

# Sensorlink

Non-Intrusive Corrosion & Erosion Monitoring  
Topside and subsea products & Services

Trondheim, 2020-12-11



ISO 9001:2015 certified  
IECEx certified  
Achilles JQS qualified

*In partnership with IEV Group Sdn Bhd*



# Sensorlink

- **Founded 1997**
- **Located in Trondheim, Norway**
  
- **Deliver non-intrusive wall thickness monitoring instruments for monitoring of corrosion and erosion in pipelines, landbased and subsea**



# Sensorlink value proposition

**We enhance our customers pipeline integrity management capability through:**

- easy to install, **non intrusive** high precision direct wall thickness monitoring systems
- reliable online corrosion/erosion rate feed back

**Return of investment:**

- optimising chemical injection
- reduced inspection cost
- reduced operational down time
- reduced risk for system failure and unplanned S/D

# Monitoring vs inspection

## Inspection methods

### **Scanning**

Gives a picture of the situation now

Labour and equipment intensive (man hours, scaffolding, vessel, ROV)

Need to be repeated to give corrosion/erosion rate

Repeatability not on the level of monitoring

### **Pigging**

Scan of pipe through it's length

Gives a picture of the situation now

Need pig launcher

Have effect on the production(need's to be shut down)

Need to be repeated to give corrosion/erosion development

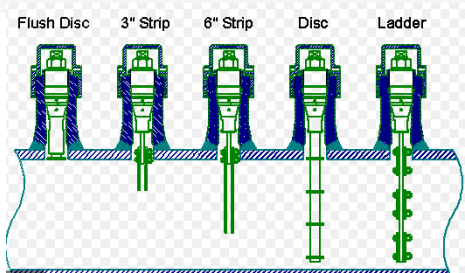


## Permanent installation of sensors enables:

- High quality wall thickness measurements
- Online information about pipe condition
- Real-time and online follow up of known defects
- Eliminate the multiple sources of error associated with manual inspection, such as variability from one measurement to the next in time of measurement location, equipment used and operator expertise
- Repeatability <math><0.1\text{ mils}/2.5\ \mu\text{m}</math>



# Non Intrusive vs Intrusive Monitoring



## Intrusive probes and coupons

- In-direct measurement, measure wear on probe/coupon not on actual pipe
- Not possible to pig while inserted
- Have to be maintained
- Wears out over time, has to be replaced
- Have to be weighed(coupons)
- Fittings and valves has to be added
- Tools for replacement
- Integrity of pressure system is jeopardized
- HSE when doing maintenance

## Non-intrusive

- Direct measurement of pipe wall
- Reduced human exposure to H2S or other operational hazards
- Reduced TML/CML (inspection)
- No access holes or fittings to pipes, zero leak risk
- Can be pigged while installed
- Less maintenance
- No wear and tear, install and forget

## Customer value of changing to non intrusive monitoring

### HSE / Cost value:

Reduced manpower onboard / on site  
Reduced scaffolding / access issues  
Reduced TML/CML (inspection)  
Less excavation of critical pipes  
Reduced pigging frequency of critical lines

### Technical value:

Non intrusive, zero asset operational risk  
Easy to install, can work through standard coatings (FBE and paint)  
No production interference, can be installed on live pipes  
Direct metal loss monitoring (no indirect indication like ER probes and coupons)

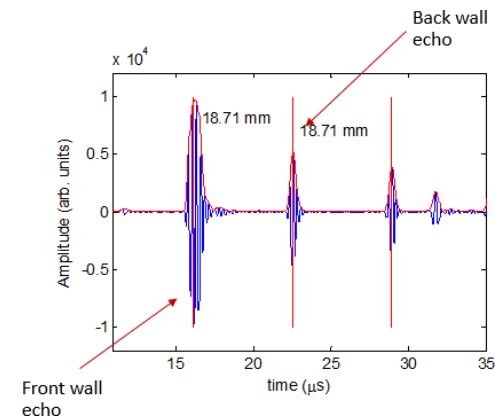
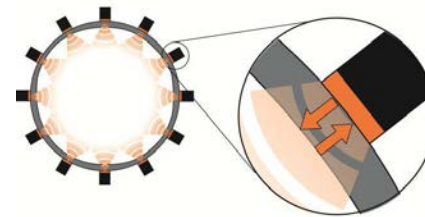
### Applications:

Real metal loss monitoring  
General corrosion trend monitoring  
Corrosion trend variability analysis (non uniform corrosion)  
Chemical program optimisation  
Chemical program tuning to changes in well flow  
Loss of inhibitor detection  
Monitoring of weld and HAZ corrosion  
Monitoring of erosion in clad pipes

# Technology

## Wall thickness monitoring using Single Element Pulse/Echo Transducers

- **Non-Intrusive**
- Direct wall thickness measurement of pipe wall
- Not sensitive to pipe wall thickness
- Fixed sensors combined with advanced signal processing detects wall loss of less than .1 mills (2.5 micrometres)



# Current Product Line

## UltraMonit®

Subsea pipeline wall thickness monitoring



## PipeMonit® Swarm®

Topside/Landbased wall thickness monitoring





# PipeMonit<sup>®</sup> Swarm S1

for topside/landbased applications



## Applications

- All landbased/topside pipelines/flowlines/pressure systems with temperatures up to 125 degrees Celsius

## PipeMonit<sup>®</sup>

- Non-intrusive measurement
- Easy strap on installation, no gluing, welding or hot work requirements
- Easy to retrofit or move
- Pipe wall thickness measurement

## System

- Ex / Non-Ex
- Accuracy 0.1 mm
- Repeatability 0.0025 mm

