



**STATS GROUP**  
Process & Pipeline Integrity Solutions

## **Emergency Pipeline Repair Isolation Systems Developed to Facilitate Pipeline Repair of Unpiggable Defects**

PPSA  
14 November 2012  
Dale Millward



## **What will be Presented**

Definition of Double Block & Bleed isolation and testing requirements

Overview of Tecno Plug™ and BISEP™ isolation tools

Developments in isolation technology for Emergency Pipeline Repair of unpiggable defects

### **Animations**

- BISEP™ isolations for unpiggable defect repair
- Newly developed Tecno Plug™ isolations for unpiggable defect repair



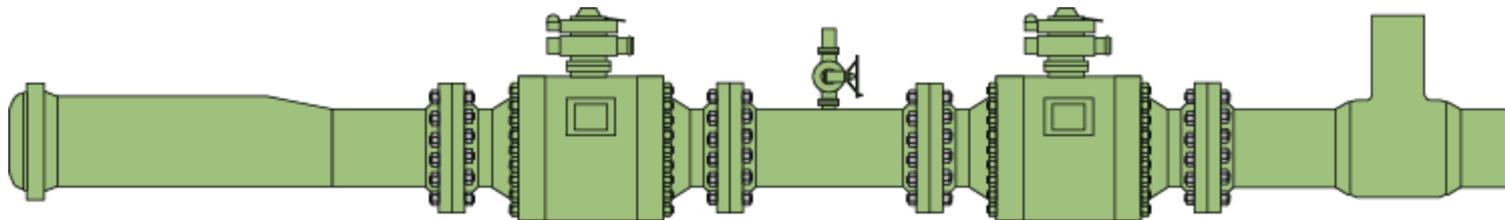
## Definition Double Block & Bleed Isolation

"Double Block and Bleed" defines a method of achieving isolation from a pressurised or hazardous medium to allow safe breaking of containment for maintenance, repair or modifications.

The UK Health and Safety Executive guidance document:

The Safe Isolation of Plant and Equipment defines Double Block and Bleed (DBB) as:

***"an isolation method consisting of an arrangement of two block valves with a bleed valve located in between."***





## **Proved Double Block & Bleed Isolation**

A **proved DBB isolation** exists where the sealing integrity of two separate isolation barriers are proven before the isolation is relied upon.

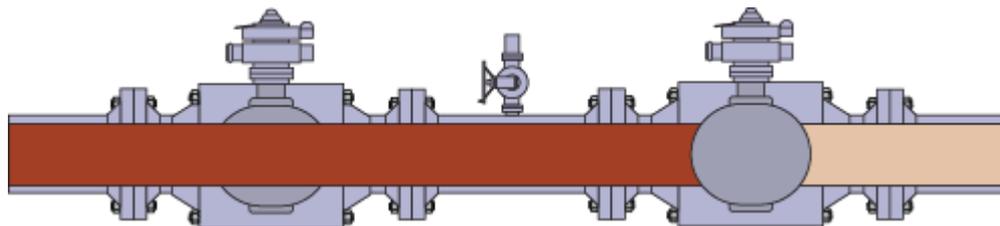
- Each part of the isolation should be proved separately
- BOTH isolation seals must be proven using full isolated pressure in the correct direction



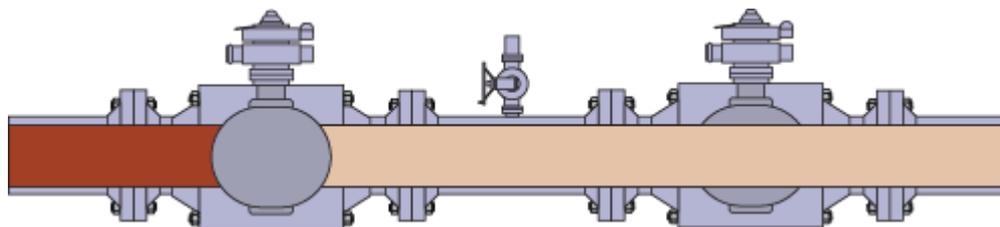
## No Single Failure

### Double Block: i.e. No single isolation barrier failure will affect Worksite

Failure of primary valve would only allow pressure to enter the bled/monitored zone between the valves. *Second proven valve will prevent any hydrocarbons from affecting the worksite.*



Failure of secondary valve would only open the ambient void to the work site offering no direct risk. *Primary valve will prevent any hydrocarbons from affecting the worksite.*





## Monitoring and Control

After testing both seals the void between the seals should be:

- Vented to provide a ZERO ENERGY ZONE
- Monitored periodically for any pressure rise
- Be able to vent any potential pressure build up

