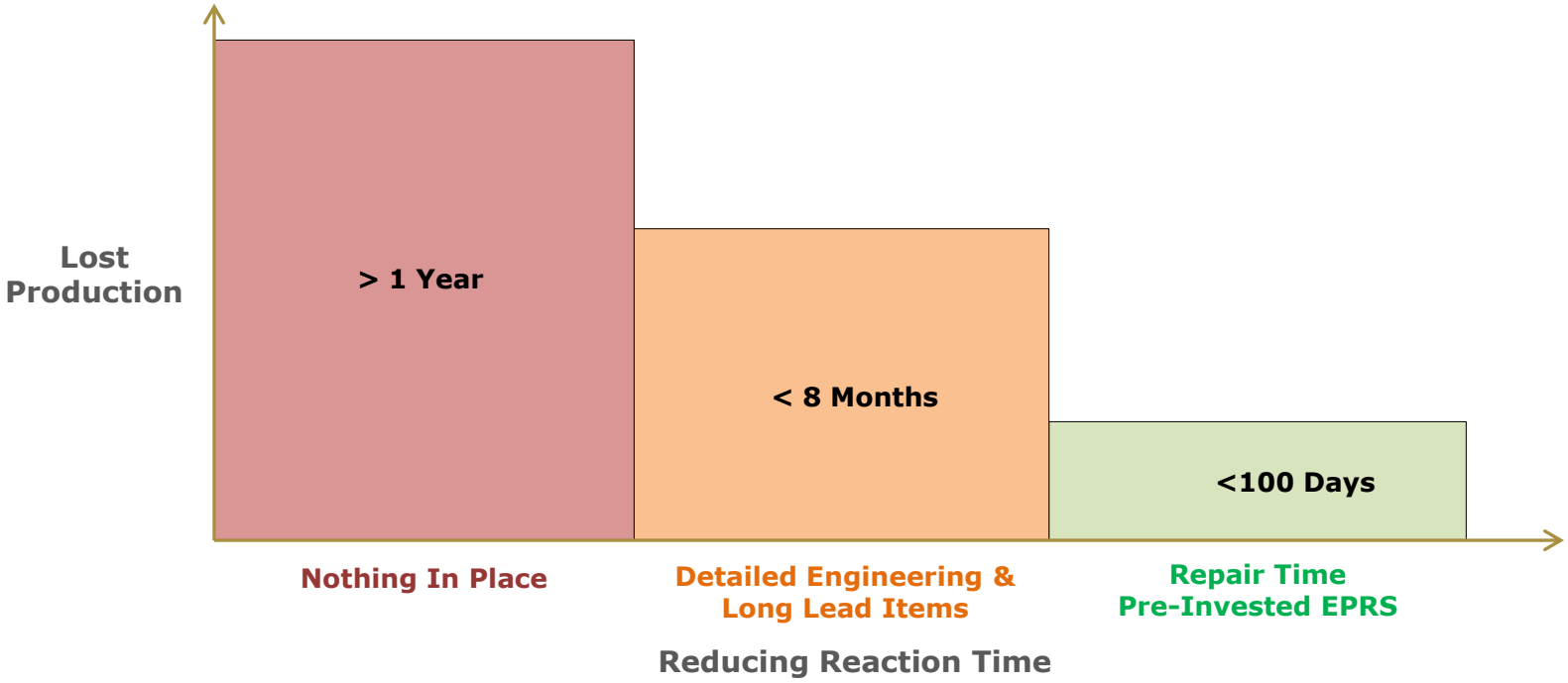
Damaged section may be unpiggable (Buckles / Dents) with or without line rupture.

Sectional Replacement

Following inspection and defect assessment, repair may require replacement of a section of pipeline.

Without double block isolation; need to flood and depressurise line to remove the damaged section and install a new section.

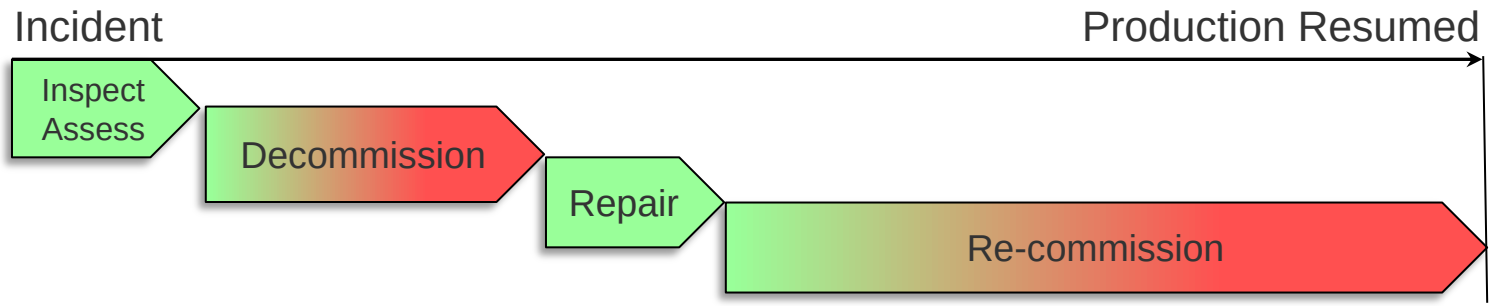
EMERGENCY PIPELINE REPAIR SYSTEM
INVESTMENT BENEFITS – Significant time saving



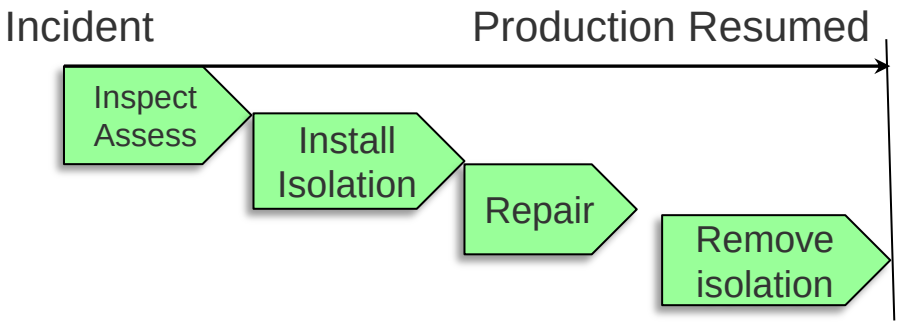
Depending on availability of repair equipment the time to return to service could be between 100days to more than 1 year.

Emergency Pipeline Repair
Out of service time

Without isolation



With isolation

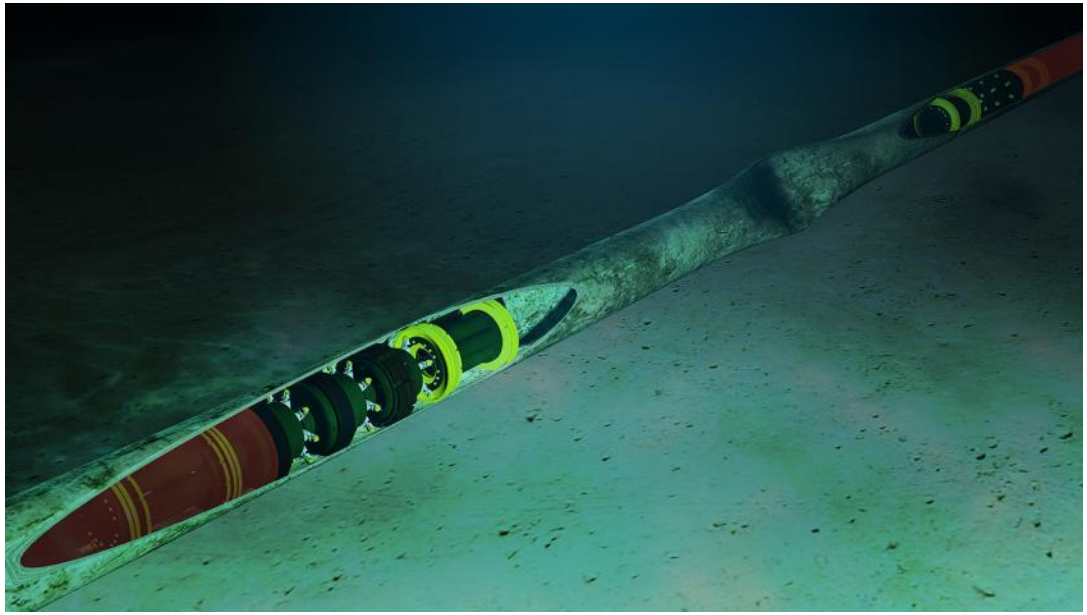


Emergency Pipeline Repair

Isolation - Benefits

Safer worksite / Reduced inventory losses

Minimal discharge to environment

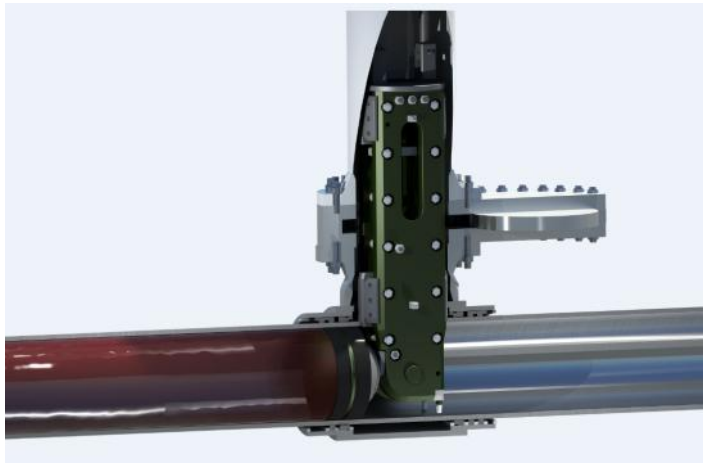


Prevents seawater ingress – Dewatering not required

Time to repair reduced

Pipeline's "Out of Service" period is minimised

Double Block Isolation tools
For unpiggable pipeline defects



BISEP™
(Branch Installed Self Energised Plug)