## PipeMonit Swarm<sup>®</sup> S1 on riser bend with SDL (Safe Data Logger)

Swarm S1 w/ protective cover



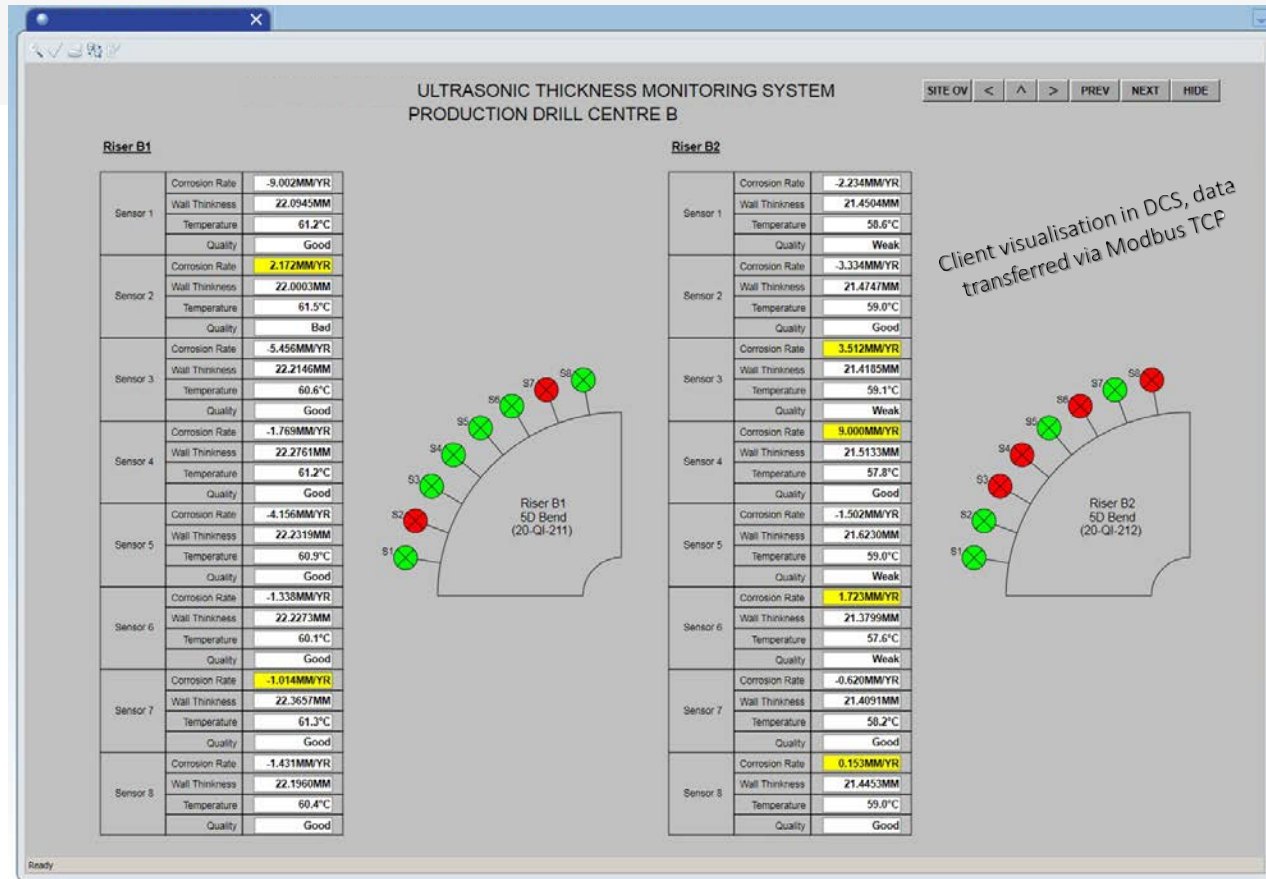
Swarm S1 with fire protection



Swarm SDL in client cabinet



# PipeMonit Swarm<sup>®</sup> on riser bend with SDL



Proud installation team from Shell, Wasco and Sensorlink



## PipeMonit® SWARM®S1

Buried installation



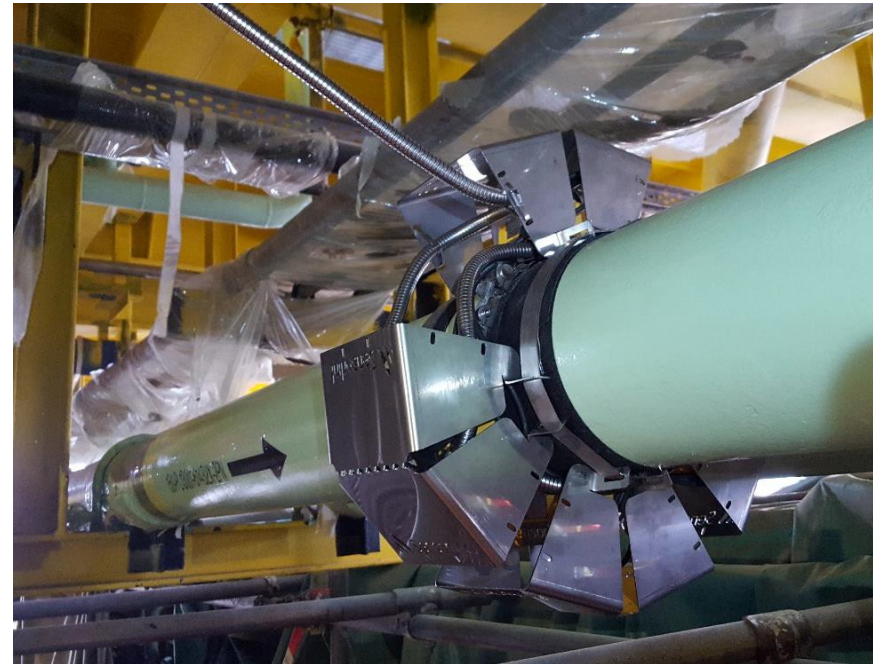
# Swarm installation on offshore unit





# PipeMonit Swarm<sup>®</sup>

at Shell E06/08



# PipeMonit® Swarm S2 wireless

for topside/landbased applications – high temperature



## Applications

- All landbased/topside pipelines/flowlines/pressure systems with temperatures up to 550 degrees Celsius
- Ideal for refineries and processing plants with high temperatures.

## PipeMonit® S2

- Non-intrusive measurement
- Ultrasound pulse-echo method
- Pipe wall thickness measurement

## System

- Ex / Non-Ex
- Wireless option ISA 100
- Accuracy 0.1 mm
- Repeatability 0.010 mm
- Works through solid coatings

# Swarm<sup>®</sup> S2 with 4 channels

- Swarm S2 datalogger with max 4 channels
- battery powered
- ISA 100 or Bluetooth communication






# Swarm S2 - Sensor types

**Sensor Types**

There are three different Swarm S2 sensors pending on required temperature requirement in the place of installation:

