ULTRASONIC INTELLIGENT SENSORS

ClampOn Subsea CEM® Corrosion-Erosion Monitor

DIGITAL SIGNAL PROCESSING

Spool piece with pre-installed ClampOn CEM® with ROV-installable/retrievable electronics.

ADVANTAGES

- **Real Time**
- **Non-Intrusive**
- **Retrofit installable**
- **Large coverage area**
- **Accurate / high resolution**

BACKGROUND

Corrosion and erosion are recognized as some of the most serious problems facing industries worldwide, and result in losses worth hundreds of billions of dollars every year. Corrosion and erosion also represent significant challenges to the global oil and gas industry, causing serious threats to the environment, people, and to transport and production systems. Major savings can be realized by establishing a code of Best Practice in order to deal with these issues. Accurate and reliable measurement of corrosion and erosion is a natural part of such a Best Practice, as this will enable you to monitor the condition of your pipes, determine inspection intervals more accurately, and ensure safer and more cost effective operation.

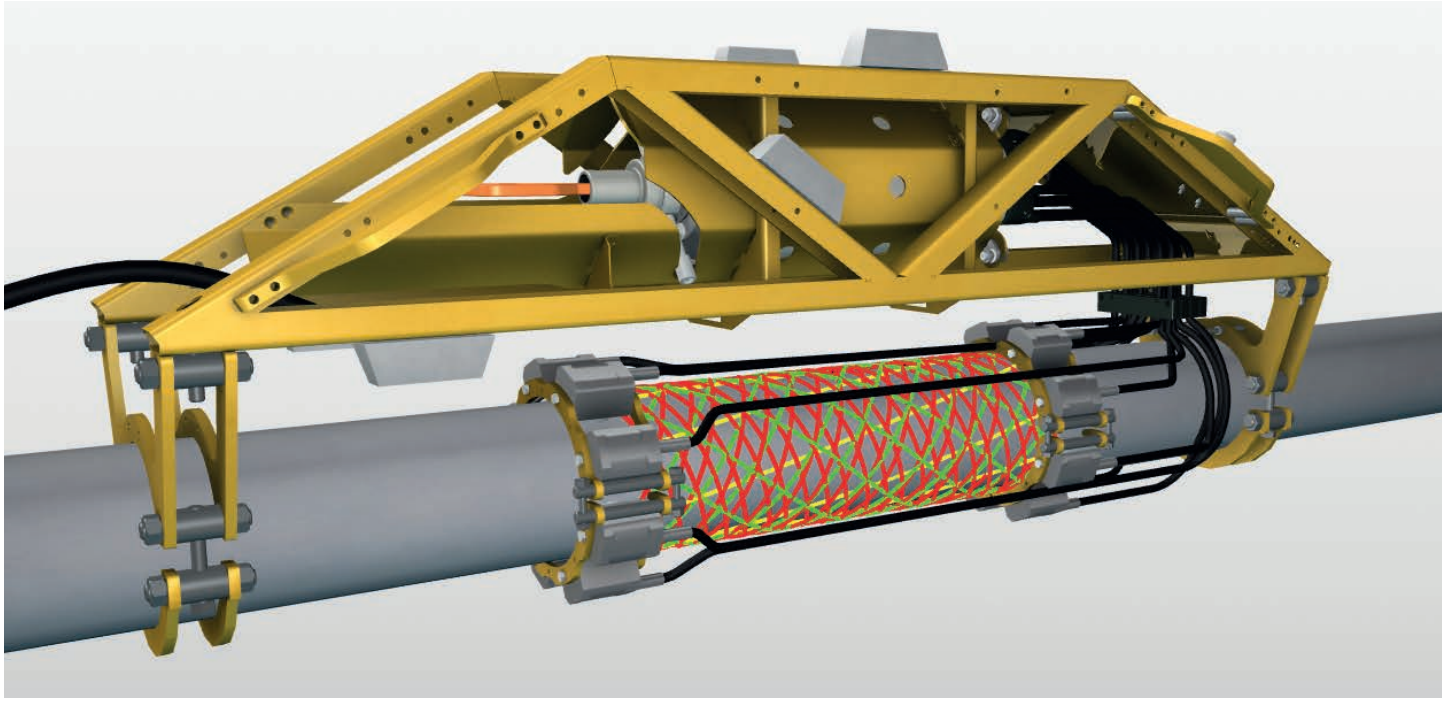
ROV and retrofit solutions that can monitor areas that are particularly susceptible to corrosion-erosion are crucial. The ClampOn Subsea Corrosion-Erosion Monitor (CEM®) is available as an ROV fitted unit and as a pre-installed system and has been developed as a JIP with BP.

Major operators have selected the ClampOn Subsea CEM® as the best solution for their subsea assets and operations.

OPERATING PRINCIPLE

The ClampOn Subsea CEM® is an ultrasonic instrument designed to measure wall thickness loss in pipes over a defined area. It uses active ultrasound and exploits the properties of Acoustic Guided Lamb Waves to detect the changes in wall thickness relative to reference values obtained during the installation of the system. Up to 16 transducers transmit and receive signals to and from each other to form a grid of signal paths over a defined area, and this is used to monitor any changes in pipe wall thickness. Using the principles of tomography, both the point at which the corrosion and erosion takes place and the actual wall thickness can be measured.

The coverage area and the accuracy/sensitivity depend on the number of transducers installed on the pipe. With the right number of transducers up to 100 percent coverage of a given area can be obtained. The CEM® can detect changes in wall thickness of as little as 0,1 per cent, and is capable of performing measurements on pipe diameters from 4" NPS and upwards, and on wall thicknesses from 8 mm to 50 mm (0.314" to 1.968").



Signal paths between multiple transducers on a subsea CEM® system (insulation/mechanical covers removed).

INSTALLATION

With its clamp-on design, the system is easy to install, and the absence of moving parts means it is virtually maintenance free. This gives the subsea CEM® the required robustness to endure subsea conditions throughout its field life. There is also no need for recalibration after installation. It is more cost effective, accurate and reliable than other ROV-controlled methods, i.e. spot measurement, as it monitors an entire section of pipe and not just a single point, which could miss any corrosion or erosion entirely. By carefully choosing the position of the transducers, it is possible to monitor infrastructure that is normally inaccessible for inspection. The system can cover a large section of the pipe (typically up to 2 metres long), depending on how many transducers are used.

The CEM® is available as a permanently installed device or ROV retrievable system. It can be installed on straight pipes (corrosion) or around bends/elbows (erosion). A variety of system configurations are possible, ranging from standalone monitoring stations with internal data logging to full real-time integration into existing data infrastructure.

The CEM® is a versatile instrument and can be used to monitor different types of metal structures, for example, manifolds, pipelines and jumpers.

KEY SPECIFICATIONS

• Method of operation:	Active ultrasound w/ EMAT transducers
• Coverage area:	Typical 3 m^2 (32 ft^2) **
• Changes:	0.1 %
• Repeatability:	Better than 1%
• Wall thickness range:	8 mm to 50 mm (0.314" to 1.968")
• Minimum pipe OD:	4 Inch NPS (114 mm)
• Wall material:	Conductive metals and alloys
• Design life:	30 Years (10+ Years for ROV mounted system)
• Electronics:	8/16 channel CEMAT with automation controller*
• Communication:	SIIS L3, SIIS L2 (Modbus TCP/IP) or Serial RS485 (Modbus RTU)
• Power supply:	18-32 VDC, Battery *
• Design depth:	3050 m (10.000 ft)

* Examples shown. System is tailored for integration
** Limitations depend upon pipe geometry and configuration

Details and specifications are for information only and subject to change without notice

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