EPRIS – Tecno Plug™

DNV·GL TYPE APPROVAL CERTIFICATE for Pipeline Isolation Plugs

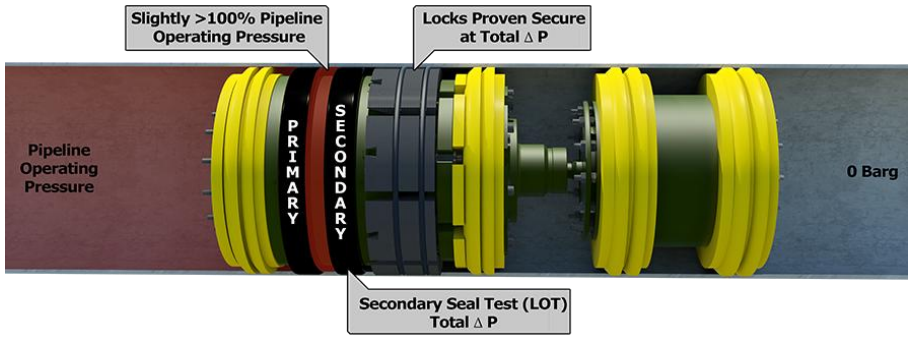
Type Designations BISEP™ and Tecno Plug™

Complying with DNV-OS-F101, DNV-RP-F113 & ASME VIII div. 2

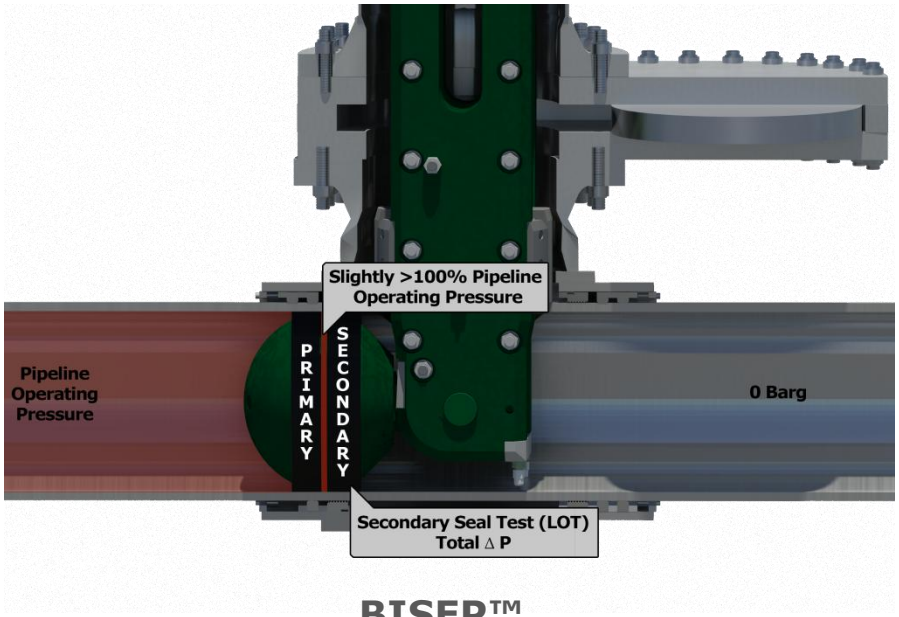
Secondary Seal Integrity Test

Pressure locked in the annulus
Pressure behind vented,

Secondary seal tested with:
Full differential pressure in correct direction



Tecno Plug™

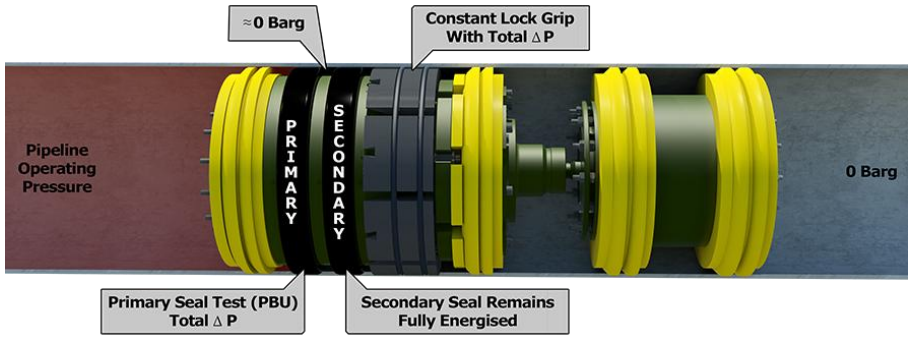


BISEP™

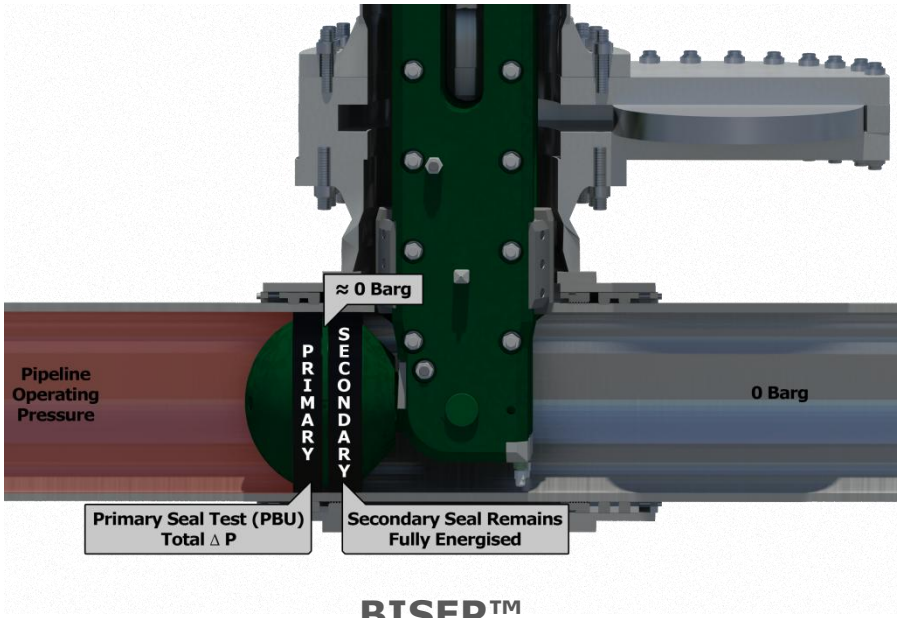
Primary Seal Integrity Test

Pipeline pressure in front
Annulus pressure vented

Primary seal tested with:
Full differential pressure in correct direction



Tecno Plug™



BISEP™

BISEP Tools

Unpiggable pipeline Repair

In some cases, pipeline may not have been piggable even before it was damaged due to lack of pig launchers or receivers or previous dents.

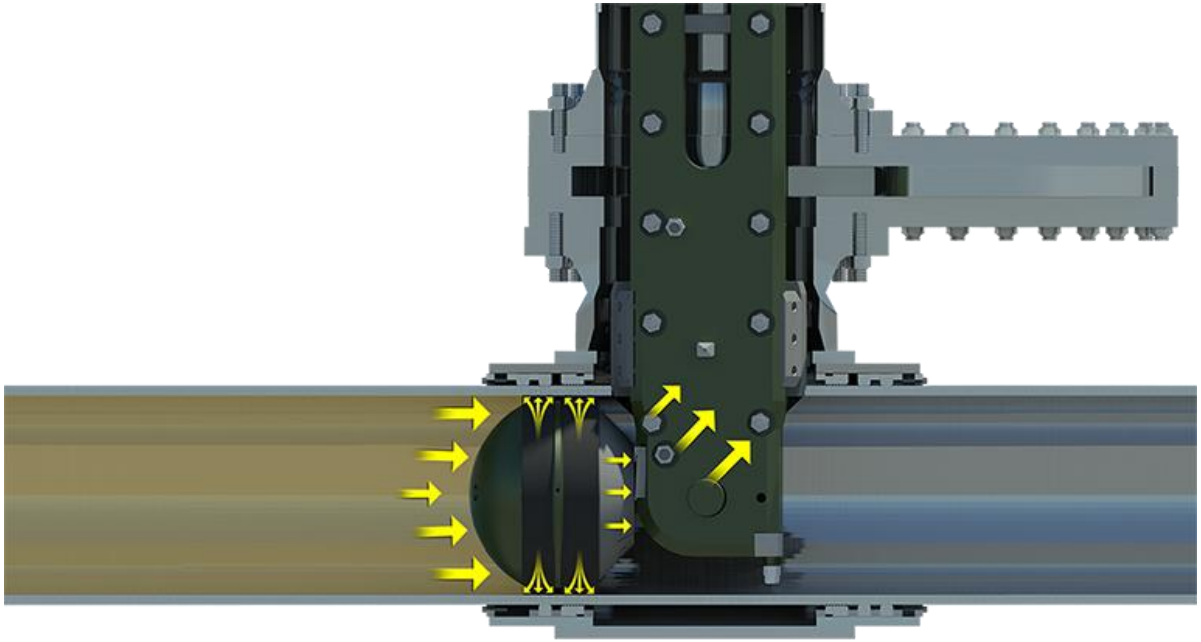
A BISEP™ may also be required to allow installation of temporary or permanent launchers and receivers so that a piggable isolation tool can be deployed into the pipeline

