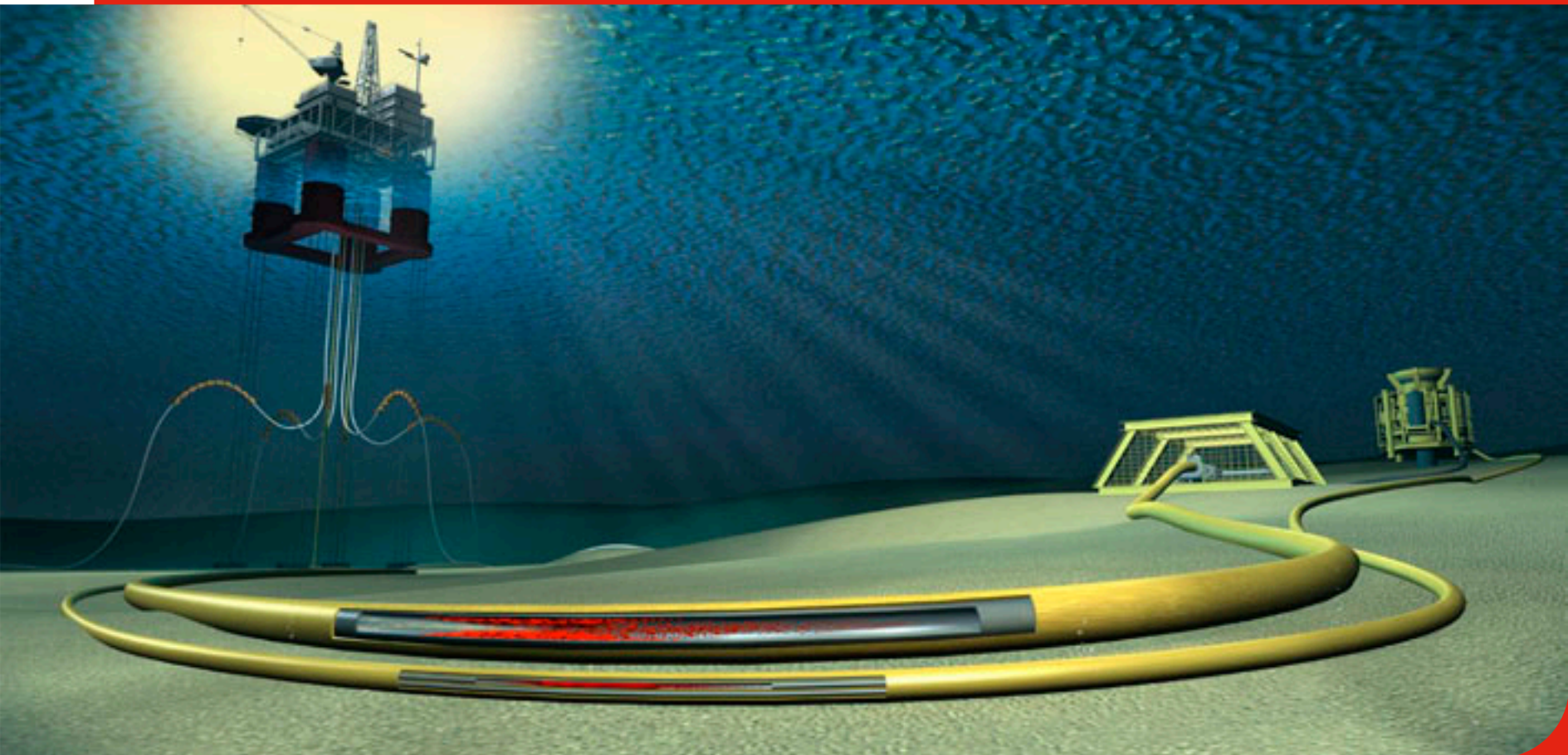


## Providing Cost Effective Production Flow Solutions



## Paradigm Flow Solutions

Game-changer technologies for topsides and subsea blockages

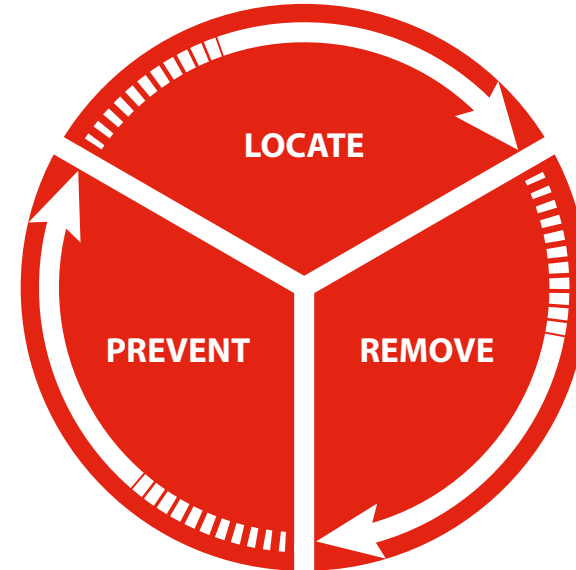
Paradigm Flow Solutions provides leading edge technologies and flow solutions for subsea and topsides systems. We provide a lifecycle of field solutions and technologies to **Locate - Remove - Prevent** blockages and restrictions, enabling clients to cost-effectively re-establish or maximize production and safeguard asset integrity.

Paradigm's unique technologies allow systems to be thoroughly cleaned whilst production is flowing and pressurized, eliminating the need for costly outages and unnecessary worksopes / additional personnel.

**Paradigm has successfully removed blockages from:**

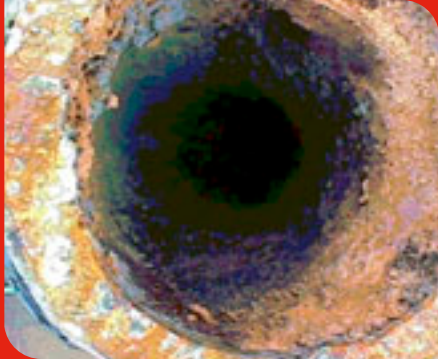
- Subsea umbilicals
- Subsea flowlines & pipelines
- Topsides process pipework
- Firewater deluge pipework
- Drains and utility systems

- **Maximize** Uptime
- **Eliminate** Shutdowns
- **Save** Millions
- **Rapid** Response
- **Safeguard** Asset Integrity



**Paradigm's Lifecycle of Field Solutions**

# Offshore **Blockages** - New Technology **Solutions**



Successfully unblocked 15km 4" subsea flowline in North Sea, after having blocked for 11 years



Successfully unblocked cement from 4" 22kpsi cement lines whilst rig was operational



Removal of corrosion and scale deposits from firewater deluge pipework

## Tackling the Oil Industry's Toughest Blockages

From subsea to topsides  
- we have the technology that works

We are the only energy service company with the core business of clearing blockages in subsea and topsides systems, and are proud of the specialist knowledge & experience we have from reservoir to export.

### Some recent projects completed:

- Successfully cleared blockages in subsea umbilicals and production systems, enabling operators to re-establish chemical injection to recommence production.
- Unblocked a multiphase flowline that had been blocked for 11 years with sand and wax.
- Removed cement that had set in cement lines on drilling rig, enabling cementing operations to re-commence whilst rig on location.
- Cleaned firewater deluge pipework of extensive corrosion debris throughout platform, returning system back to pristine condition and fit-for-purpose condition

## Subsea Solutions

### New Technology for Subsea Blockages

Subsea blockages are an industry-wide problem; with many fields experiencing blockages in umbilical tubes, chemical injection points, and flowlines / pipelines. Conventional methods to remediate blockages generally involve an intervention vessel and/or intrusive techniques such as pigs or coiled tubing, all of which incur significant costs and time to execute.

Paradigm have developed innovative technologies to enable Operator's to quickly and accurately detect subsea blockages, and then remediate the blockage from the host platform. Depending on the subsea system configuration, the work can be done without requirement for an intervention vessel thus saving Operators significant costs.