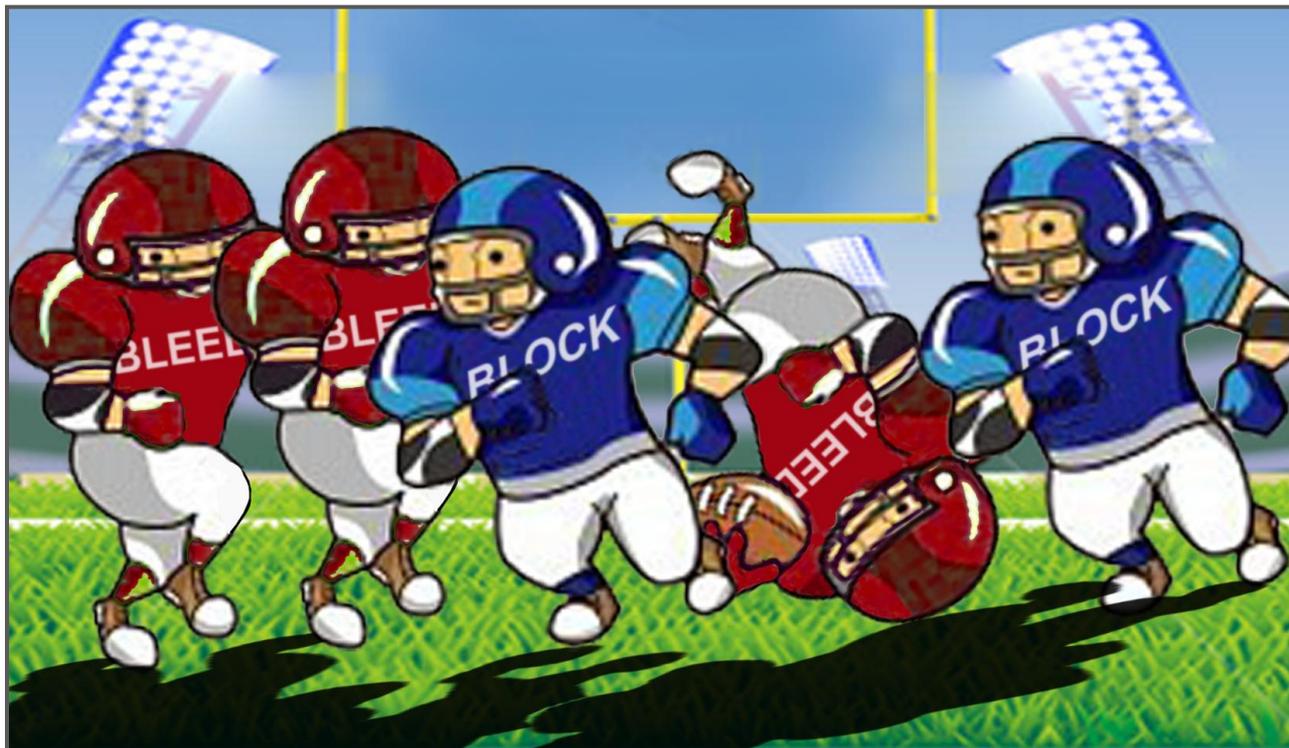
This will ensure any pressure build up from a passing primary valve is detected and vented to a safe area, whilst being retained by the secondary valve. *Preventing any hydrocarbons or pressure from affecting the worksite.*

BP – Guidance on Practice for Safe Isolation and Reinstatement of Plant specifies:

*"Double Block and Bleed consists of the closure of two block valves in series with an intermediate bleed valve. The integrity of both valves shall be tested separately and the bleed valve will then be left in the closed position between periodic integrity checks."*



## DBB Simple in principle more complicated in practice



The reality is that that most of the time two leak tight valves are not available and Double Block and Bleed Isolation can not be achieved or be proven.



## Tecno Plug™

### Dual Seal Isolation Plug

Provides two independently testable seals with a vented monitored zero energy zone between the seals

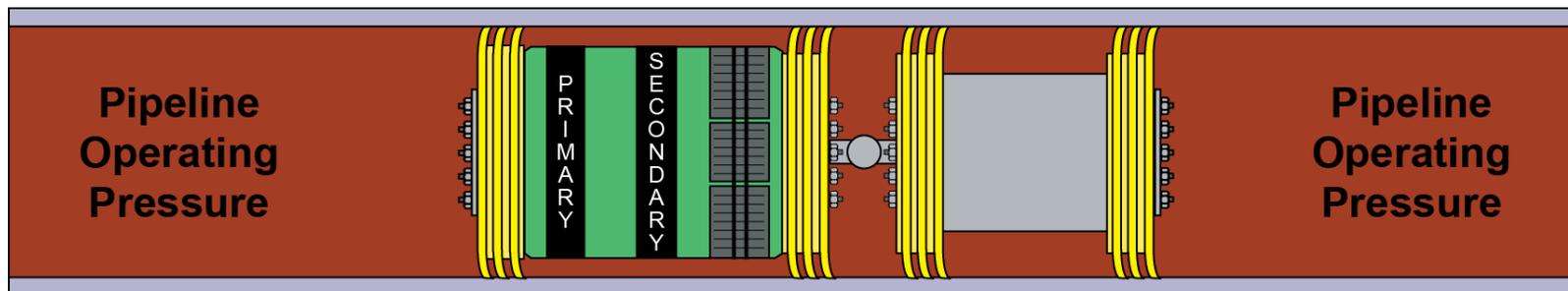


**36in Remote Tecno Plug™**



## Double Block Verification Seal Testing Sequence

Prior to setting the plug the pipeline pressure will be equal on both sides of the plug