BISEP™ Installation Sequence

18in BISEP™ Isolating Pipeline

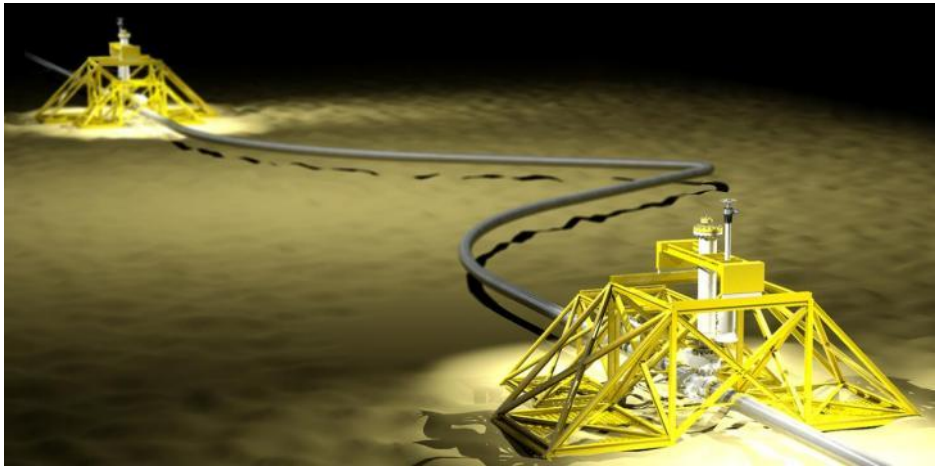
Fail-Safe Isolation
Self-Energisation

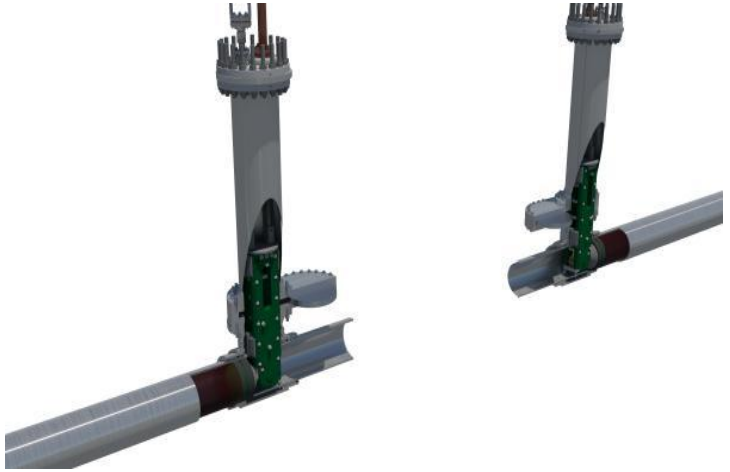
- Pipeline differential pressure across BISEP™ activates seals independent of hydraulics
- Hydraulic set pressure ensure two independent activation mechanisms
- Seal support head bears on two solid clevis arms, each one capable of taking the full load (100% contingency)
- Clevis arms are axially retained by the hot tap penetration and fitting



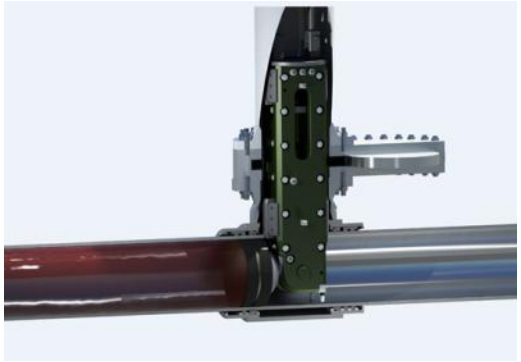
BISEP™ Self-Energisation

BISEP
midline Repair





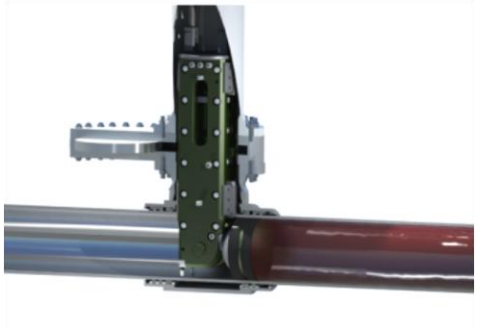
With the isolation tools installed and tested.



Cut out damaged section

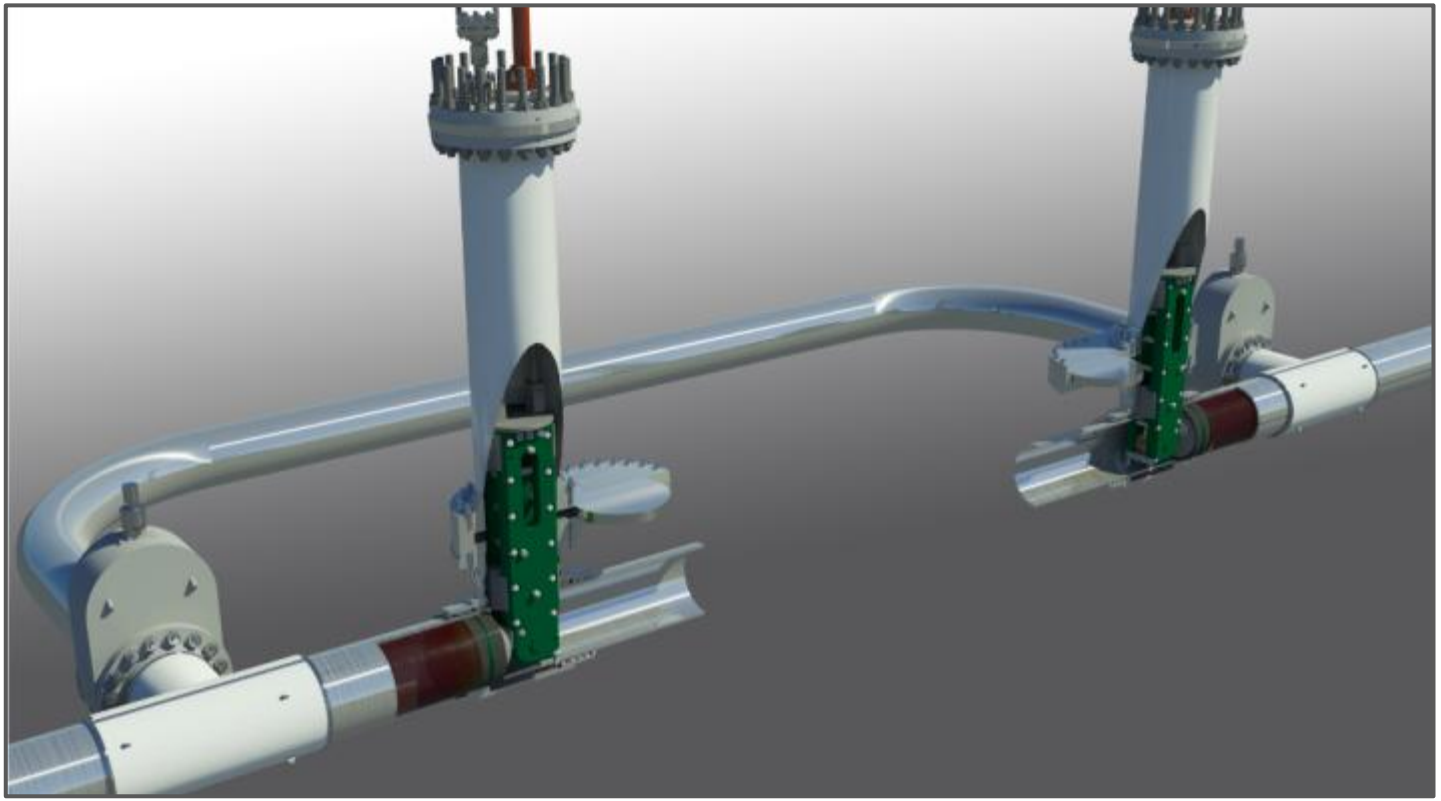
Install replacement section.

Bypass option for continuous production



BISEP™

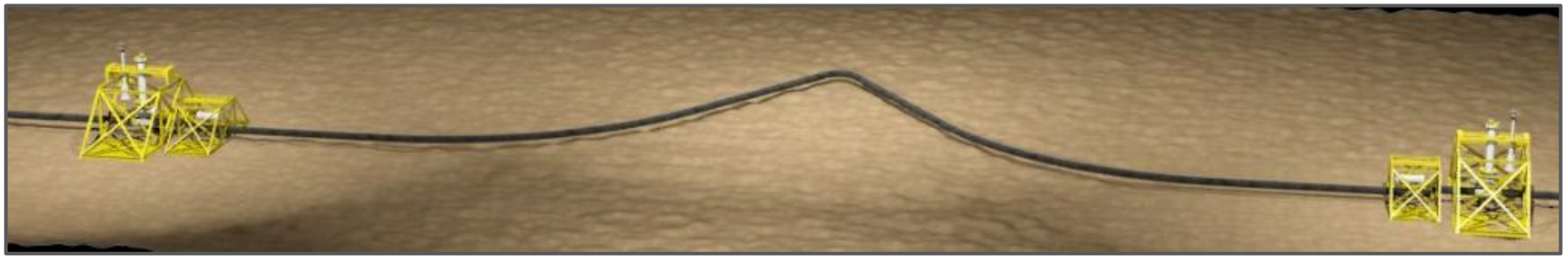
Midline Repair – Continuous Production



Midline DBB Isolation With Bypass
Repaired Without Stopping Production

Unpiggable Defect Repair

Hot Tap Penetrations Removed



EPRIS - Isolation Tools

Case Study – EPRIS for client in Qatar

Tecno Plugs Developed to be pigged towards an unpiggable line defect – from both sides or to pass through a dent (less than 10%).