### Accurate Detection of Subsea Blockages

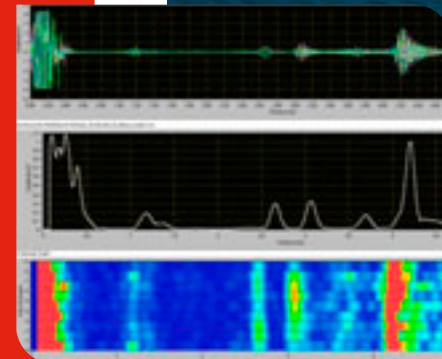
Paradigm's **Find-Block** system can detect subsea blockages to an accuracy of 1m/km. The technology is based on hydraulic Time-Domain Reflectometer (TDR) principle, whereby a standing wave pressure pulse is transmitted within the pipe towards the blockage. A reflected signal from the blockage is then detected by the **Find-Block** monitoring equipment, and then analyzed to determine blockage location.

Blockages types can be determined; with soft blockages such as wax and sand having a shallow pressure pulse signal, whereas mechanical or hydrate blockages having a sharp pulse signal.

### Removal of Subsea Blockages

Once the blockage location is confirmed, the **Pipe-Pulse** unit is then configured to automatically remove the blockage. The equipment can easily be connected to the topsides pig launcher or TUTU, and provides a non-intrusive and remote access method of breaking the adhesion between the blockage and the pipe wall.

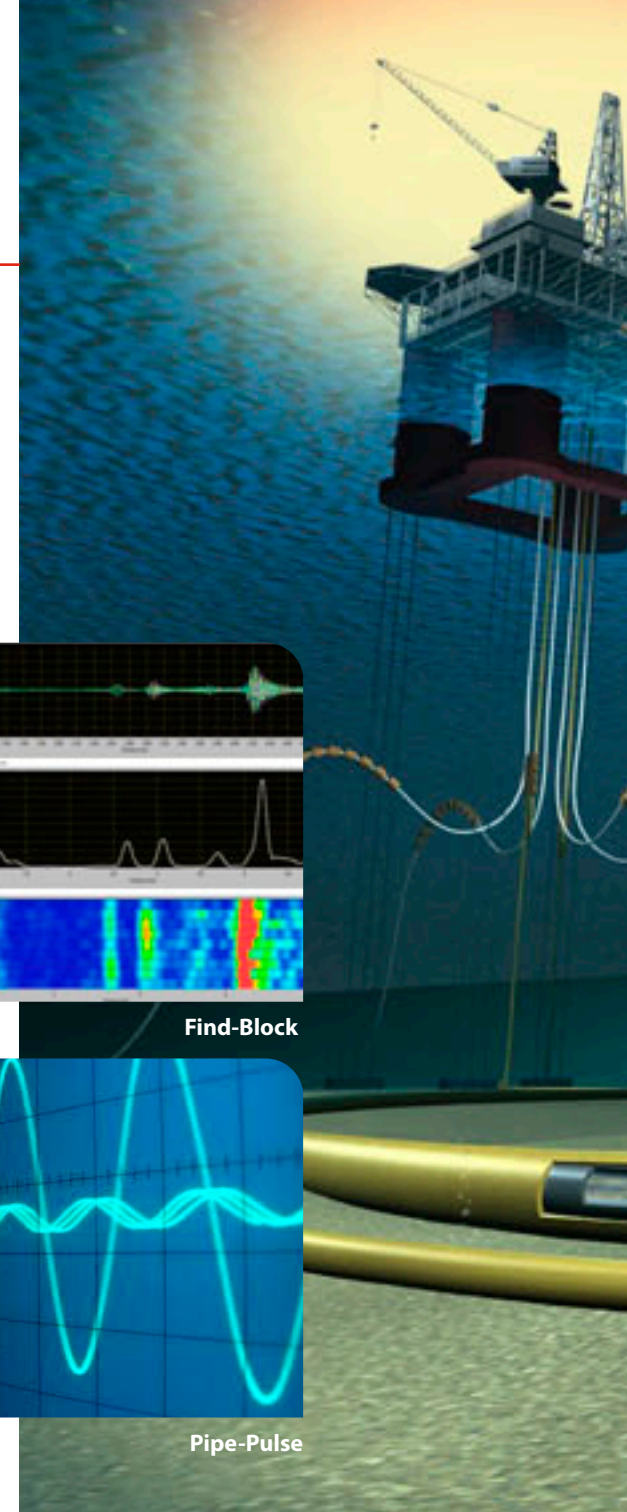
Depending on the system configuration, the blockage is then displaced using pressure from either upstream or downstream of the blockage.



