ToFD

Increasing use of risk-based inspection (RBI) on chemical and refining plant places greater emphasis on the ability to accurately size and monitor pre-existing or growing in-service discontinuities. ToFD is well suited to many process industry applications.

Our solution

The Time-of-Flight Diffraction technique (ToFD) was originally developed as a method of accurately sizing and monitoring the through wall height of in-service flaws. It is equally effective in weld inspection for the detection of flaws, irrespective of type or orientation, since ToFD does not rely on the reflectivity of the flaw but uses the diffracted sound initiating from the flaw tips.

In the ToFD technique the transmitting and receiving probes are located equidistant over the weld center and scanned parallel with the weld. Normally a single pass is sufficient to attain the required inspection coverage.

A transmitting probe emits a short burst of sound into a material, and this energy spreads out and propagates in an angular beam. Some of the energy is reflected from the flaw, and some is incident to the flaw and is diffracted away. A fraction of this diffracted sound travels toward a receiving probe; the signals are time resolved using simple geometry calculations and are graphically displayed in a greyscale form.

ToFD is an important tool for inspection of:
- New welds to record a repeatable base line image. Such data is invaluable for comparisons with subsequent inspections throughout the life of the equipment.
- In-service welds for erosion loss at the root zone, also on High Temperature surfaces.
- In-service welds for preferential corrosion loss at the root and heat affected zone (HAZ).
- In-service welds for original build quality assessment prior to change in operating conditions of the equipment.
- In-service welds and material for fatigue or service related cracking problems.
- New construction HDPE fusion weld inspection.
- Defect sizing - height and length.

Benefits

ToFD, as it is an ultrasonic technique is very suitable to replace radiography when this is not desirable, because of the radiation hazard. ToFD has the following benefits opposed to standard ultrasonic testing and radiography:

- Defect detection does not depend on orientation.
- Cracks not perpendicular to the measured surface, can be detected.
- Very accurate determination of defect height and length.
- Higher Probability of Detection (POD) improves reliability.
- Inspection results are immediately available as a permanent record of the inspection.
- ToFD fingerprinting, applied during construction, may reduce future in-service inspection costs.
- High data collection speeds possible (250mm/second).
- Can be used between 6mm up to 350mm thick welds and even more.
- Can be used on plastics like HDPE materials (fusion welds).

Related services

- Ultrasonic Testing
- ToFD level II