Isolation Plugs for 32” 34” 38” Pipelines (Two Plugs for each line)

Subsea Control and Monitoring

Topside winch drum with subsea antenna cable

Down line OPTION

Remote Communication Console

Acoustic OPTION

Topside acoustic modem deck box

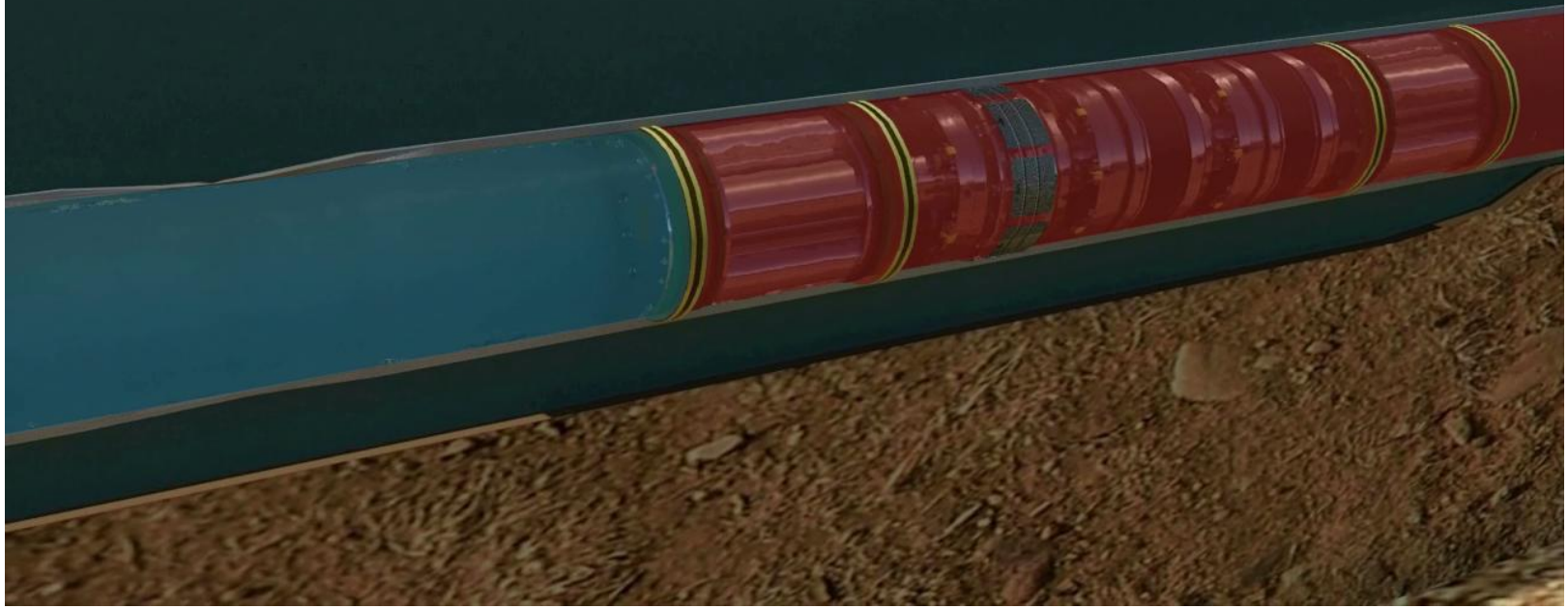
Acoustic Thru-Water Link

Subsea cable down line

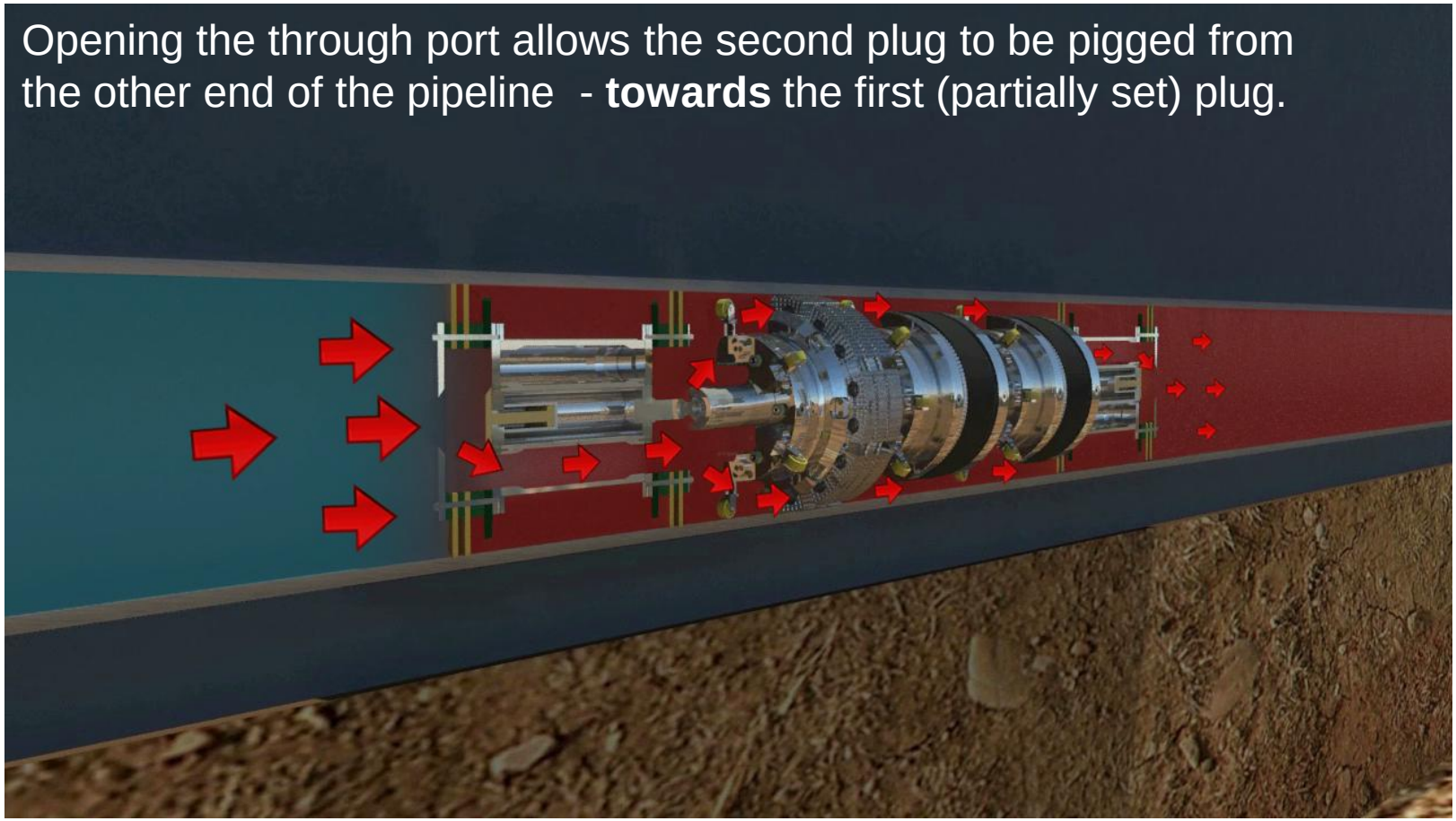
Subsea ELF Antenna
Thru-Pipe wall communication
(oil filled pressure compensated)