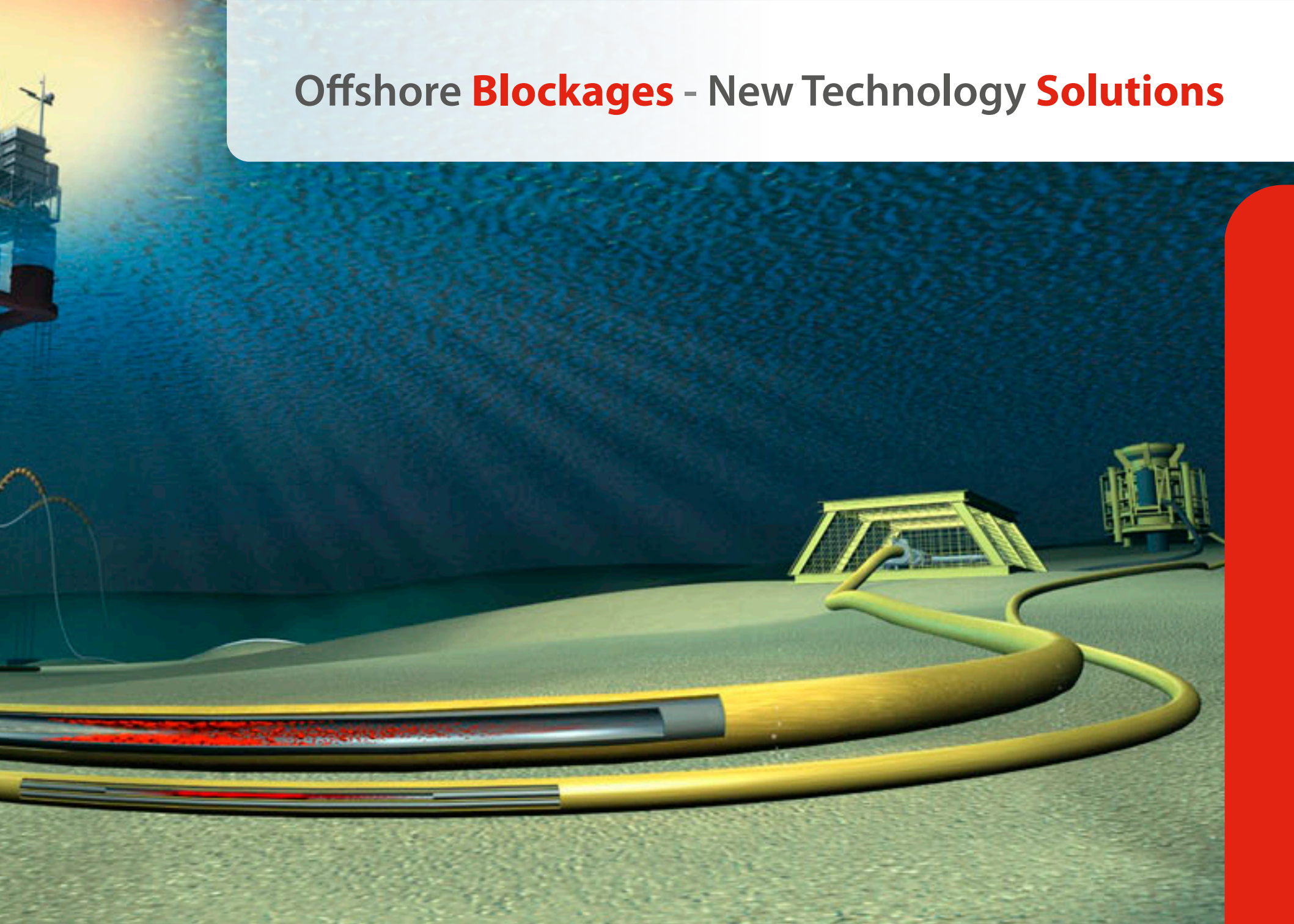
Find-Block



Pipe-Pulse



# Offshore **Blockages** - New Technology **Solutions**



## Subsea Technologies

### Flexi-Coil

Removal of blockages and restrictions from pipework whilst they are pressurized and/or flowing

Based on the coiled tubing concept for well interventions, **Flexi-Coil** has been developed to enable safe and 'live' entry into process systems to remove any blockages and restrictions whilst the system is pressurized and/or flowing.

