TWISTED TUBE® HEAT EXCHANGER INSPECTION WITH EDDY CURRENTS

THE CHALLENGE	THE SOLUTION	THE BENEFITS
Developing the first reliable solution for the inspection of non-ferromagnetic Twisted Tube® heat exchangers.	An adaptive probe that adjusts to the geometry of twisted tubes featuring a slip ring and an ingenious combination of coils.	Fast, reliable examination of Twisted Tube heat exchangers.

Heat exchangers are essential to the operation of many systems in various industries, processing plants and electric power generation plants, for example. A unique type of heat exchanger (HX) was introduced several years ago: the Twisted Tube® HX. They offer the highest levels of efficiency, but have always been a challenge for periodic inspections. Until now.

THE CHALLENGE

A twisted tube is composed of two straight, circular sections near the tubesheets, separated by a length of helical, oval tube. This helix creates a small, central circular passage along the length of the tube where traditional bobbin probes can be pushed and pulled.

However, standard ECT probes deliver suboptimal performances—detecting, characterizing, and sizing defects are problematic because of poor signal-to-noise ratios. Defects on the wall furthest away from the tube's center (crest) produce much smaller, distorted signals than same-size flaws in the narrow section, closest to the tube's center (dip). This is because of the liftoff created by the tube's geometry between its walls and the ECT probe. This amount of liftoff translates into a lower probability of detection and less accurate sizing.

Moreover, the common sizing method for determining defect depth is inaccurate because of the reduced sensitivity and the large tube signal variations coming from the various defect locations (crest or dip).

Internal rotary inspection systems (IRIS) also suffer from the non-linear geometry, as reflecting echoes are not perpendicular to the inspected wall. It can therefore not be considered as an alternative.

The tubes in such HX come in a variety of pitches, diameters (typically 19.1–25.4 mm [0.750–1 in]), and non-ferromagnetic and ferromagnetic materials.

THE SOLUTION

Eddyfi Technologies set forth to develop a probe that would fit into most Twisted Tube HX and dynamically adjust to the changing geometry, minimizing liftoff and optimizing inspection results.

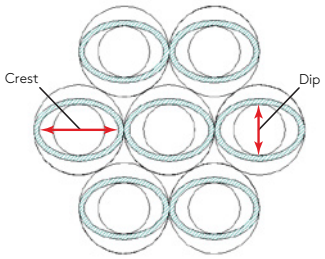
The patent-pending Eddyfi® Twistec™ probe is designed with a rotating head equipped with two "feelers" that press down the coils they contain against the twisted tube's inner surface. The probe also incorporates a pair of oval coils that match the helix pitch of the twisted tube. The Twistec probe therefore remains close to surface under test, yielding significantly more precise inspection data. The feelers can compress, which enables the probe to fit through the circular section at the tubesheet.

At a pulling speed of approximately 0.3 m/s (12 in/s), the probe was able to inspect 1500 tubes at a rate of about 60 to 80 tubes per hour, yielding results that allow defects to be much more clearly identified. The Twistec probe's signals are also less noisy than those from a conventional bobbin probe, which yields more reliable results.

THE BENEFITS

Twistec's revolutionary rotating probe head with its adaptive feelers and oval coils minimize liftoff and noise from the tube's helix, while optimizing results.

The probe enables efficiently and reliably distinguishing between inner/outer-diameter defects, and determining whether they are in the crests or dips of

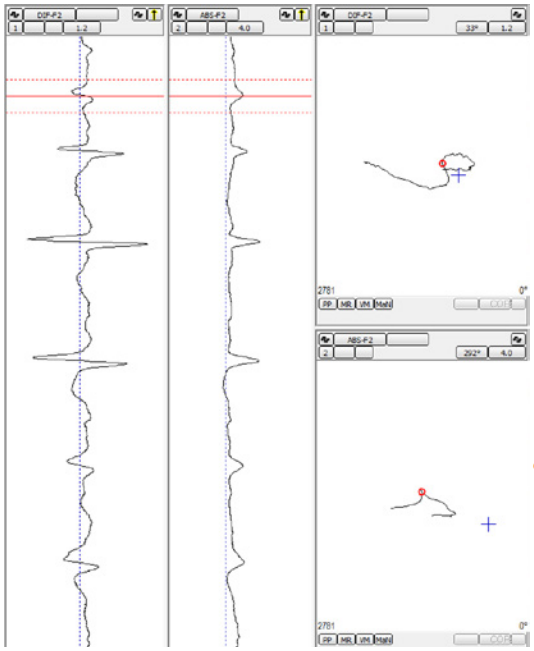


tubes. These results are easier to analyze and much more accurate than those obtained with conventional bobbin probes in this particular application.

Twisted Tube® HX operators will have an easier time extending the useful life of this mission-critical piece of equipment with the high-quality results of the only solution capable of giving reliable results.

This is only one of the many demanding challenges that Eddyfi Technologies has risen up to until now. Talk to us about your own inspection project requirements.

Bobbin probe results



Hole in crest

Hole in dip

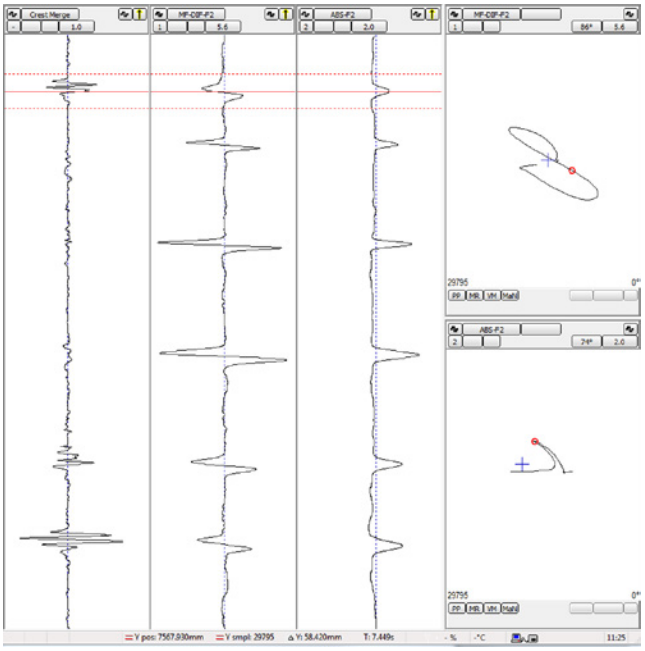
60 % FBH in dip

4×20 % FBHs

60 % FBH in crest

2×holes in crest

Twistec probe results



Crest detection

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Eddyfi Technologies

Beyond current