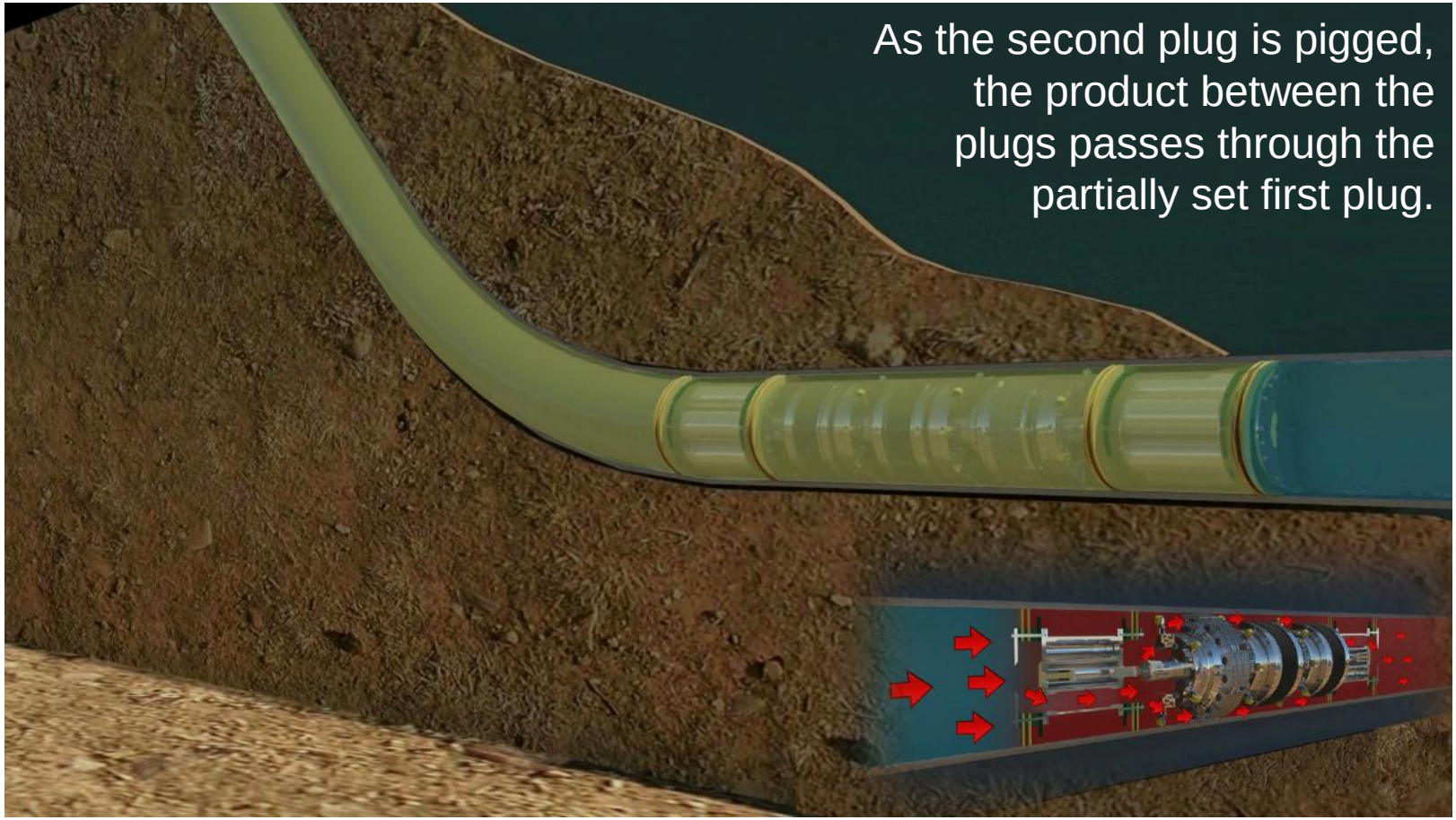
Before reaching the line defect the plug is partially set (locks only)

Through port vent opened.

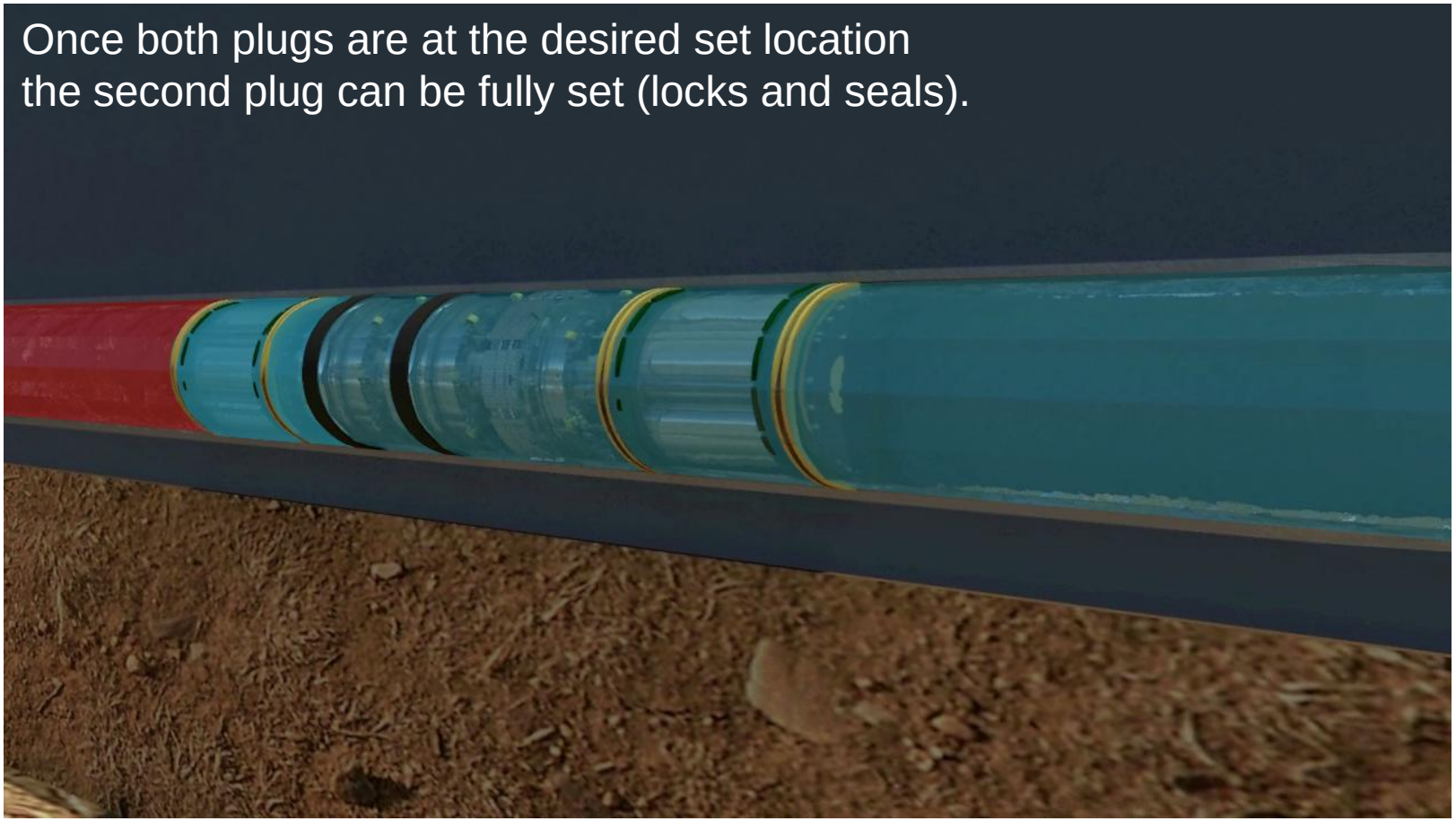


Opening the through port allows the second plug to be pigged from the other end of the pipeline - **towards** the first (partially set) plug.

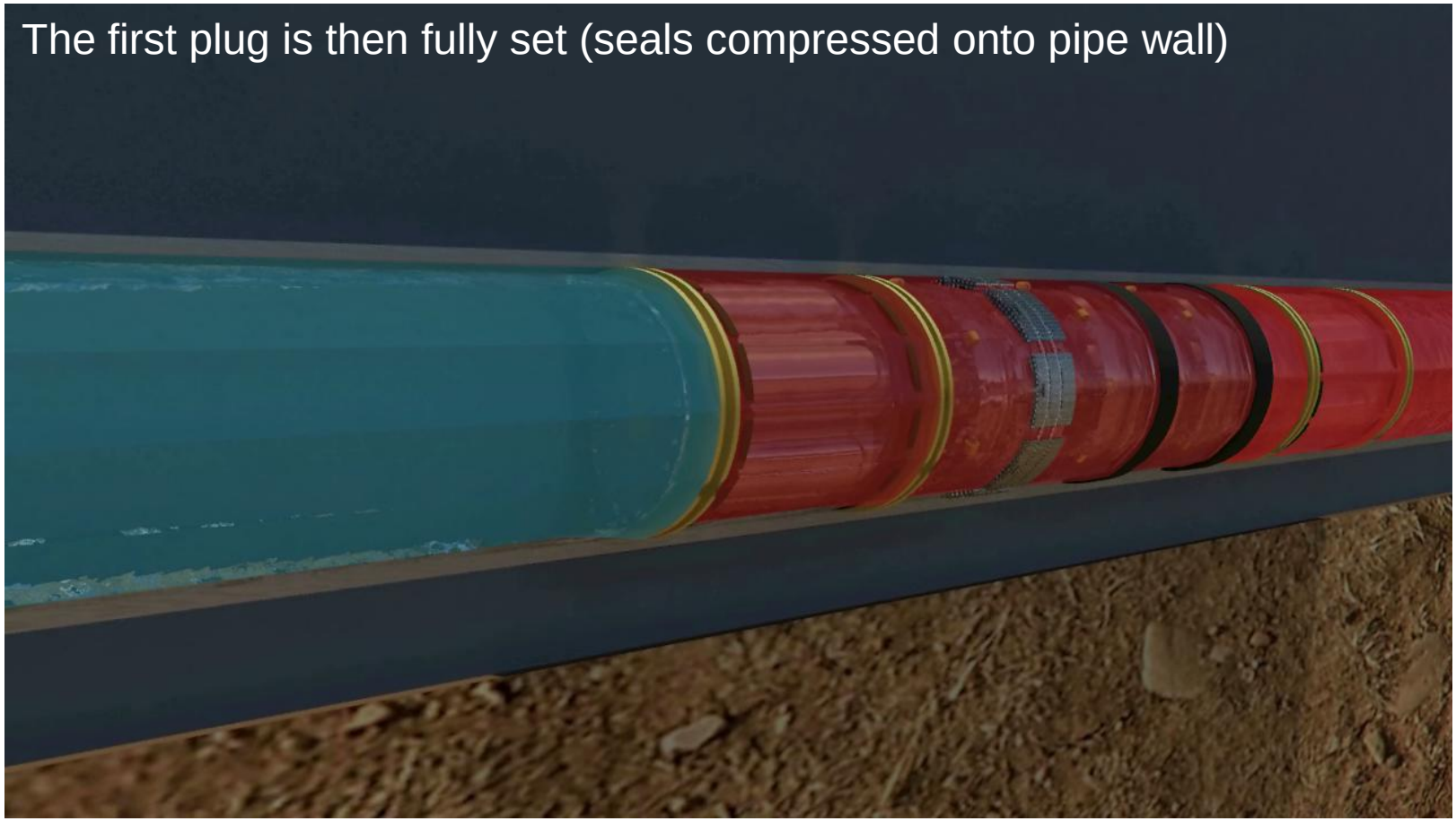



As the second plug is pigged, the product between the plugs passes through the partially set first plug.

