Time of Flight Diffraction (TOFD)
High Precision Weld Inspection

Welding defects can compromise the stability and integrity of a welded structure. There are different weld testing methods available, with time of flight diffraction (TOFD) considered to be the most reliable method of all.

TOFD is a high performance non-destructive testing (NDT) technique which offers the accurate detection of cracks, slag and lack of fusion. It is an improved version of the conventional ultrasonic testing method which provides a fully computerized system able to scan, store, and evaluate indicators in terms of height, length, and position. There is no other method currently available with similar grade of coverage, precision and speed.

TOFD principle

An ultrasonic probe is positioned on either side of the weld, one acting as a transmitter and the other a receiver. The longitudinal sound beam can encounter obstacles on its path, which cause reflected and diffracted signals.

When the probes are moved in a parallel motion along the weld, the resultant waveforms are digitized, stored on hard disk and displayed on the video-screen as a grey scale image. The image build up is in effect a through sectional view of the weld examined and can be used for accurate sizing and monitoring of indications.

Inspection approach

We at TÜV Rheinland are dedicated to finding the optimal non-destructive testing method that will perfectly meet client needs. Whether or not the TOFD inspection technique is suitable for a specific inspection situation depends on many different factors. TÜV Rheinland offers individual testing solutions for any kind of testing project. Our inspection approach includes consultancy services prior to inspection, weld testing using the TOFD technique, data processing with our in-house developed software, and assistance in the interpretation of inspection findings.

The use of our TOFD inspection service will lead to major time savings during the life cycle of new build and replacement projects. It is an excellent and widely accepted pre-service and in-service inspection tool that is recognized internationally, with defined codes, standards and acceptance criteria available for its use.

Areas for application

- Construction weld inspections.
- Intermediate inspections to examine partially filled welds at the preheat temperature.
- In service inspection at ambient or high temperatures.
- Examination of steam drums used in power generation.
- Root corrosion detection in piping vessels.
- High temperature weld inspections of up to nearly 500°C.
- Inter granular stress corrosion cracking in welds.
- Pre-service inspection of piping welds, duplex pipeline welds and spherical storage tanks.
- Nozzle inspection.
INDUSTRIAL SERVICES - TIME OF FLIGHT DIFFRACTION (TOFD)

Benefits at a glance

- High probability of defect detection.
- Reduced cost thanks to online inspections.
- No logistical difficulty as inspection takes place on-site.
- Quick inspection results.
- Inspections under high temperature conditions.
- Accurate inspection data.
- Certified inspectors.

ScanPlan

Our in-house-developed software suite called ScanPlan® aids in the professional preparation of TOFD inspections and minimizes the preparation time required. It is an integrated software package that can either work standalone or in combination with a database. The relevant data consist of the client, site and component information, and of course the TOFD inspection data. It not only helps to find the optimum calibrations and configuration for the TOFD inspection, it also has excellent reporting features. ScanPlan® works in accordance with industry standards such as the Pressure Equipment Directive (PED), American Society of Mechanical Engineering (ASME) and the British Defense Standards (Def Stan).

About TÜV Rheinland:

Founded 140 years ago, TÜV Rheinland is a global leader in independent inspection services, ensuring quality and safety for people, the environment, and technology in nearly all aspects of life.

Our experience - your benefit

TÜV Rheinland Sonovation has over twenty years of experience with weld testing by means of TOFD. Our inspection team is one of the best-resourced in the world. Our involvement in equipment development, inspection solutions and accredited TOFD training courses demonstrate our commitment to this technique.

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