Please fill in the name of the event you are preparing this abstract for.	International Petroleum Technology Conference
Please fill in your 5-digit IPTC manuscript number and IPTC Control number.	IPTC-19335-MS 19IPTC-P-2036-IPTC
Please fill in your abstract title.	Innovative Permanent Down-Hole Scale and Corrosion Monitoring System Using Ultrasound Guided Waves Technology

Please fill in your author name(s) and company affiliation.

Given Name	Surname	Company
Abubaker	Saeed	Saudi Aramco
Arno	Volker	TNO
Quincy	Martina	TNO
Erwin	Giling	TNO

Abstract

Scale and corrosion affect the production certainty of oil and gas well. Scale build-up reduces flow and ultimately could shut down production when it block to tubing completely. Corrosion of the tubing wall occurs very often simultaneously with scale build-up and affects the integrity of the tubing wall. Vital information about the integrity is essential for safe operation and flow assurance. The objective of this research is to develop a scale and corrosion monitoring system based on ultrasonic guided waves. The innovative approach is based on transmitting axisymmetric ultrasound guided waves to a receiver array around the circumference of the pipe. Both torsional and longitudinal waves are used over a wide frequency range. These modes are sensitive to variations in tubing wall thickness, scale thickness and scale properties. Numerical simulations are used to investigate various scaling /corrosion scenarios and proof the concept theoretically. The simulations also provide the requirement for specially designed EMAT's (ElectroMagnetic Acoustic Transducers), which are capable of withstanding downhole conditions, i.e., pressure and temperature. These transducers cover a wide frequency range, such that there will be several higher order modes present. This is required for accurate sizing. The used wave modes are only sensitive for changes in tubing wall thickness and scale build-up. The newly developed transducers are tested on a 4.5-inch tubing with artificial scale. During the experiment the artificial scale thickness is varied to evaluate the sizing accuracy. Experimental results demonstrate the capability of measuring the scale built-up from the outside with good accuracy.