Once both plugs are at the desired set location
the second plug can be fully set (locks and seals).

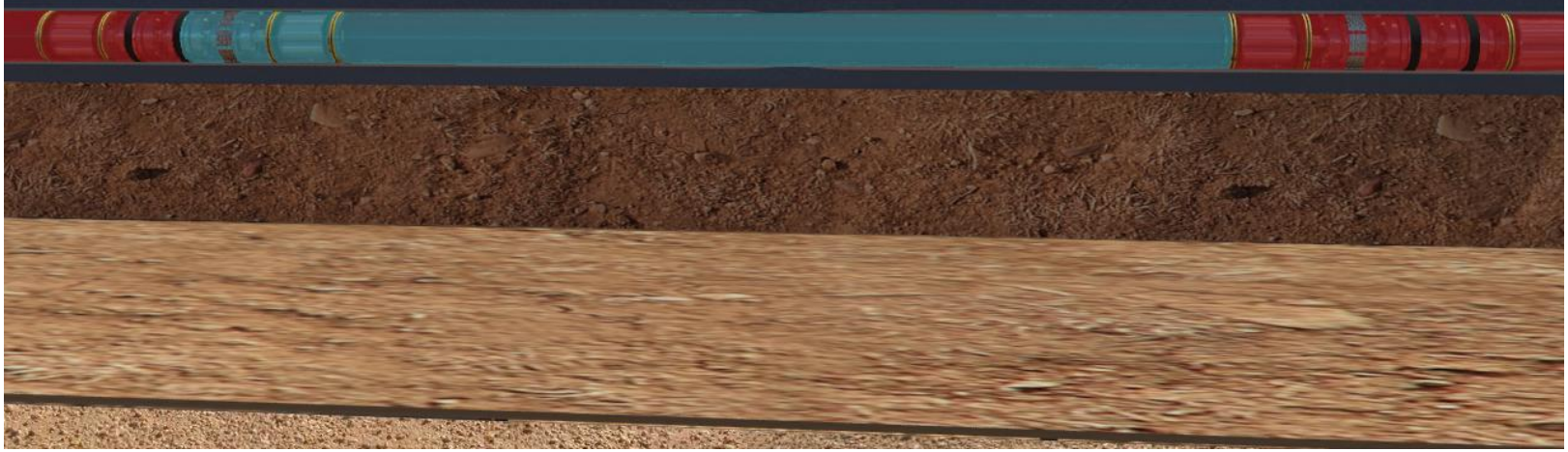


The first plug is then fully set (seals compressed onto pipe wall)

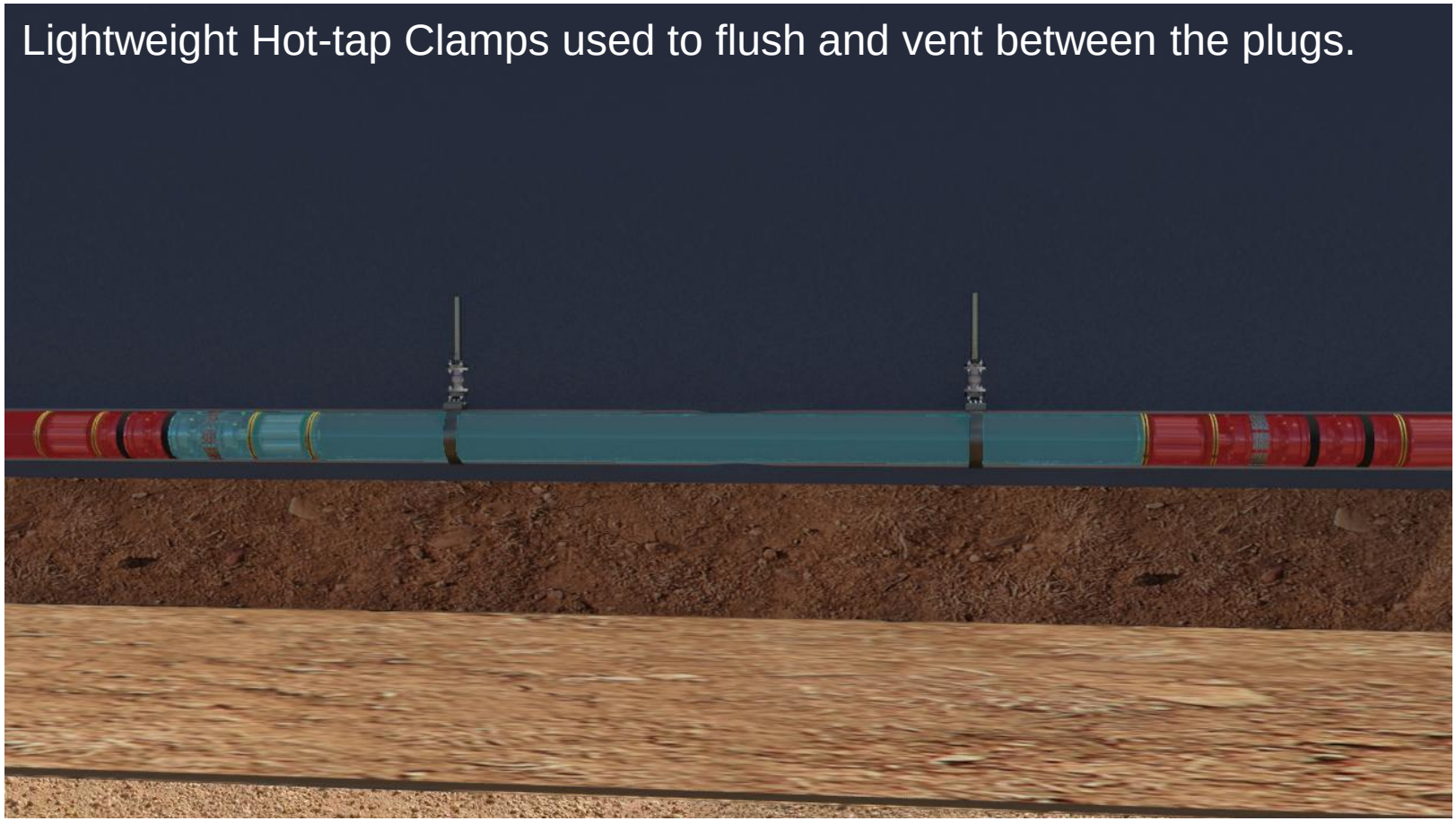


The damaged section of pipeline is now isolated.

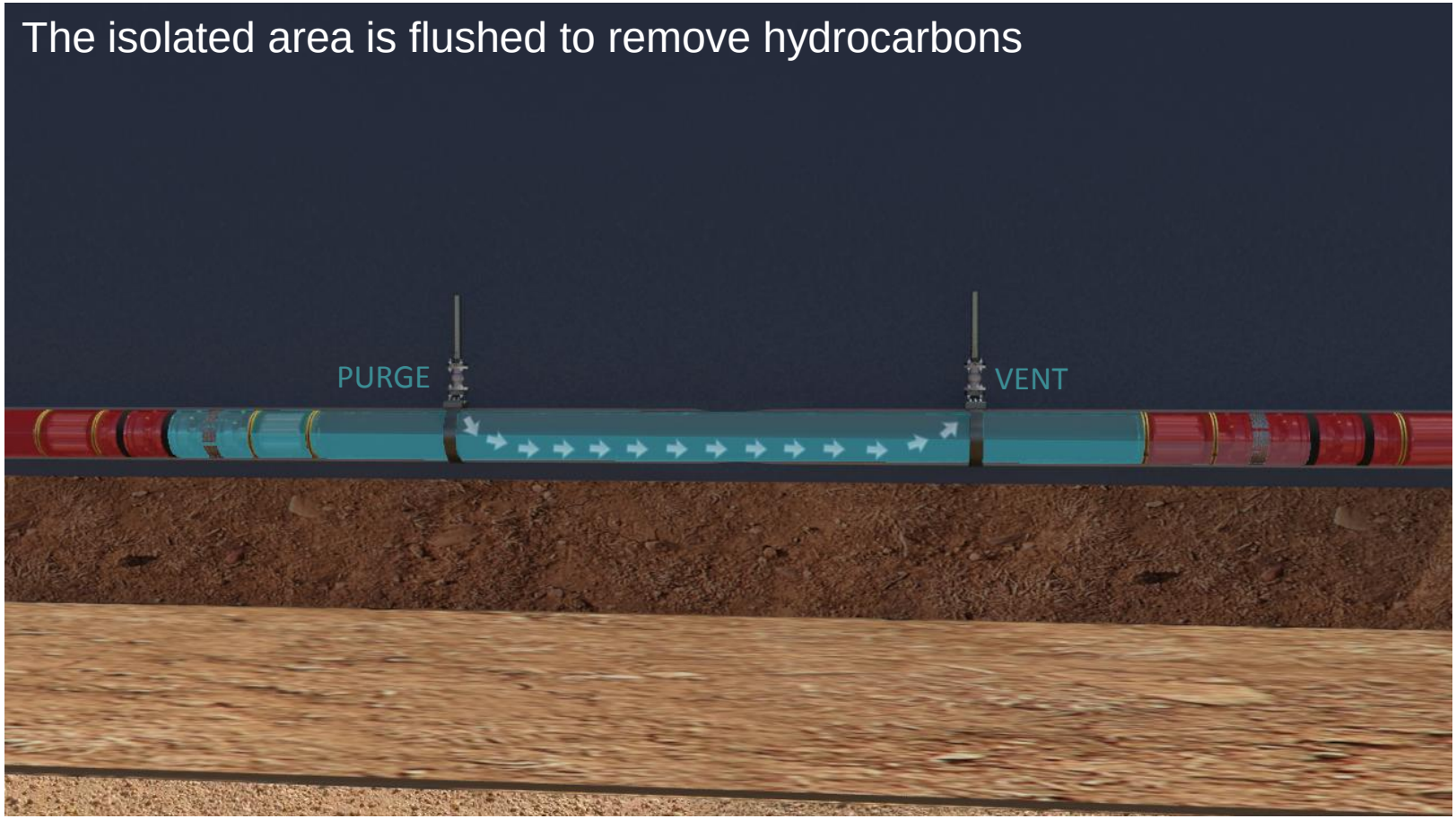
Double Block Isolation of both plugs is proved.