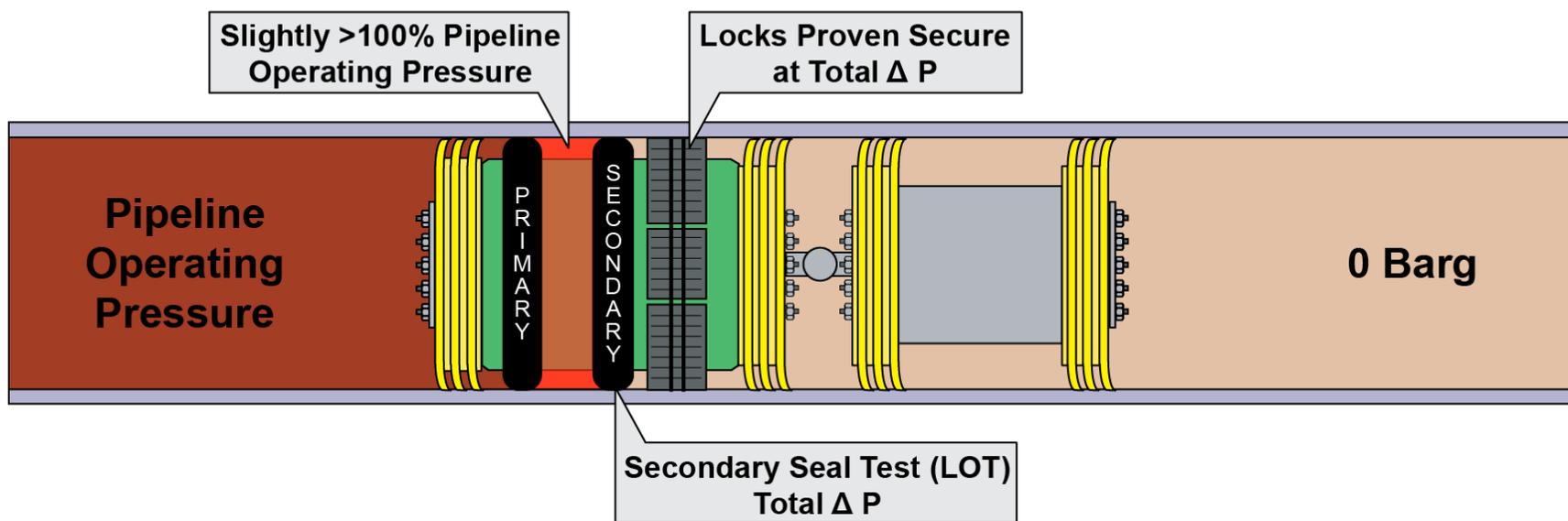




## Secondary Seal Verification Full Differential Pressure Leak Off Test

- During secondary seal test annulus pressure slightly above pipeline pressure
- Pressure between seals is monitored for pressure leak off
- Secondary seal integrity proven with full differential pressure

### Secondary Seal Integrity Test Leak Off Test (LOT)

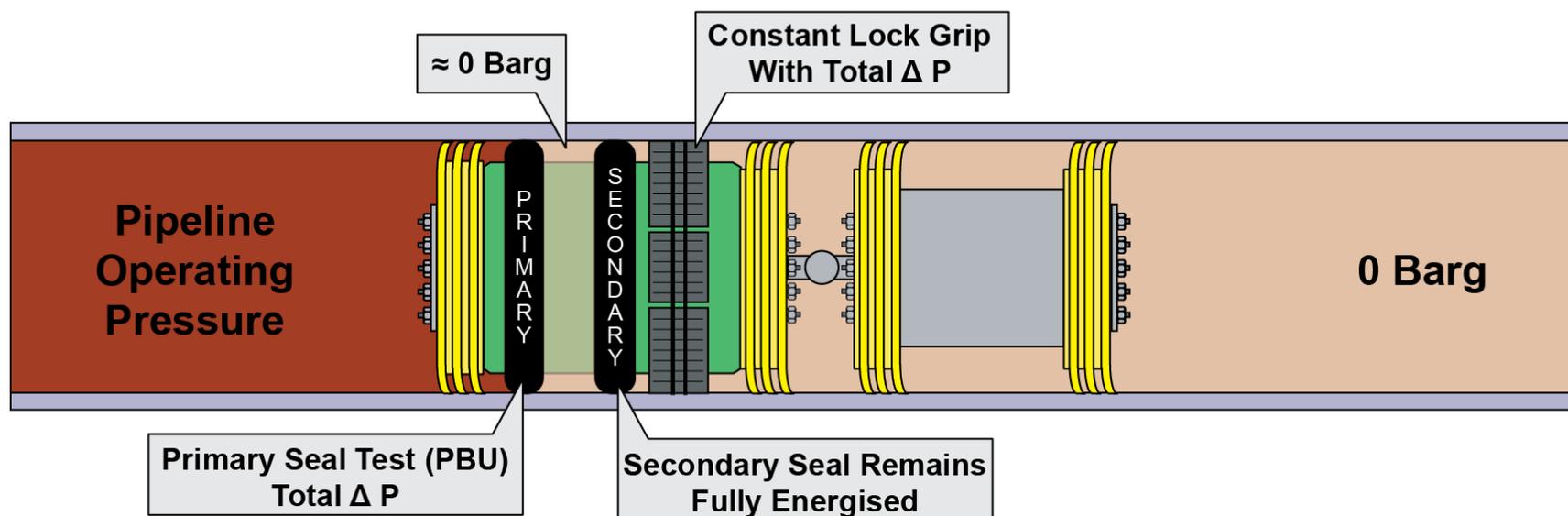




## Primary Seal Verification Full Differential Pressure Build Up Test

- Annulus pressure vented to ambient (small volume vented to upstream side)
- Pipeline pressure is at full isolation pressure
- Annulus between seals is monitored for pressure build up
- Primary seal integrity proven will full differential pressure
- Throughout isolation period a Zero Energy Zone is provided between two fully proven seals