**Flexi-Coil** utilizes all the same basic components as coiled tubing, however they are a fraction of the size and weight, enabling the equipment to be mobilized quickly and operated from any location on platform.

#### **Flexi-Coil can be deployed in the following 'live' systems:**

- Production risers
- Produced Water Overboard Caissons
- Hydrocarbon pipework & manifolds
- Open / Closed Hazardous Drains Systems
- Hydrocyclones

#### **Benefits of Flexi-Coil system:**

- Light-weight & small footprint
- Modular components
- Small team to operate
- Automated & remote control
- Deployed over long distance
- Allows live & online remediation
- Minimizes / avoids loss of production & revenue
- Eliminate work for turnarounds



### Pipe-Pulse

Remote non-intrusive method of locating and removing blockages in long distance pipework

Paradigm developed the **Pipe-Pulse** system as a more effective, lower cost, and non-intrusive method of clearing blockages over traditional methods of disconnecting equipment subsea.

The **Pipe-Pulse** system is designed specifically to be connected onto the topsides equipment associated with the subsea or pipeline system (i.e. Topsides Umbilical Termination Unit or Pig Launcher), to clear blockages.

#### **Pipe-Pulse can clear blockages in the following subsea systems:**

- Umbilicals
- Chemical injection points
- Subsea distribution units
- Trees / manifolds / PLETS
- Pipelines

#### **Benefits of Pipe-Pulse system:**

- Light-weight & small footprint
- Modular components
- Small team to operate
- Automated & remote control
- Deployed over long distance
- Non-intrusive access
- Eliminates need for costly vessels & subsea interventions



# Offshore **Blockages** - New Technology **Solutions**



Condition **BEFORE** Paradigm treatment



Condition **AFTER** Paradigm treatment

## Safety Critical Equipment Firewater Deluge Systems

Ageing deluge facilities experience build-up of corrosion deposits due to carbon steel construction of the pipework. When the deluge system is activated; the corrosion, scale and marine growth cause the deluge nozzles to block up, reducing the effectiveness of the deluge protection and potentially resulting in a catastrophic situation.

Paradigm's unique Deluge Preservation system provides a fast and cost-effective method of thoroughly cleaning the deluge pipework back to original condition.

Our system utilizes bespoke power brushes that can be deployed via deluge nozzles, and can navigate the tight bends to remove the debris, followed by polishing of the internal pipe bore and then application of non-toxic bio degradable corrosion inhibitor.

### Benefits of Paradigm Deluge Preservation:

- Guarantees pristine condition of pipework and prevention of future blockages.
- Does not damage integrity of pipework, per acids used in chemical treatment.
- Cost-effective, quicker and less personnel required than conventional cleaning methods.

**AUDIT**  
Survey

**PRESERVATION**  
Clean & Inhibit

**AFTER CARE**  
Test, Inspect & Inhibit

**Paradigm's Deluge Preservation Process**

**paradigm (par-a-dime)**

*paradigm shift: to have a sudden and complete change in thinking that allows the creation of a new condition previously thought impossible or unachievable*



- Maximize Uptime
- Eliminate Shutdowns
- Save Millions
- Rapid Response
- Safeguard Asset Integrity



**Find and Remove Subsea Blockages**



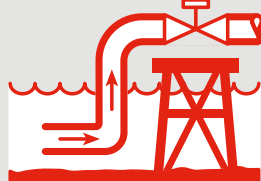
**Overboard Water Caisson**



**Hydrocyclones**



**Locating Subsea Restrictions**



**Production Riser**



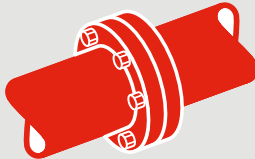
**Deluges/Sprinklers**



**Production Chemicals Condition Monitoring**



**Online Inspection**



**Topside Pipework and Drains**



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