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Rotoscan: Automated UT Weld Inspection

Rotoscan is an automated ultrasonic inspection system developed in-house by Applus+ RTD to perform NDT welding inspections of girth welds during the construction of long-distance pipelines. Developed for both onshore and offshore NDT pipeline inspection, the Rotoscan UT weld inspection system can detect and measure welding imperfections within the weld and associated heat-affected zone, determining both the circumferential length and the through-thickness dimension. The system combines a low false-call rate (FCR) with flaw-sizing capabilities, a user-friendly color presentation using customized software, and the storage of results.

THE Applus+ SOLUTION

Applus+ provides pipeline inspection through qualified, highly skilled operators and its own field-proven, automated ultrasonic testing equipment: Rotoscan.

As with all Applus+ scanners, Rotoscan is designed to be operated by one Rotoscan AUT operator who is in charge of scanning, interpretation, and reporting, and one scanner technician who helps the AUT operator with the scanner and guiding band handling. An electric drive motor provides the scanning motion. An encoder measures positions around the circumference. Pipeline girth welds are divided into several depth zones, related to the wall thickness and weld bevel configuration.

The coverage area for the UT weld inspection is achieved by placing ultrasonic probes (either conventional or phased array) on both sides of the weld such that each generated inspection function or probe examines a dedicated depth zone within the weld. This eliminates the need to move the probes to and from the weld, as is conventional practice in time-consuming manual ultrasonic inspections.

The Applus+ Rotoscan requires approximately 5 minutes to complete the weld integrity test. The scanning time depends mostly on the pipe circumference and wall thickness.

The NDT probes, custom-designed by Applus+, are manufactured to the specific weld configuration and material (angle, frequency, and focus) of each pipeline inspection and UT weld test. NDT probes can also be designed to withstand high-temperature pipe surfaces, in particular for offshore pipeline construction.

The system can be configured with conventional or phased array probes and is equipped with two different types of scanners, offering three frame options to cover a wide range of pipe diameters from 5cm to 142cm (2" to 56"). Moreover, the integrated and simultaneous ToFD/Creep/Transverse ultrasonic testing feature provides additional information to assist in the evaluation of indications.

Weld Inspection Software

The Rotoscan system incorporates computerised data presentation and storage. The onboard computer enables the digitization of ultrasonic signals from automated ultrasonic testing, which is essential for coherent C-scan mapping and the use of Time of Flight Diffraction (TOFD) within the system. Additionally, the software enables the automatic evaluation of indications and the generation of defect lists.

Applus+ conducts its NDT welding inspections in accordance with all customary standards, including ASTM 1961, API 1104, and DNV OS F101. The company has qualified its automated ultrasonic testing equipment with DNV for pipeline inspection projects with wall thicknesses ranging from 6mm to 30mm. The wall thickness range on which the system can be applied varies from 6 to 45mm.

Target customers

Rotoscan was primarily developed for the transport-pipeline industry for weld integrity test and verification. Our automated pipeline inspection services fill the gap where conventional methods including industrial radiography prove to be either cost- or time-restrictive. Through the development of Rotoscan and the zonal technique, Applus+ has consistently offered a quality service to, and generated a high degree of confidence among, its clients, ensuring integrity from the start.

Key customer benefits

The benefits of using Rotoscan's automated pipeline inspection system for weld integrity test include:

- Higher probability of detection (POD) of critical linear anomalies
- Can accommodate all weld bevels or welding processes such as SMAW and GMAW
- Rapid interpretation of results
- Immediate weld-quality feedback during inspection and construction to reduce repair rates
- No radiation hazards

- No harmful chemical waste
- Substantial reduction of inspection time
- Can be used with TOFD/Creep/Transverse at the normal Rotoscan inspection speed
- Provides accurate flaw height, depth, length, and type for ECA (engineering critical assessment) weld-acceptance criteria, which is something radiography cannot provide
- No equipment inside the pipe
- High-speed offshore pipeline inspections – up to 350 welds per day
- Inspection speeds of up to 80mm/sec (3”/sec)
- No delays or stoppages to adjacent pipeline workers
- Capable of inspecting welds at elevated temperatures (up to 95°C)
- Acceptance criteria can be adjusted to suit client requirements
- Cost effective when used in long-distance pipeline construction
- Welding and UT weld inspection can be carried out at the same location