

ClampOn CEM[®] Corrosion-Erosion Monitor

DIGITAL SIGNAL PROCESSING



ClampOn Topside CEM[®] Corrosion-Erosion Monitor

ADVANTAGES

- **Real-time**
- **Non-intrusive**
- **Retrofit installable**
- **Large coverage area**
- **Accurate / high resolution**

MOTIVATION

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. Major operators have selected the ClampOn topside CEM[®] (Corrosion-Erosion Monitor) as the best solution for their topside assets and operations.

OPERATING PRINCIPLE

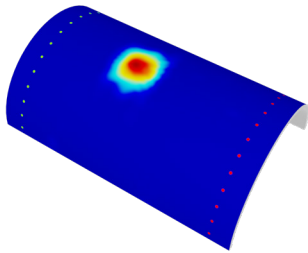
The ClampOn Topside CEM[®] is an ultrasonic instrument designed to measure wall thickness loss in pipes over a defined area. It uses active ultrasound and exploits the properties of Acoustic Guided

Lamb Waves to detect the changes in wall thickness relative to the reference values obtained during the installation of the system. Changes to wall thickness is detected by a grid of signal paths, generated by up to thirty-two transducers. Tomography enables us to monitor the actual and minimum wall thickness, and generate a 3D visualization of the monitored section.

The coverage area and the accuracy / sensitivity depend on the number of transducers installed / pipe-size. With the right number of transducers up to 100 percent coverage of a given area can be obtained. As little as 0.1% change in wall thickness can be measured in real-time.

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 Topside CEM the required robustness to endure challenging conditions throughout its field life. There is also no need for recalibration after installation. By carefully choosing the position of the transducers, it is possible to monitor infrastructure that is normally inaccessible for inspection. The topside CEM



The tomography software shows the location and depth of any corrosion or erosion



is a permanently installed system. Installing a CEM is quick and simple. Two to thirty-two transducers are fastened to the surface of the pipe (or other metal plate structure) and connected to a clamp-on control unit. The control unit continuously sends and receives guided waves between the transducers, resulting in a grid of measurement paths that covers the selected area. This is a more cost effective, accurate and reliable solution than other methods, e.g.

spot measurement, as it monitors an entire section of pipe and not just single points, which could miss localized corrosion or erosion entirely. 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 system can cover a large section of pipe, typically 2-5 OD, depending on how many transducers are used.

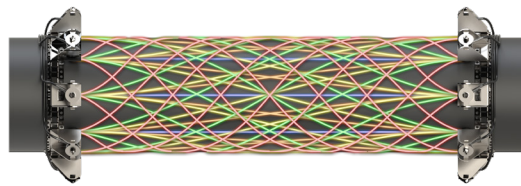


Illustration of signal paths with 16 transducers on a horizontal pipe, giving 100% coverage with multiple redundancy signal paths

KEY SPECIFICATIONS

- Method of operation : Active ultrasound, guided Lamb waves
- Transducer technology: EMAT
- Maximum coverage area: 3 m² [32 ft²]
- Sensitivity: 0.1 %
- Repeatability: Better than 1 %
- Wall thickness range: 8 to 45 mm [0.3 in to 1.8 in]
- Minimum pipe OD: 114 mm [4 in]
- Wall material: Conductive metals and alloys
- Design life: 25 years
- Electronics: 32 channel main unit and PC/ automation controller
- Pipe temperature: -40 °C to 180 °C [-40 °F to 356 °F]
- Ambient temperature: -40 °C to 60 °C [-40 °F to 140 °F]
- Power Consumption: 6.5 W operation 4.5 W standby
- Communication: RS-485, Modbus RTU, Ethernet
- Cable interface: Cable with connector/flying lead/gland for cable access
- Cabling minimum: 4 * 0.75 mm² - depending on system configuration

All specifications are subject to change without notice



ULTRASONIC INTELLIGENT SENSORS

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