

# Ultrasonic testing of Inconel lined carbon steel using WAND sensors

## Overview

Certain processes in oil & gas extraction and refining/processing present especially harsh conditions, where standard carbon steel piping needs to be lined internally with corrosion-resistant materials suited for extreme conditions. Inconel alloys are one such family of materials.

Trending the thickness loss of the same precise location using conventional ultrasonic testing (UT) can be particularly challenging. Measurement repeatability is essential in order to accurately determine internal corrosion rate.

Inductosense has performed a series of tests to demonstrate that the WAND sensors can be used to monitor the remaining thickness of an Inconel 625 lining on a carbon steel block. Two types of WAND sensor have been developed (TMS-S5R and TMS-B5R), both of which were tested.

The results from the tests show that:

- ✓ **Both types of Inductosense sensors were validated for thickness characterisation of an Inconel layer lining a carbon steel structure.**
- ✓ **The benefit of greatly improved data quality and accuracy of corrosion trends is also provided by the Inductosense system in this type of application. This allows for accurate monitoring of corrosion due to harsh conditions generally or potential process changes on the Inconel lining.**



# The testing, at a glance...

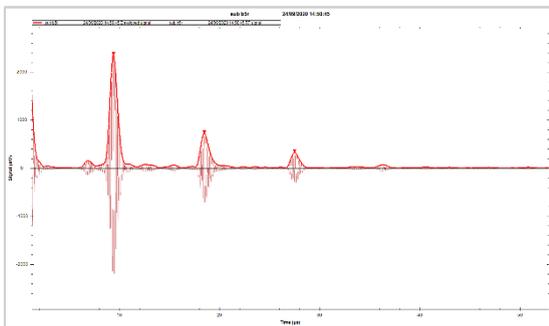
Two types of Inductosense sensors were used on the sample to validate their use in characterising the thickness of the Inconel layer:

## 1 TMS-B5R

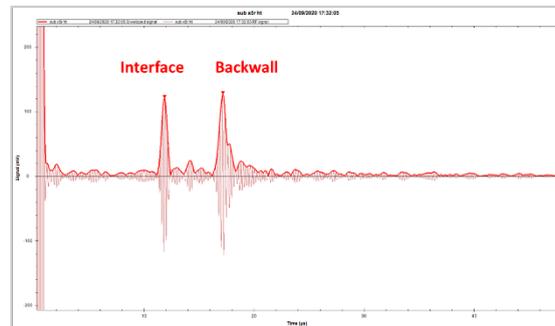
The first type of sensor, TMS-B5R, generates longitudinal ultrasonic waves. Testing has shown that this type of ultrasonic wave transfers very efficiently through the interface between the steel and Inconel, generating no or very little reflection. The resulting A-scan is shown below. This means that the usable echoes in the A-scan are from the backwall of the whole structure. The absolute thickness of the Inconel layer can be calculated if the thickness of the steel layer is known, otherwise a thickness loss value can be obtained. The advantage of this type of sensor is that they yield large signal amplitudes, which can help acquire signals in certain conditions.

## 2 TMS-S5R

The second type of sensor generates a different type of ultrasonic wave. With this type of ultrasonic wave, the interface reflects some of the energy of wave well. The A-scan is shown in figure 3. This means that the absolute thickness of the Inconel layer can be directly calculated using a peak to peak method (interface to backwall of whole surface).



A-scan resulting from the TMS-B5R



A-scan resulting from the TMS-S5R

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