

Metallurgy for Industries

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A Monthly News Letter

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Corrosion mapping using PAUT

A novel NDT application.

Corrosion is the deterioration of a metallic material by chemical or electrochemical attack. This is normally caused by the environment (most often water) and sometimes by another material. It is often desired on the cross country pipelines to estimate and map the areas of corrosion in order to assess their reliability and life.

There are several types of corrosion:

- Uniform corrosion that extends evenly across the surface.
- Pitting corrosion that is uneven and has smaller deep areas (pits).
- Exfoliation corrosion that moves along layers of elongated grains.
- Inter-granular corrosion that grows along grain boundaries.

This technique is based on the Ultrasonic technique that can measure variations in material thickness accurately; hence, loss of thickness due to corrosion can also be estimated.

To perform corrosion mapping an automatic or semi-automatic scanner is used to scan an inspection surface with various ultrasonic techniques such as pulsed echo A-scan and phased array. Phased Array Ultrasonic Testing (PAUT) method can be utilized effectively for identifying and mapping corrosion on internal side. Corrosion mapping is widely used in the oil, gas and nuclear industries for the inspection of pipework, pressure vessels, storage tanks and reactors.

Corrosion mapping by advanced ultrasonic testing using phased array system is a nonintrusive (non-invasive) technique which maps material thickness using ultrasonic techniques. Variations in material thickness due to corrosion can be identified and graphically portrayed as an image. The data is stored on a computer and may be color coded to show differences in thickness readings.

Results for corrosion mapping provide a high degree of repeatability, the advantage of position and size data for every flaw which can be compared to repeat scans of the same area to

Microstructure of the Month

**Magnification:** 200X**MOC:** Duplex Stainless Steel - UNS32205**Component:** Buried cross-country pipeline**Observation:** the optical micrograph shows typical signature of pitting corrosion damage in the microstructure of elongated grains of ferrite and austenite.

track flaw growth or corrosion rates for both general and individual pits.

TCR Advanced can provide corrosion mapping service using state of the art PAUT machine Olympus Omni Scan MX2. It offers a high acquisition rate with powerful software features for efficient manual and automated inspection performance. It is a compact, portable, modular instrument for ultrasonic testing on site. Our corrosion mapping technique can estimate length, width and depth of thickness loss areas.

These dimensions/data are vital to ascertain minimum allowable working pressure for line pipes as per ASME B31G.

A typical case study for same is as under:

To simulate corrosion conditions, longitudinal and circumferential grooves were made on internal surface of pipe and same were mapped by PAUT.

We have the capabilities of online corrosion mapping and there is no need for shutdown of plant. We carry out corrosion mapping at elevated temperatures up to 100 deg C.



PAUT scans for above respective grooves are as under.



To download detailed case study on corrosion mapping, please visit following link

www.tcradvanced.com/download/Corr_map.pdf

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