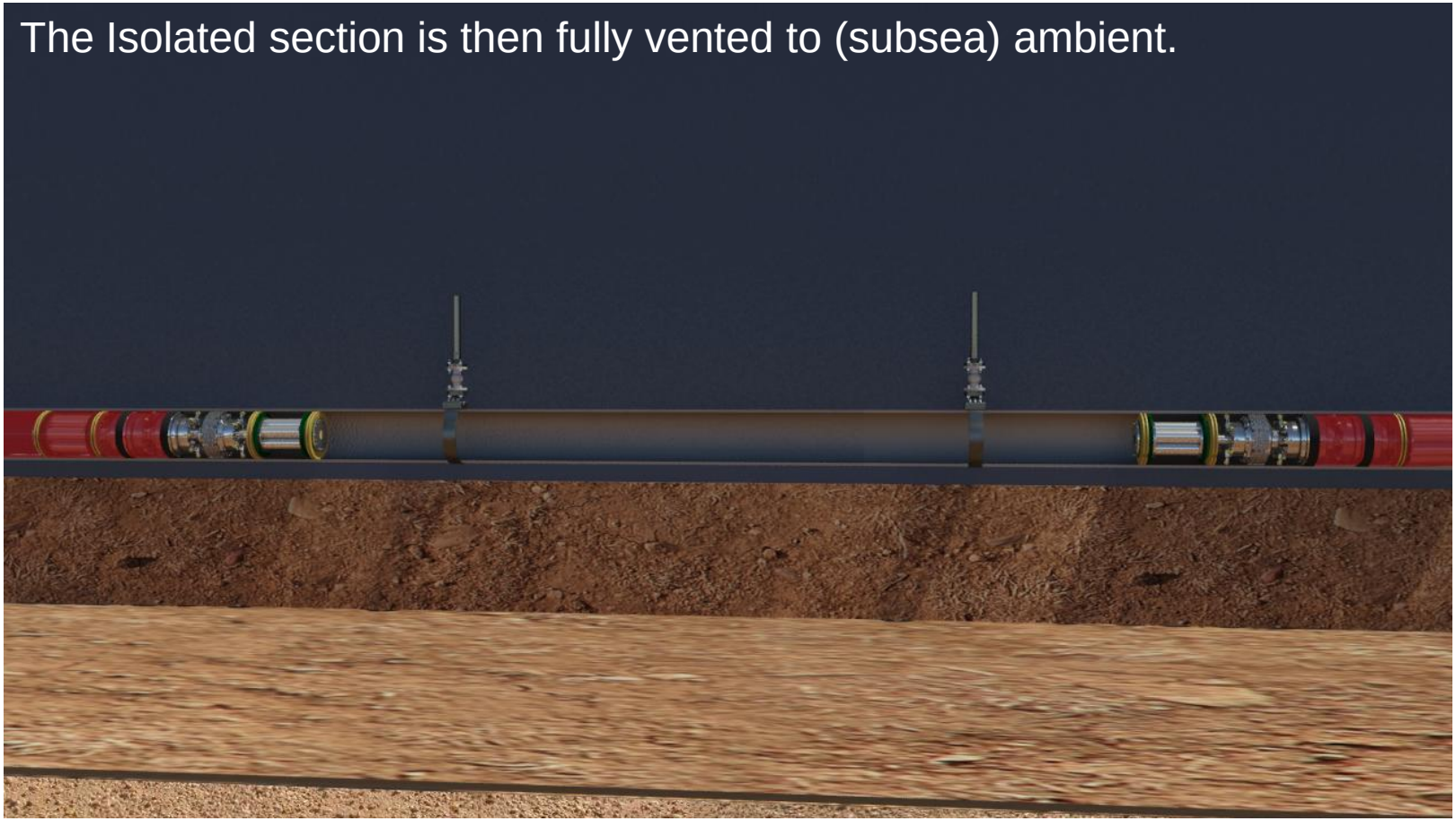
Lightweight Hot-tap Clamps used to flush and vent between the plugs.



The isolated area is flushed to remove hydrocarbons

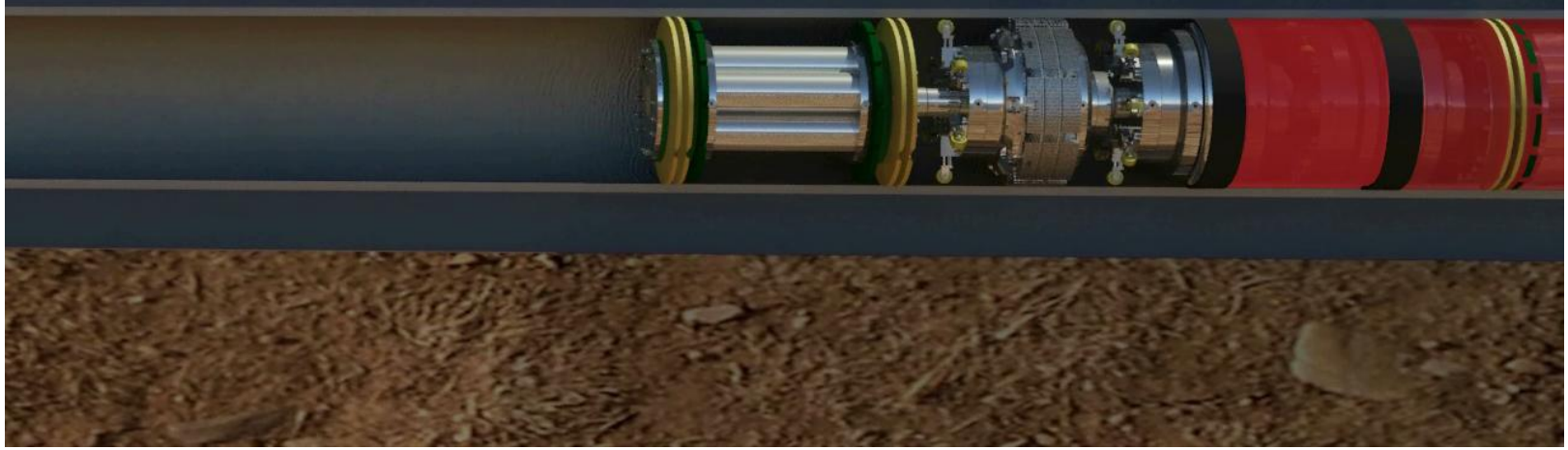


The Isolated section is then fully vented to (subsea) ambient.



Pressure between the seals is monitored to prove the Secondary seal.

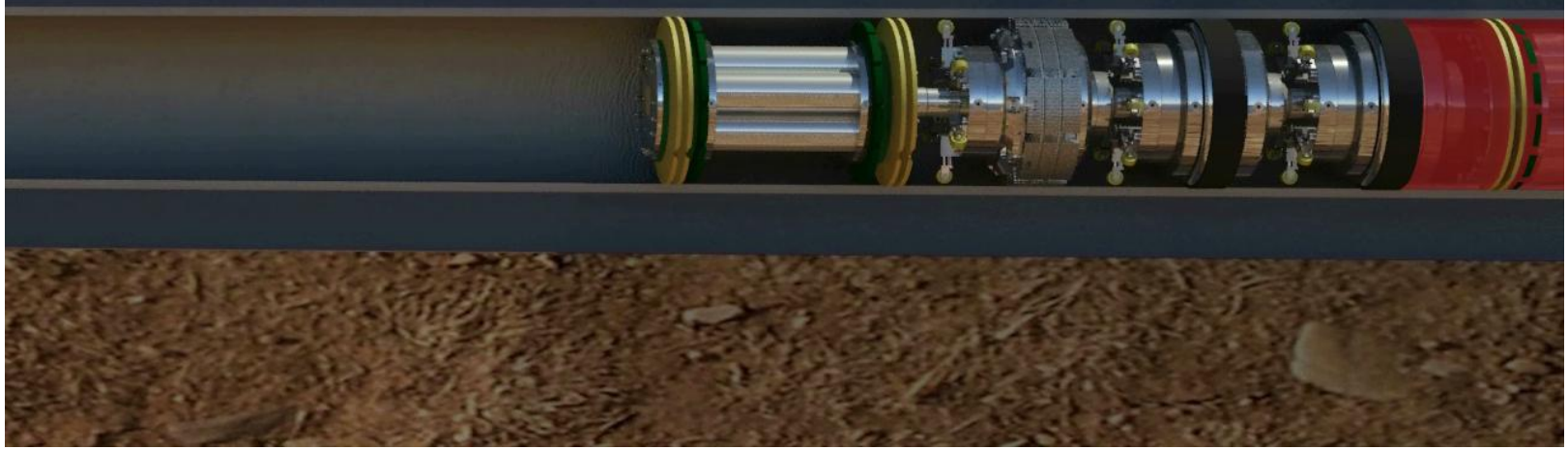
Secondary seal tested with full pressure in the correct direction.