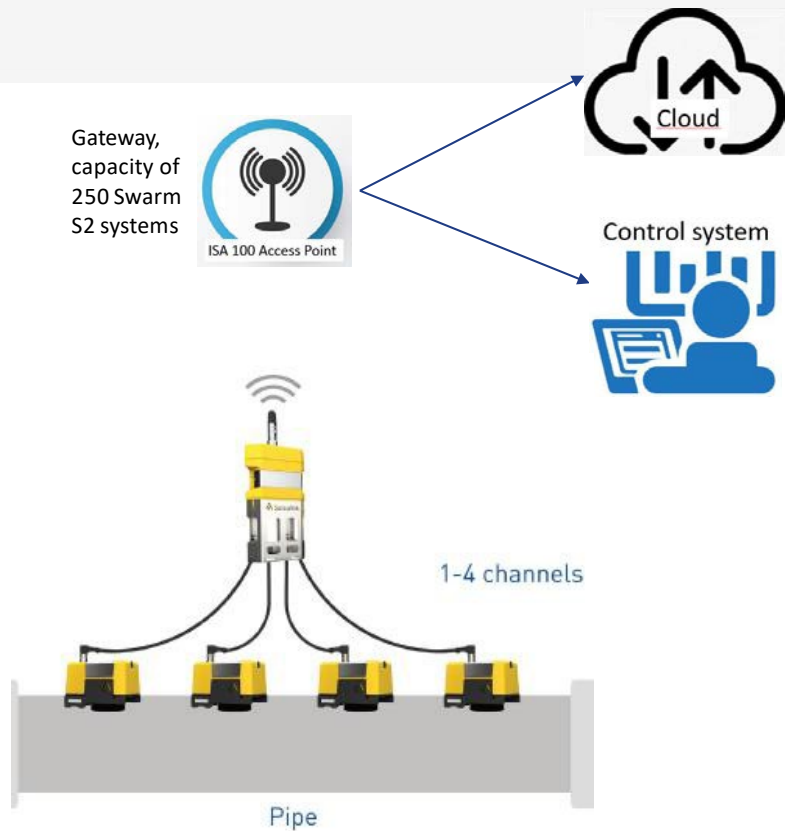


**Swarm S2 LT (Low Temperature)**  
- for temperatures up to 120 degree Celsius

**Swarm S2 HT (High Temperature)**  
- for temperatures up to 350 degree Celsius

**Swarm S2 UHT (Ultra High Temperature)**  
- for temperatures up to 550 degree Celsius

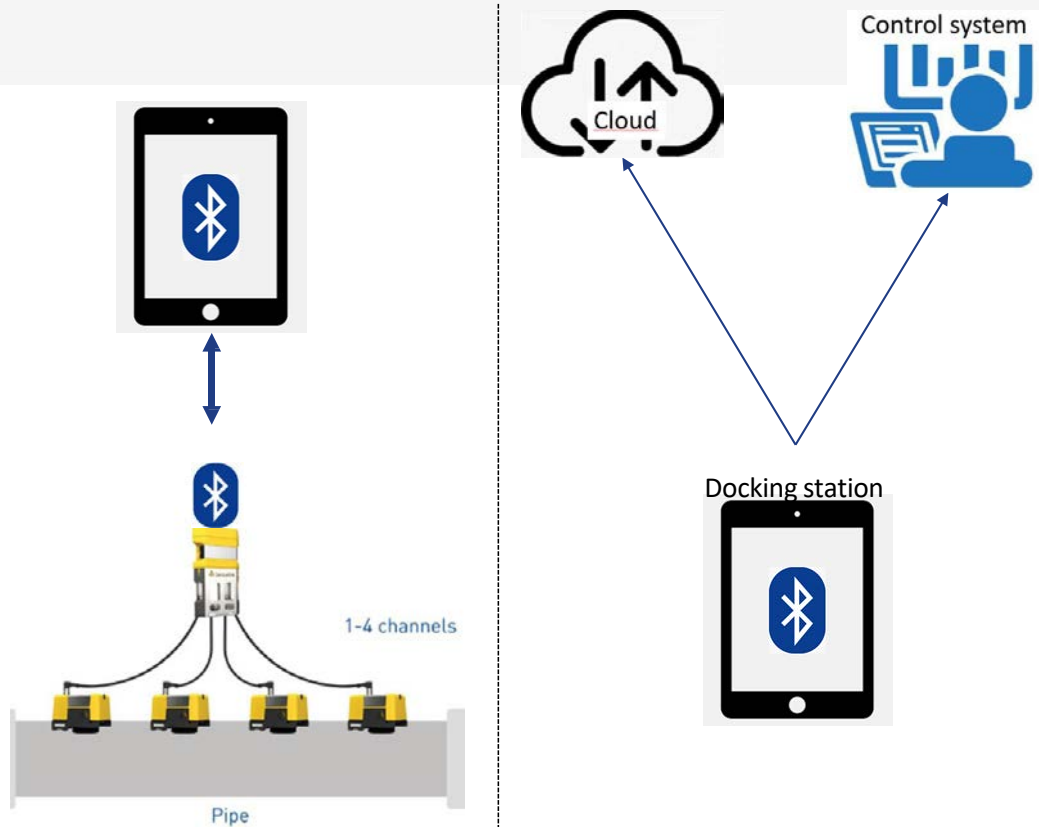
## SWARM S2 ISA 100, will be in 1'st version



