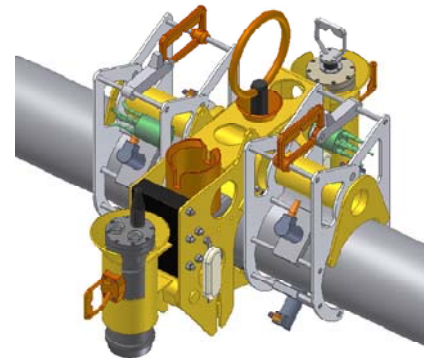
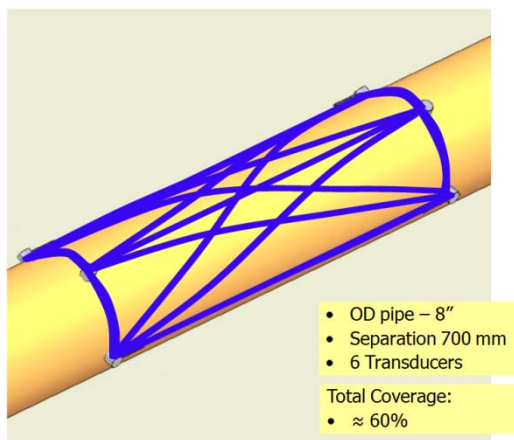


The ClampOn DSP Corrosion-Erosion Monitor (CEM) is an ultrasonic instrument designed to measure wall thickness loss in pipes, plates or other metal structures. It uses active ultrasound where transducer pairs work in a pitch catch mode of operation, giving the average wall thickness between the transducers. As a part of the ClampOn family, it is non-intrusive. A permanently installed CEM system will measure the wall thickness frequently and at a very high repeatability, thereby eliminating the weaknesses that are commonly encountered in manual ultrasonic thickness gauging. Wall thickness trends are generated automatically and can be observed in real time, logged internally in a datalogger or presented in a wireless solution. This technique has been installed topside and will now also be made available subsea.



CEM - Coverage Area



The CEM uses up to 8 transducers, resulting in a coverage area of up to 65% of a selected pipe section and of up to 2 meters in length. The subsea version will utilize up to 32 transducers, increasing distance to a maximum of 8 meters. Installation is easy and the system virtually maintenance free, due to the newly developed Dry Contact transducers which utilize electromagnetism to transmit and receive acoustic signals. Therefore no glue is required and the transducers can be placed on the exterior on up to 3 mm of paint or coating. The CEM is a versatile instrument and can in practice be used to monitor all metal structures, such as:

- **Subsea production templates**
- **Jumpers/Flow Lines**
- **Manifolds**
- **Retrofit solution**

The ClampOn CEM is based on Acoustic Guided Lamb Waves (AGLW). One of the most important properties of AGLW is the dependence on the velocity of the frequency and the thickness of the structure through which they propagate. Knowing the dispersion curves of various materials enables ClampOn to calculate the wall thickness and observe the change along the signal path. Any change in plate thickness can be detected by the change in the Lamb wave velocity due to the dispersive nature of the modes. Wall thickness changes of 1% can positively be detected and the system has a repeatability of $\pm 0.04\%$. The technique is robust and will not break down. The subsea system will be available for pipe OD of 6" (15.2 cm) and greater and wall thicknesses in the range of 4-35mm (0.158-1.378 inches)

