IRIS inspection of tubes

Internal Rotary Inspection System (IRIS)

IRIS is one of the recognised techniques used for the inspection of tubes in e.g. heat exchangers, boilers and airfin coolers.

IRIS can be applied on both ferrous and non-ferrous materials, although predominately IRIS is used on ferrous tubes and Eddy Current for other types. Either can be provided.

With IRIS the remaining wall thickness of tubes can be accurately measured. IRIS is more accurate than other tube inspection techniques and has the advantage of presenting information about the geometry of defects. Local defects and wall-loss on both sides of the tube can be accurately measured.

Defects under support plates can be measured without any limitations.

Theory

The probe used in IRIS examination is made up of a centering device, an ultrasound transducer and a rotating mirror. An ultrasound pulse will be generated in the transducer that is mounted in axial direction. A 45 degree rotating mirror in the probe will guide the sound bundle towards the tube wall. An ultrasound reflection (echo) will take place at the inner and at the outer wall of the tube. These echoes are reflected back and processed by the equipment. The time between these two echoes represents the wall thickness of the tube. Knowing the sound velocity in the material under test, an accompanying wall thickness can be calculated. Water is used rotate the probe mirror and is also needed as a couplant between the transducer and the tube wall.

A calibration standard of the same material and dimensions as the tubes to be examined is used to check the IRIS system response.

After an inspection an “on-site” report detailing the condition of each tube will be presented to the client.

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Overview of possibilities and limitations of IRIS

- This is a rotating ultra sound inspection method to measure the wall thickness of tubes. The technique can be applied to ferrous and non-ferrous tubes (e.g. carbon steel and Stainless steel). The method can also be applied on finned tubes.
- The data obtained with this inspection is presented in such way that it is possible to determine depth and geometry of defects.
- It's very accurate for measuring both local internal as external defects and wall thicknesses (pits with a diameter of 2 mm and bigger can be detected). It's possible to distinguish between internal and external defects.
- Wall thicknesses smaller than 0.8 mm cannot be measured reliably.
- The examination is not being influenced by changing material characteristics like conductivity and permeability. Changes in these factors can cause false indications when using electromagnetic testing methods.
- Defects under support plates can be detected and sized.
- Bends cannot be examined, but it is possible to pass bends in bigger (boiler) tubes to inspect the straight ends after the bends.
- Speed: to scan an entire tube wall with maximum sensitivity, pull speed will be around 5 cm/sec.
- This technique is often used as a tool to verify RFT and PSEC results and to get additional information on the geometry of defects.
- Tubes need to be very clean as dirt my cause loss of signal.

IRIS 9000

The IRIS 9000 is specifically engineered to provide the most accurate NDT inspection results for air cooled and liquid cooled heat exchanger tubes.

Most heat exchangers are prone to both internal and external pitting and corrosion. Currently available techniques offer at best an approximation of the remaining tube wall thickness.

This IRIS 9000 can accurately measure internal and external corrosion and pitting, and document the results for future reference.

This state-of-the-art portable instrument was designed to operate reliably and accurately in the harsh conditions that are found in petrochemical and industrial plants worldwide.

Representing the sixth generation of digital IRIS systems developed in-house, the IRIS 9000 has more than 20 years of field inspection experience incorporated in its design.