

Rotoscan Automated Ultrasonic Weld Inspection

The Rotoscan system was developed in house by Applus+ RTD for the inspection of girth welds during the construction of long-distance pipelines, both onshore and offshore. Rotoscan detects and measures welding imperfections within the weld and associated heat-affected zone, determining both the circumferential length and the through-thickness dimension. The system couples a low false-call rate (FCR) with flaw-sizing capabilities, a user-friendly presentation in colour using customised software and storage of results.



THE Applus+ SOLUTION

Applus+ RTD provides pipeline inspection through qualified, highly skilled operators and its own field-proven, mechanized, ultrasonic-inspection system: Rotoscan. As with all Applus+ scanners, Rotoscan is designed to be handled by a single operator (with a standard scanner, a second operator is needed to handle the guiding band). An electric drive motor provides the scanning motion. An encoder measures positions around the circumference.

Pipeline girth welds are divided into a number of depth zones related to the wall thickness and weld bevel configuration. Full inspection coverage 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 inspection time using Rotoscan is approximately 5 minutes, depending on pipe circumference and chosen scanning speed.

Applus+ RTD custom designs and manufactures ultrasonic probes to the specific weld configuration and material (angle, frequency and focus) of each individual pipeline project. Probes can also be designed to withstand high-temperature pipe surfaces, in particular for offshore barge construction.

Rotoscan can be configured with the use of conventional or phased array ultrasonic probes and can be equipped with two different types of scanners in combination, with 3 frame options to cover a wide range of pipe diameters from 5cm to 142cm (2" to 56").

Moreover, the integrated and simultaneous TOFD feature provides additional information to assist in the evaluation of indications.

The Rotoscan system incorporates computerised data presentation and storage. The on-board computer enables ultrasonic signals to be digitised, which is essential for coherent C-scan mapping and the use of Time of Flight Diffraction (TOFD) within the system. In addition, the software allows for the automatic judgement of indications and generation of defect lists.

Applus+ RTD works according to all customary standards, including ASTM 1961, API 1104 and DNV OS F101. Additionally Applus+ RTD has qualified its system with DNV for pipeline projects with a wall thickness of between 6mm and 30mm. The wall thickness range on which the system can be applied varies from 6 to 45mm.

Target customers

Rotoscan, having been primarily developed to aid in the transport-pipeline industry for the verification of weld integrity, services a gap where conventional methods including 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

Benefits of the Applus+ RTD Rotoscan method 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 hazard
- No harmful chemical waste
- Substantial reduction of inspection time

- Can be used with TOFD 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 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 inspection can be carried out at the same location