ECHOGRAPH-REPS
Ultrasonic Tube End Inspection

KARL DEUTSCH

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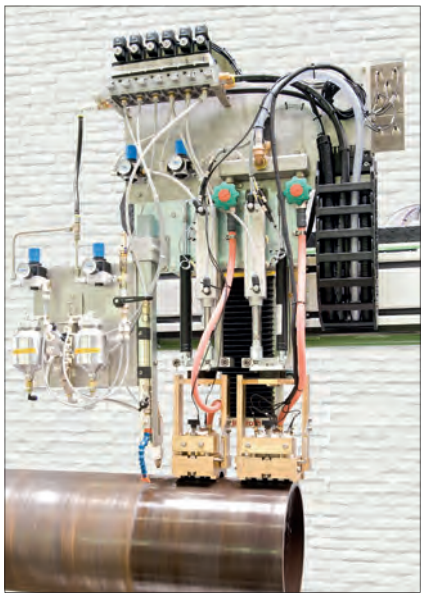


Testing system for tubes with heavy walls where a total of seven probes is employed: Two for longitudinal external defects, two for longitudinal internal defects, two for transverse defects and one for wall thickness measurement and lamination detection. In this case, the seven probes are mounted into two probe holders. A paint marking device can be supplied to mark defective tubes.

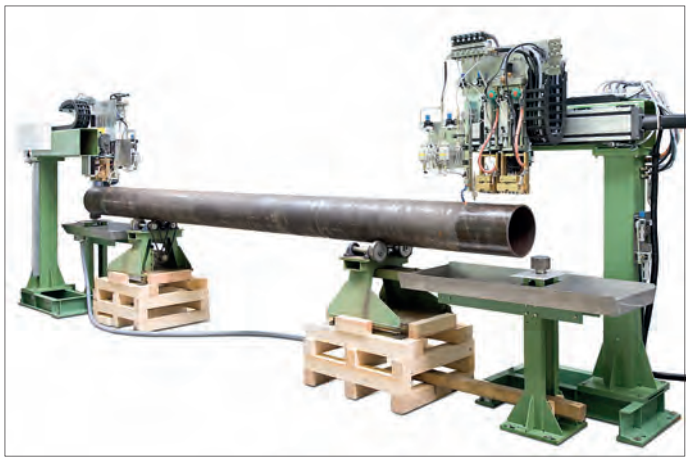
Ultrasonic Tube End Inspection

KARL DEUTSCH has developed ultrasonic testing equipment since 1951 and has shipped the first tube inspection system more than 40 years ago. Many improvements of the ECHOGRAPH-electronics, the robust testing mechanics and the ultrasonic probes have led to our current state-of-the-art. KARL DEUTSCH maintains a strict quality management system according to DIN EN ISO 9001.

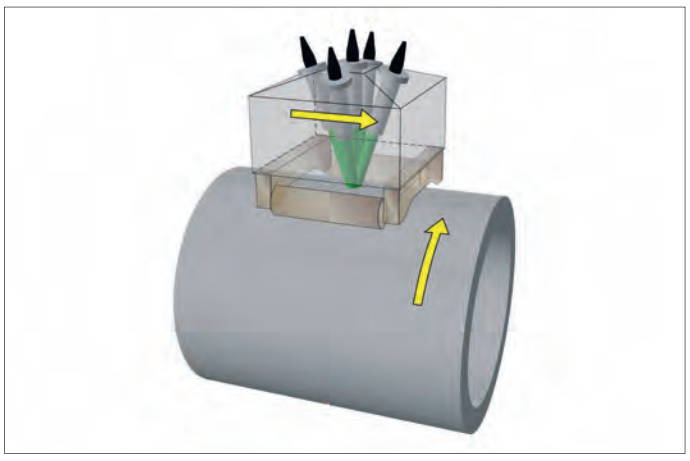
For each tube testing system, a small untested end remains. This is caused by the fact, that ultrasonic coupling uses water and the water path between tube surface and ultrasonic probe surface has to be in a stable condition. Due to the high relative speeds between tube surface and probe holders, this task can be very challenging. Therefore, separate tube end testing systems are required.

The tube is tested on both ends with two separate machine stands using one common ECHOGRAPH ultrasonic electronics. The tube is moved by a linear tube conveyor into the testing stand or the machine moves towards the pipe end. The probe holders are mounted to a robust machine frame and their height is roughly pre-positioned in accordance to the tube position. The test position is at 12 o'clock or at 6 o'clock. The probe holders are guided on the tube surface by rollers. Once the tube is detected by position sensors, the probe holders are pneumatically lowered onto the tube surface. Gimble-mounted probe holders are used to compensate the tolerances concerning the tube straightness and ovality.

Either seamless or welded tubes are inspected. The type of tube determines the relevant testing functions. Seamless tubes are often tested with 5 ultrasonic testing angles (clockwise, counter-clockwise, both tube axis directions and straight beam). SAW-pipes often require the detection of laminations in a zone of 50 mm width. For that purpose, broad-beam dual-element probes are used to provide a full coverage during one rotation.



Two machine stands – one for each tube end and provisional tube rotating device for assembly at KARL DEUTSCH systems workshop.



Testing principle with five ultrasonic probes and helical testing traces (rotating tube, linear movement of probe holder, probe holder in 12 o'clock position). Longitudinal defects are detected with two probes which transmit ultrasound in both circumferential directions (clockwise, counter-clockwise). Transverse defects are detected with two probes with ultrasonic incidence in the tube axis direction. One straight beam probe is used to measure the wall thickness and for lamination detection.