### Main characteristics

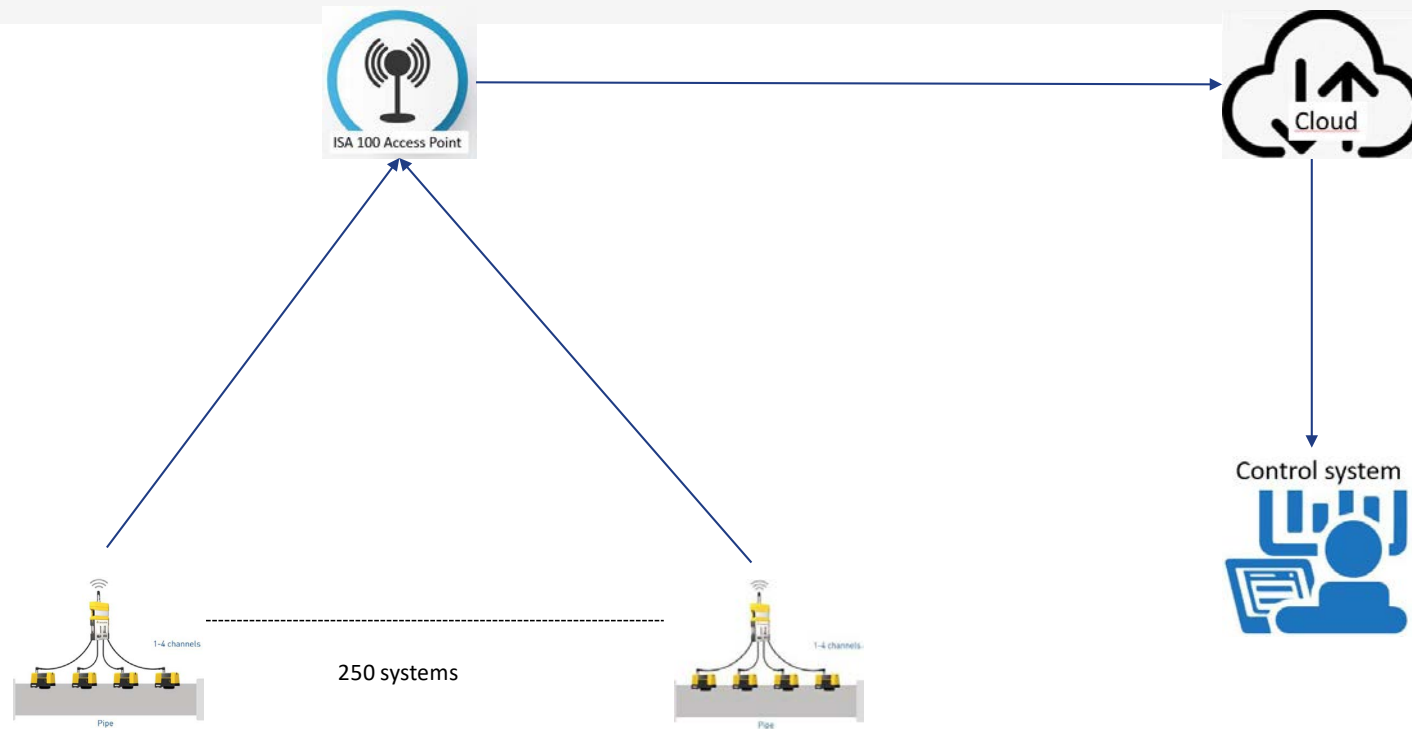
Wireless Interface	ISA 100
Ambient temp range	±20°C to +55°C (radio and battery module)
Pipeline temp range	±40°C to +150°C (LT version) ±20°C to +300°C (HT version) ±20°C to +550°C (UHT version)
Pipe size	Minimum 4 inches OD
Pipe wall thickness	Minimum 4 mm
Coating thickness	Max 3 mm
Battery life	min 2 years
IS class	IEC Ex(ATEx) Exib IIB T4
Protection grade	IP 65
System consist of	1 SWARM S2 unit 1 ISA 100 lid/antenna Max 4 SWARM sensors (1-4)
Data transferred to	Control system or cloud solution