Annulus between the seals is vented to produce a zero energy zone.

Pressure build up test of annulus proves primary seal isolation.

Primary seal is tested with full pressure in correct direction.



Pipeline repair work is carried out.

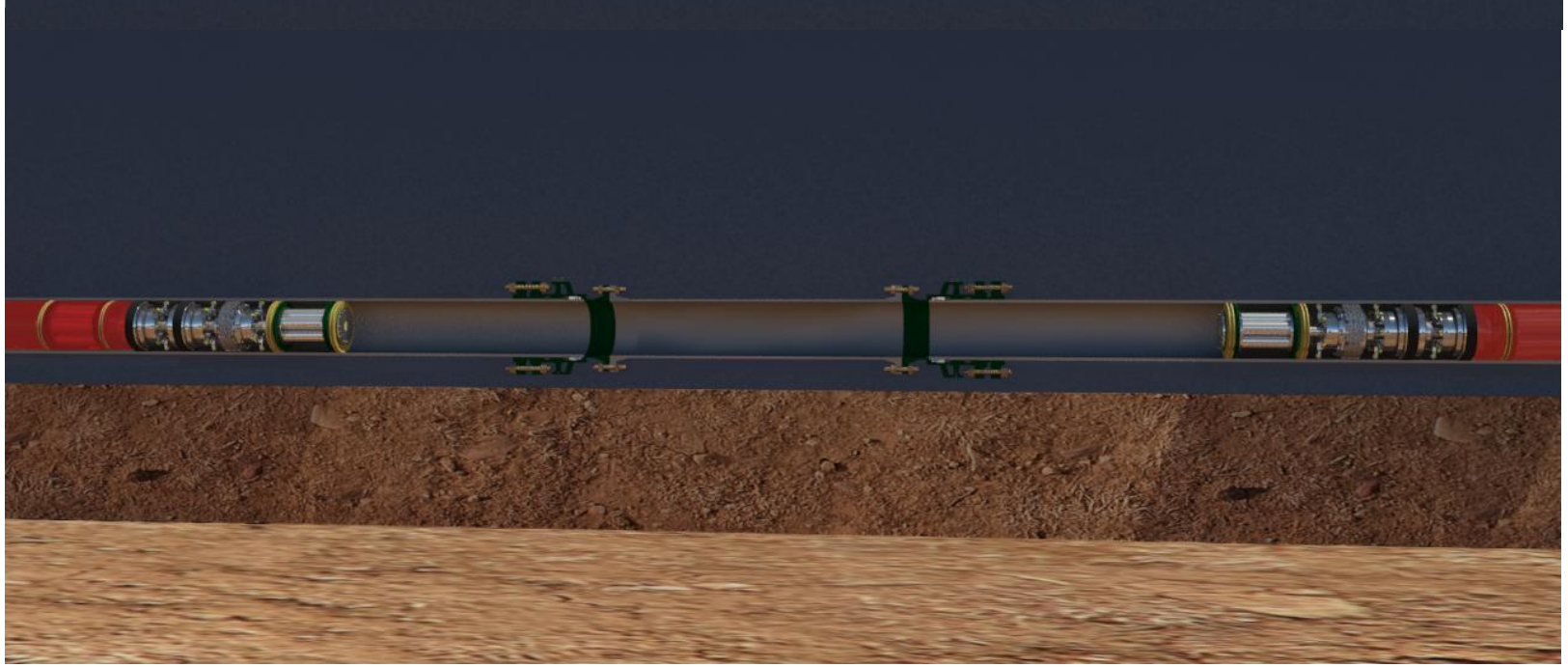
Line is not flooded

Inventory is not lost.

Environment is not contaminated

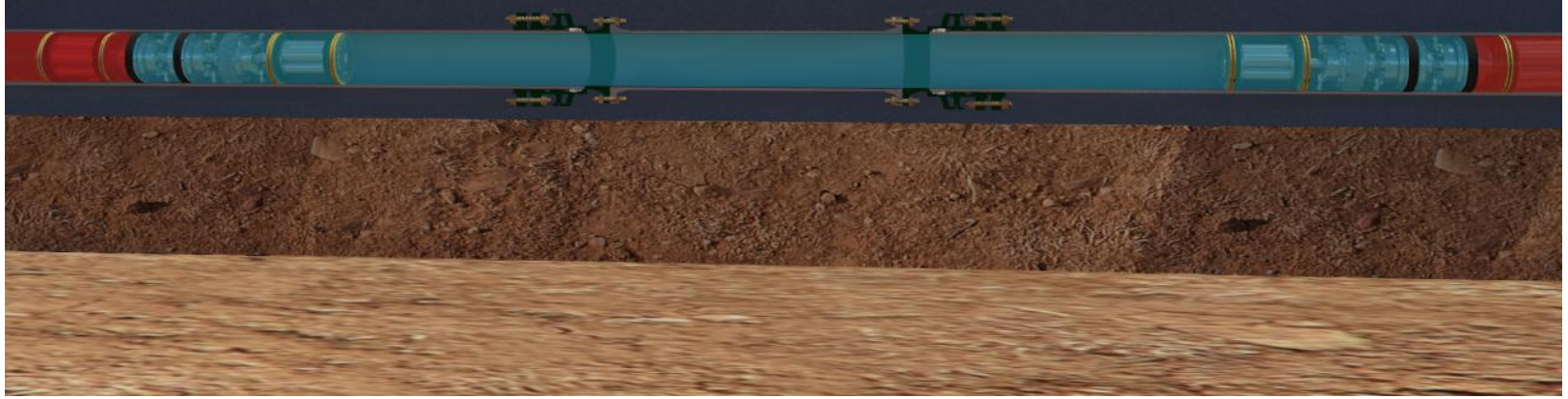
New section of pipe installed

Using mechanical connectors or hyperbaric weld.



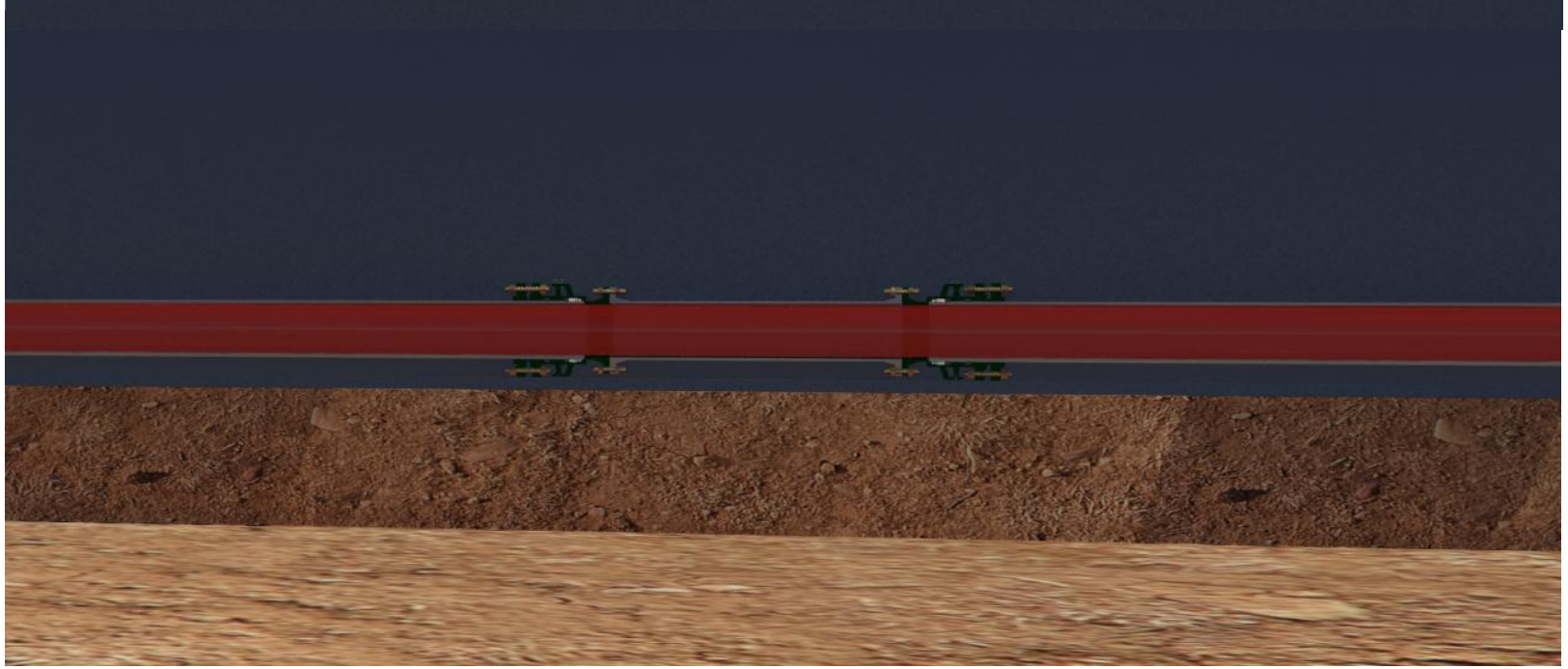
Leak test the repair

Equalise pressure and unset both plugs



Pig both plugs back to one end of the pipeline using production flow.

Remove from receiver



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Thank You For Your Attention

Q&A

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