ClampOn

Kjetil Nysæter,
Area Sales Manager

Subsea
Corrosion-Erosion Monitor
(CEM)
Introduction

ClampOn’s main focus is sand monitoring and we have 16 years of experience. We are continually improving our products and services to give the client the best quality available.

- State of the art electronic hardware and software solutions
- Sand management / support department
- Manufactured and delivered more than 10 000 instruments.
- Main office with in-house development, engineering and manufacturing
- Customized solutions
Equipment range

- Sand Monitors
- PIG detectors
- Leak detectors
- Vibration Monitors
- Corrosion-Erosion Monitoring
- Well Collision Detector
Background

Subsea Corrosion & Erosion
- Integrity damage
- Production stop
- Expensive
- Spill
- Pollution
- Major problems
Background

**Corrosion**
- Cause; sour gas/condensate
- Effect; loss of integrity
- Remedy; anti corrosion agents

**Erosion**
- Cause; Sand production
- Effect; loss of integrity
- Remedy; reduce sand production
Background

Norwegian subsea assets

- Majority between 5-14 years in production
The Solution: ClampOn Subsea CEM

**Adding value and safety**
- Monitors Corrosion-Erosion rate
- Determine remedy
- Avoid spill and pollution
- Safe production
- Increase production
How does it work

- Acoustic Guided Lamb Waves
- EMAT (Electro Magnetic Acoustic Transducers)
- Dry contact (not glued)
How does it work?

- OD pipe – 8”
- Separation 750 mm
- 8 Transducers set-up

Coverage of selected area:
- ≈ 80%
- Max path width is 70mm
• Transducers can be mounted on the outside of coating <1mm /0.04” thickness

• Measures WT between the transducers in “line of sight”
• Resolution/sensitivity better then 1% of WT
• Signal is Robust and will not break down
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What do we measure?

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What does it provide?

- Real-time monitoring of average wall thickness
- Covers up to 100% of pipe area
- Measures up to 56 individual paths
What does it provide?
Where can it be installed?

- Pipelines
  - Straights
  - Bends
  - Reducers
- Risers
- Jumpers
- Structure
Available configurations

- Topside installed
- ROV installed
- Fully interfaced
- Battery powered
- Internal data storage
- Charged by ROV
- Wireless communication
Available configurations

**Corrosion-Erosion Monitor**

Green field version

- Permanent Transducers
- Retrievable electronics
Available configurations

Transducer sets

Sand Detector

CEM electronic

Connection to SCM/SEM
Power and signal for both ASD and CEM
Available configurations

Corrosion-Erosion Monitor

Brown field version

- Retrievable Transducers
- Retrievable electronics, Coms and Battery
- Acoustic link, subsea to topside
- 5 years battery life
Data collection - Wave Gliders

- Monitors on every well
- Acoustic link between CEM and wave glider
- Satellite link between wave glider and office (web)
- Data retrieval can be every day
ULTRASONIC INTELLIGENT SENSORS

X-axis [cm]
Y-axis [cm]

Wall Thickness Loss [mm] - Maximum Depth 0.66 mm

Grinded Max depth 0.78 ± 0.2 mm
Shallow depth 0.37 ± 0.2 mm

CEM “Measure” 0.66 mm
**Tomography.**

Average wall thickness monitoring

Several signal paths over the same area

Can we utilize this information more?
CEM – Down the road

Original

TFT from 16 transducers

Min thickness = 9.64mm
CEM – Tomography

Min thickness = 9.57mm
CEM – Tomography

Original WT
Max depth
10mm
0,5mm

Min thickness = 9.56mm