### Primary Seal Integrity Test Pressure Build Up Test (PBU)





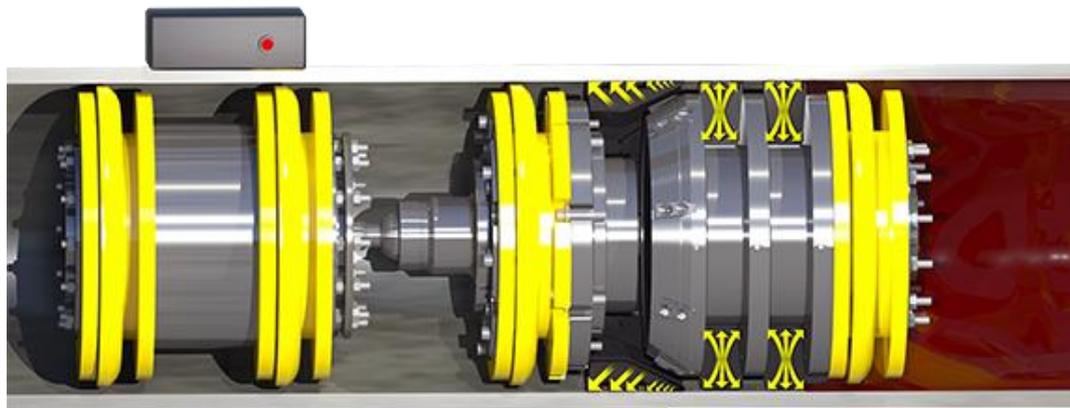
## **Self-Energisation Isolation Fail-safe Feature**

Self-energisation feature maintains safe isolation while differential pressure exists across the tool

The Tecno Plug™ has two separate activation mechanisms:

- 1) Both seals and locking grips fully energised by pipeline pressure
- 2) Both seals activated and locks held in place by the integral hydraulics

Both separate activation mechanisms need to be removed to unset the plug



**Tecno Plug™ Self-Energisation**



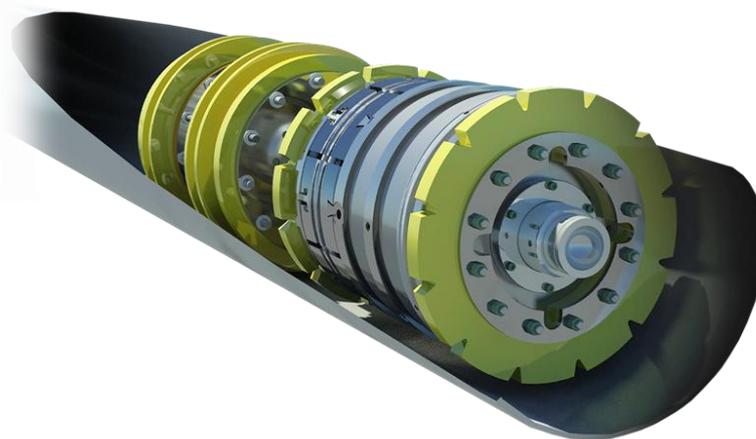
## **Passive Unset** **Fail-safe Unset and Recovery Feature**

In the unlikely event of control system failure or possibly flat batteries:

Passive unset design ensures isolation integrity is maintained and the Tecno Plug™ is always recoverable upon job completion.

NB: Isolation cannot be unset until the breaking containment operation is completed and the pressure behind the plug is raised to pipeline pressure.

Hydraulic system override releases the tool setting mechanism when pressure is equalised.  
*The plug will then passively unset – without an active control input*



**Remote Tecno Plug™ - Unset**



## Tecno Plug™ Isolation Projects

38in Remote Tecno Plug™ | Ras Laffan Facility, Doha, Qatar

> Gas pipeline isolation for removal of 2" bypass branch connected to a 38" ESDV

2 off 36in Remote Tecno Plugs™ | MLNG-Dua, Bintulu, East Malaysia

> Pipeline isolation operations facilitates Kumang Cluster onshore tie-in project

