Waygate Technologies
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Application note

Railway solid axle front face UT inspection

Summary

When railway axles fail, the consequences can be disastrous. For safety, railway solid axles must be inspected regularly using non-destructive testing (NDT) methods to detect transversally oriented fatigue cracks.

If inspecting from the axle's lateral surfaces, methods like ultrasonic testing (UT) or magnetic particle testing (MT) require coating, painting and removal of accessories—such as brake disks and gears—to allow for proper coupling of the probe or inspection device.

From the axle's front face, only UT inspection is feasible because it is the sole method that can penetrate several millimeters of material. Unfortunately, solutions based on conventional UT often do not achieve the highest probability of detection (POD). That's because minimizing the number of inspection angles and transducers may not result in an optimal inspection. Moreover, many specific setups and kits may be required for different inspection tasks.

Solution

With sectorial steering capability, Waygate's **solid axle mechanized testers (SAMT)** combine several conventional probes into one single phased array (PA) probe. This flexible solution delivers the required steering angles to optimally cover the axle's full lateral surface. More reliable inspection is possible because the SAMT's single PA probe delivers a lower risk of loss of the UT coupling.

Combining SAMT with our Mentor UT phased array flaw detector's multi-group capabilities lets operators apply defined steering angles and groups to highlight flaws in respect to geometry indications. This capability translates to easier and more informative inspection evaluations.

This solution helps boost the POD—and ultimately enhance axle safety—via its steering angle fine tuning capability, enhanced flaw extension evaluation (through additional B-S scan views), and dynamic full data recording for post processing and traceability.

Key features/advantages

- Combined B-Scan of all groups in preparation. Full A-Scan recording possible.
- Magnetic coupling within the center bore of the axle via an exchangeable cone.
- Manual probe rotation over approximately 370º.
- Position related data recording thanks to an integrated encoder.
- Maximal circumferential resolution is 1 (one) degree.
- Phased-Array transducer with 32 or 16 elements in 2 or 4 MHz with a 0º wedge. Both can be replaced by the user.
- Coverage of 55% of the axle length from one end (typical 1,2m).
- Inspection time is less than 5min for an entire axle (2 tests), depending on the UT Requirements.

## Mentor UT's group function capability

Groups allow for information filtering, custom settings, enhanced evaluations, and fewer demands on the operator or evaluator. Each group is completely independent with regard to:

- A-scan settings
- Delay laws (sweeping range)

A single set of groups should be defined to optimally cover the critical axis areas.

The Mentor UT allows user-defined workflows (apps) for step by step guidance through the inspection process for a consistent inspection every time.
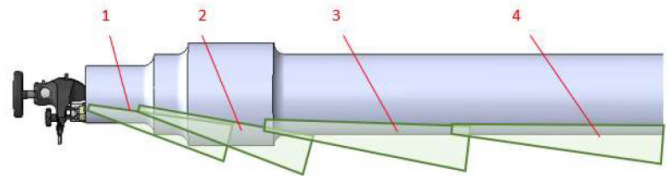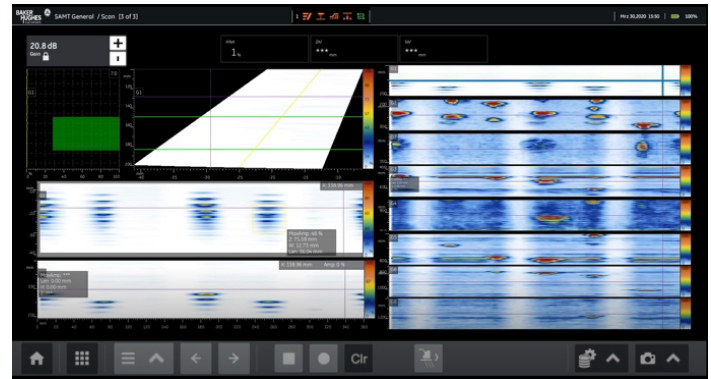
Part numbers

0600512 SAMT Basic 4 MHz System	0600520	Probe; SAMT 4 PA32
	0162476	Cone Kit; SAMT 90º
	0162459	Wedge; SAMT 100-180 mm
	0162460	Wedge; SAMT 90-100 mm
Additional accessories	0600558	Probe SAMT 4 MHz PA16
	0600585	Probe SAMT 2 MHz PA16
	118M1844	Presentation Module (Mentor UT)
	Mentor-UT-ADAP32-T	Adapter; Mentor UT 32ch/Tyco
Mentor UT Base Unit	100N3883	

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