

1.5.9. USE OF MICROWAVES FOR THE DETECTION OF CORROSION UNDER INSULATION

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Corrosion Under Insulation (CUI) is a major cause of pipeline failure in the oil industry. When water breaches the external cladding used to protect the insulation, it starts to corrode the external surface of the pipe. Inspection of the pipe by removal of the insulation is expensive and time consuming. This paper explores the possibility of detecting CUI with an indirect approach aimed at monitoring the presence of water in the insulation; a necessary precursor to CUI. In particular, it is observed that the pipe and the cladding form a coaxial waveguide which can be used to propagate microwaves within the insulation along the length of the pipe. An accumulation of water in the insulation will act as an impedance discontinuity within the waveguide, causing a reflection of the microwave signal. These reflections can be used to detect and locate water accumulations, and hence locate the regions of the pipe at risk of CUI. Here, we discuss the characteristics of the dispersion curves of the modes that can propagate in clad pipelines for typical pipeline geometries and propose an antenna array design for pure mode excitation. We then present initial experimental results using time domain reflectometry on a mock 12" coaxial waveguide that demonstrates the possibility of detecting small water patches.