36in Remote Tecno Plug™ | Dol 2 Platform, North Field, Qatar

> Double-block isolation facilitates 36" valve maintenance activities

24in Remote Tecno Plug™ | Dunlin Alpha Platform, North Sea, UK

> Double-block isolation facilitates valve change out activities



36in Remote Tecno Plug™ Deployment Malaysia



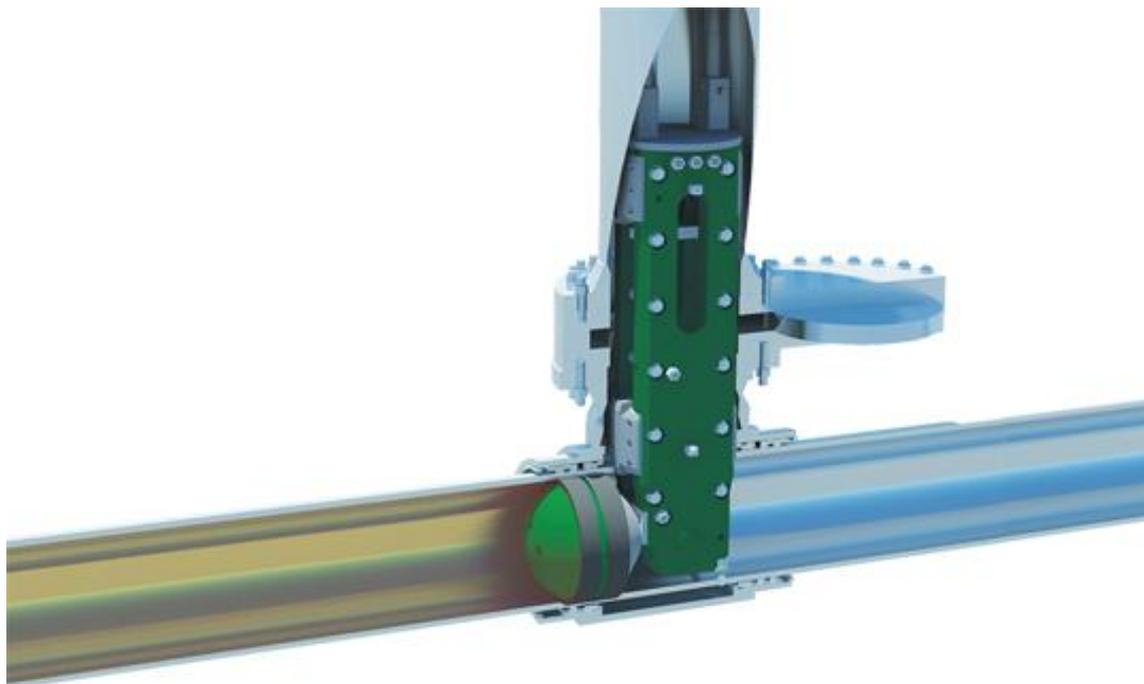
38in Remote Tecno Plug™ Qatar



## **BISEP™** **Branch Installed Self-Energised Plug**

The BISEP™ is a Double Block and Bleed line stop tool which has been developed and patented by STATS Group

It uses Tecno Plug™ seals mounted on a spherical head to provide the dual barrier isolation



**BISEP™ - Double Block & Bleed Isolation**



## **BISEP™ Set Sequence**

- Can be deployed into flowing line
- Head rotated towards pressure threat
- Once fully rotated, seals are activated
- Gradual setting of seals ensures a controlled flow termination

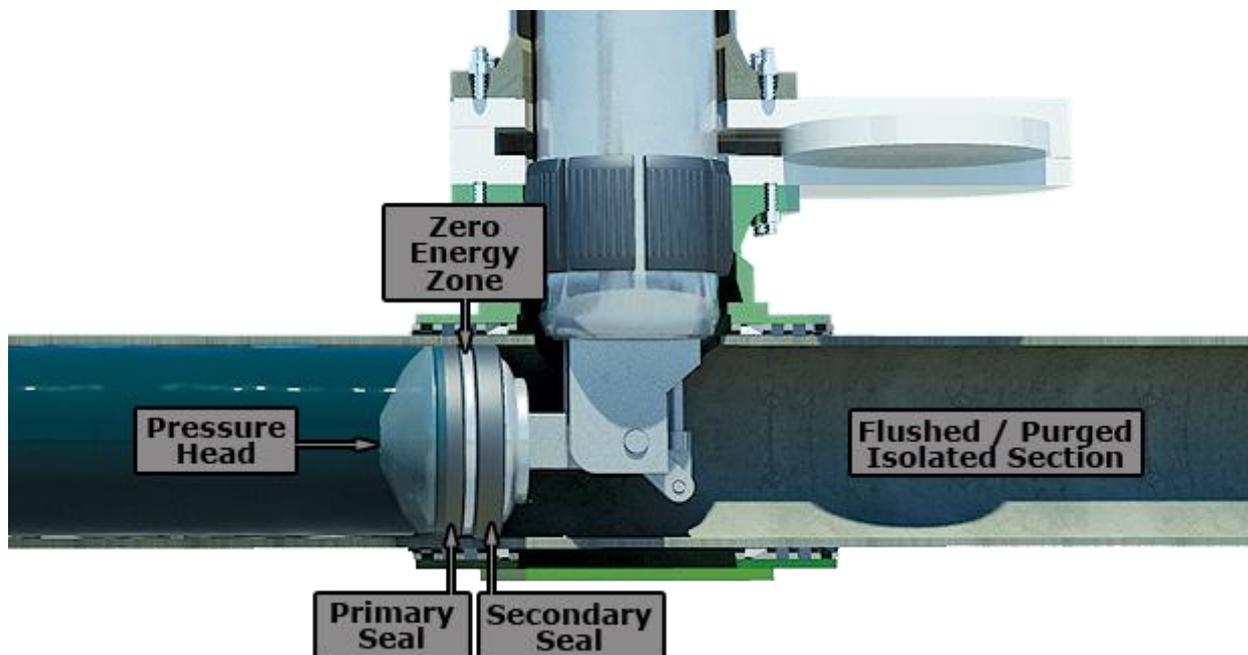


**BISEP™ Set Sequence**



## Double Block & Bleed Verification Tests

- Once isolated section is vented, BISEP™ has full pressure differential across it
- Annulus between seals can be pressurised, or depressurised to test seals
- Secondary seal test – full pressure, correct direction
- Primary seal test – full pressure, correct direction
- Zero Energy Zone between seals