# Swarm S2 Bluetooth, will be in 1'st version



Main characteristics	
Wireless Interface	ISA 100
Ambient temp range	±20°C to +55°C (radio and battery module)
Pipeline temp range	±40°C to +150°C (LT version) ±20°C to +300°C (HT version) ±20°C to +550°C (UHT version)
Pipe size	Minimum 4 inches OD
Pipe wall thickness	Minimum 4 mm
Coating thickness	Max 3 mm
Battery life	min 2 years
IS class	IEC Ex(ATEx) Exib IIB T4
Protection grade	IP 65
System consist of	1 SWARM S2 unit 1 Bluetooth lid/antenna Max 4 SWARM sensors (1-4)
Data transferred to	Control system or cloud solution

## Example: System solution for refinery



## PipeMonit Swarm® S2 in Refinery/Petrochemical



# UltraMonit® SEC Subsea Instruments

Fixed installations/  
new pipelines



UltraMonit® SEC® InSitu

Retrofittable  
installations



UltraMonit® SEC® Retrofit

Retrofittable  
modular design



UltraMonit® SEC® PC

# UltraMonit<sup>®</sup> S3

## Diver and ROV installable

Intended for 6-12-24 months inspection/monitoring

Will give absolute wall thickness with an accuracy of +/- 0,1 mm  
Will give wall loss rate according to NACE regulations within 60-120 days

- Single lift on to seabed
- Installed by diver or ROV
- Different pipe sizes, can be moved from site to site
- Datalogger w/battery
- Sensors modular design
- Can be assembled on elbows, jumpers etc
- 5 years lifetime

### Capacities

- Accuracy: <=0.1 mm (0,004 inches)
- Sensitivity: < 20 um
- Temperature: - 25 to 150° C
- Water depth : 2000 meter
- Design life: 2 years





## UltraMonit<sup>®</sup> S3 – typical application

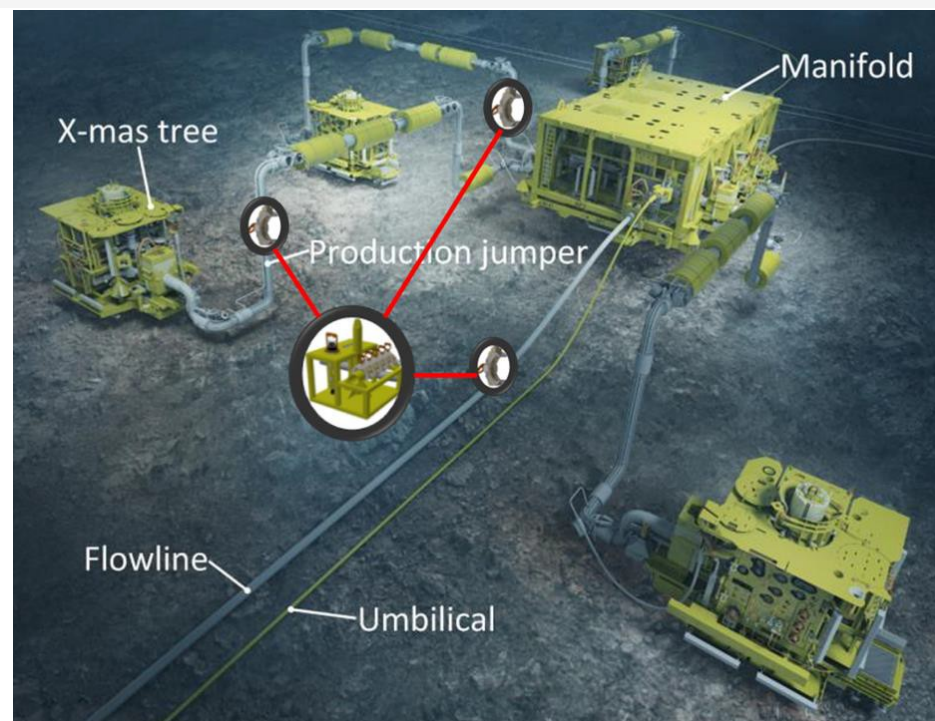
### Diver and ROV installable

Typical applications:

- Jumpers
- Spools
- Flowlines
- Bends

Some key advantages of the UltraMonit<sup>®</sup> S3

- Easy to install/lightweight
- Gives wall loss rate according to NACE in 90-120 days
- Works through solid external coatings (PE, 3LPP, FBE, etc.)
- Autonomous with battery power (can also be tied into subsea control system for power/communication)
- Removable, movable and replaceable through the lifetime of the tool





**FOR FURTHER INFORMATION ON**



**Please contact our exclusive partner**



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