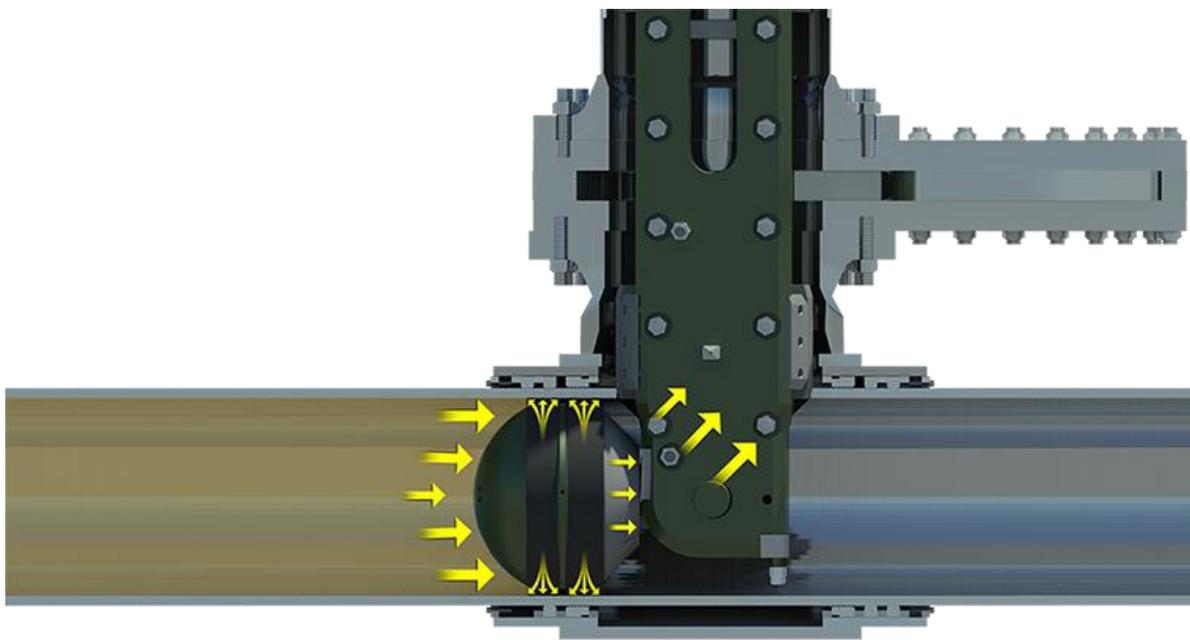


**BISEP™ Double Block Verification**



## Fail-Safe Features Self-Energisation

- Pipeline differential pressure acting across BISEP™ head activates seals independent of hydraulics
- Hydraulic set pressure to 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

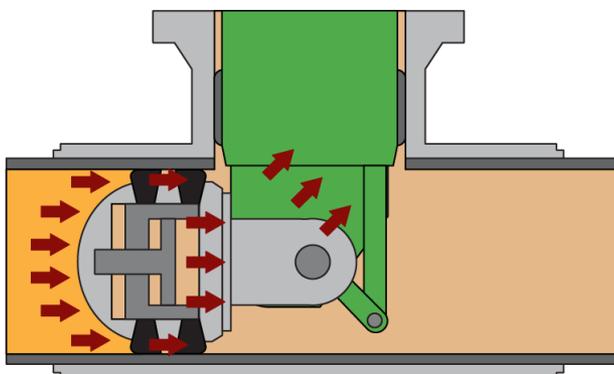


**BISEP™ Self-Energisation**

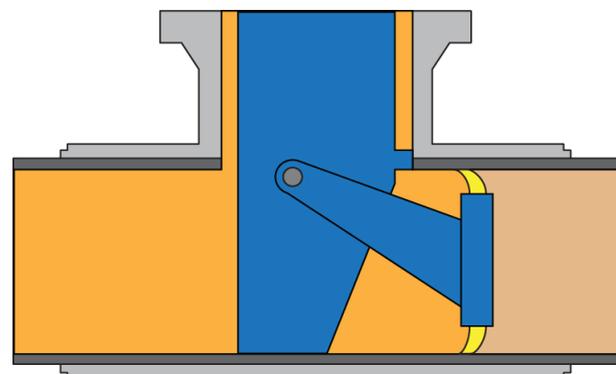


## BISEP™ Summary

- Hot tap deployed double block and bleed isolation tool
- Technology significant advancement on conventional line stopping lip seal tools
- Sealing technology based on Tecno Plug™ sealing – extensive track record
- Back pressure capability for pressure testing the reinstated pipework
- Leak tight sealing on pitted corroded surfaces– compression seals
- Deployed upstream of fitting – vent and purge operations can be performed through launcher
- Fail-safe: Self-energised sealing
- Monitor capability during isolation



**BISEP™ Load Diagram**



**Lip Seal Diagram**



## BISEP™ Examples

30in BISEP™ | Cassia A Platform, Trinidad

> **Isolation allows replacement of 30" ESD Valve**

18in BISEP™ | Sullom Voe Terminal, Shetland, UK

> **Isolation of 18" bypass line allows removal of dead leg**

Two 14in BISEP™ | Galeota Point Terminal Facility, Trinidad

> **Crude oil pipeline isolation allows piping spool tie-in**

10in BISEP™ | Brent Bravo & Delta Platforms, North Sea, UK

> **Thirty-two cell fill line replacements within utility shaft of platforms**

6" BISEP™ | Theddlethorpe Terminal, England, UK

> **BISEP™ isolation facilitates valve replacement**

3in BISEP™ | Piper Bravo Platform, North Sea, UK

> **Isolation facilitates replacement of piping system**



**18in BISEP™ Isolating Pipeline  
Dead Leg Cut Away**



## **BISEP™ Examples**

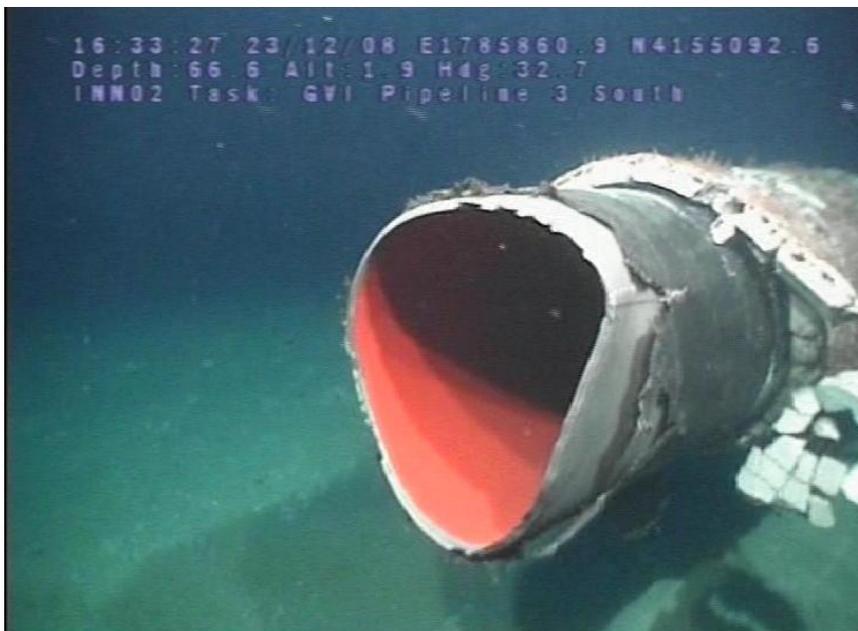


**30in BISEP™ Installation**



## Large Diameter Pipelines Damaged/Ruptured

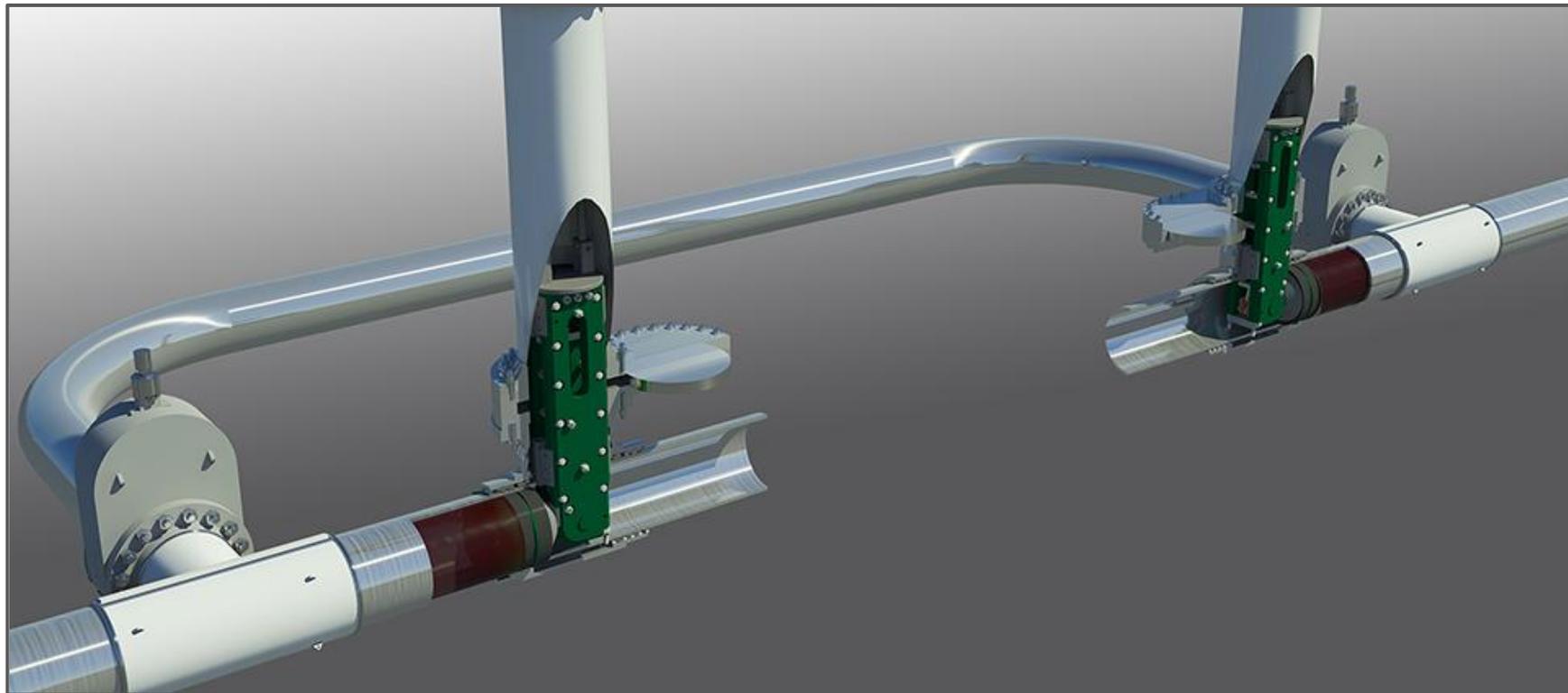
- 20" & 26" TMPC trunklines
- 30" Kvitebjorn line
- 2 off 24" North Africa lines
- 30" ADMA Oil export line
- 36" CATS trunk line



Since 2007  
(excluding GoM)



## **BISEP™ Mid Line Isolation Unpiggable Pipeline Repair**

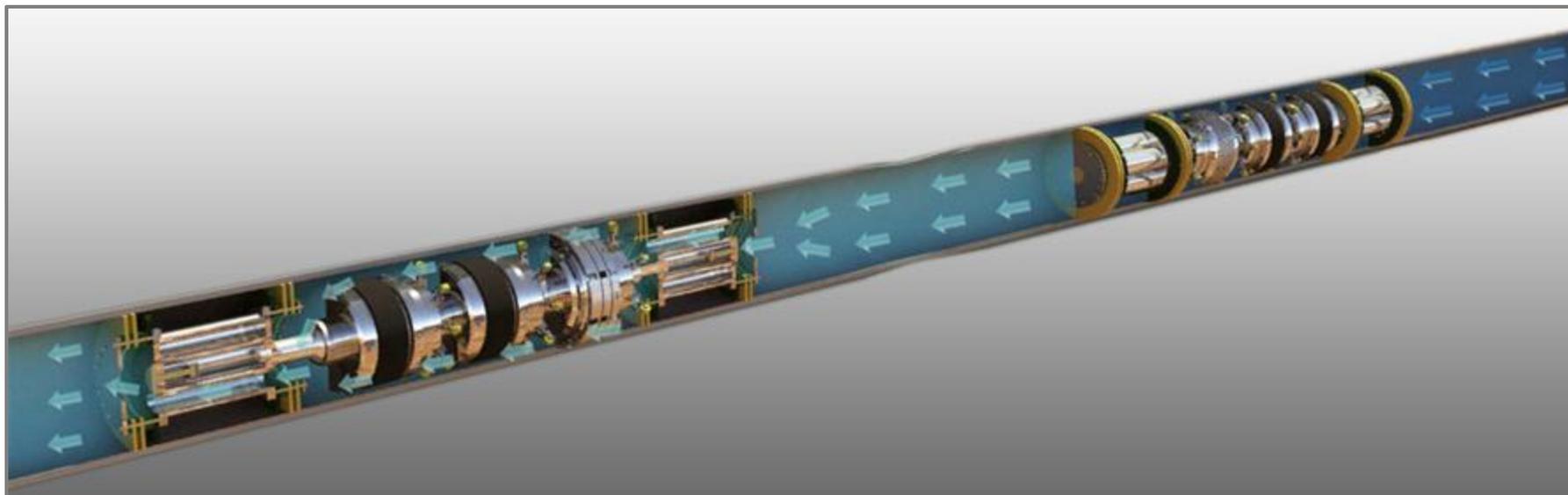


**BISEP™ Mid Line Isolation with Bypass Line**



## Unpiggable Defect Pigging From Both Ends

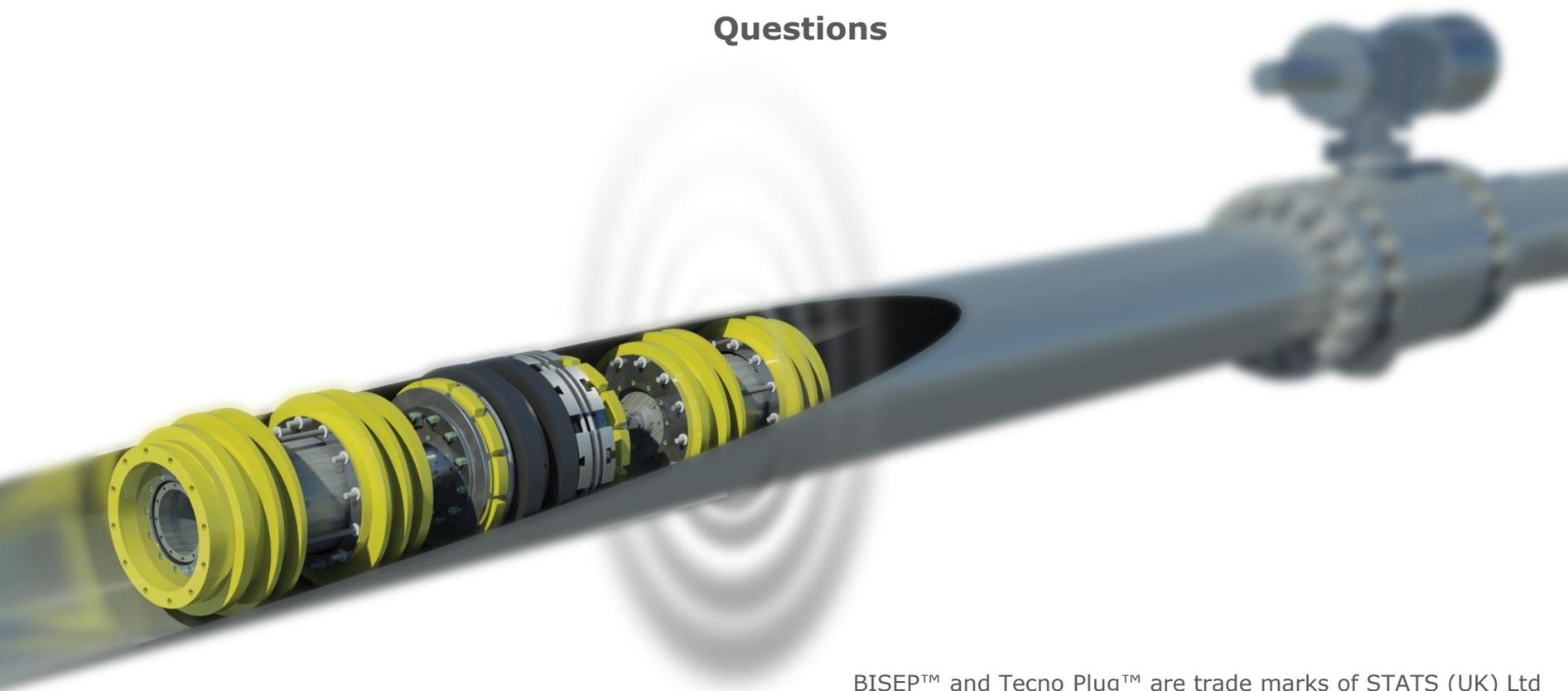
Tecno Plugs™ pigged to either side of unpiggable defect to facilitate section replacement





**Thank You For Your Attention**

**Animations  
&  
Questions**



BISEP™ and Tecno Plug™ are trade marks of STATS (UK) Ltd