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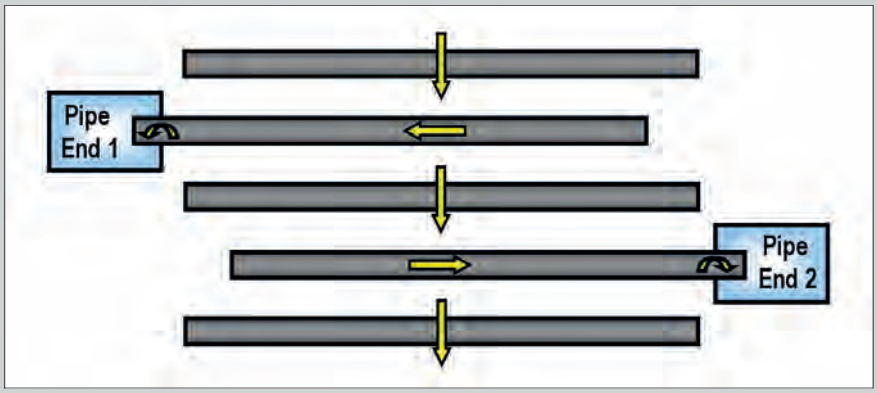
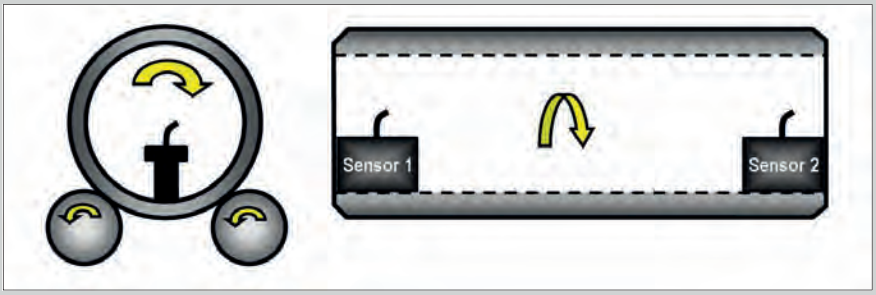
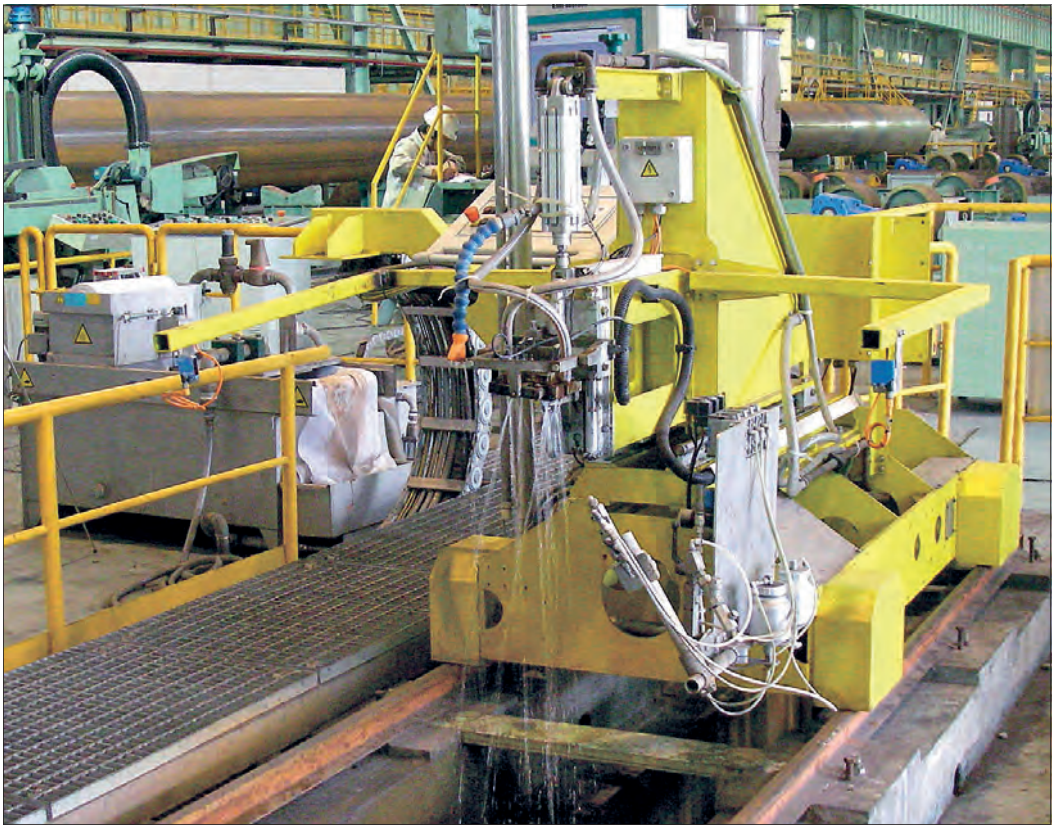


Principle of tube transportation (customer responsibility): The tubes ends are tested sequentially. The transportation is carried out by a transverse tube conveyor. Either the tube is linearly moved towards the testing system (see figure) or the system moves towards the pipe. Once the tube is in the test position, a rotating device starts to spin the tube.



SAW-pipes should be inspected from the inside for the shortest possible untested ends. Therefore, the optimal test position is in 6 o'clock. Broad-beam ultrasonic probes ensure a large coverage during one rotation.

Onsite situation for SAW-pipe end testing system: The testing system is mounted on rails to approach the pipe. Once the pipe end has been reached, the ultrasonic probes are pneumatically lowered onto the internal pipe surface.



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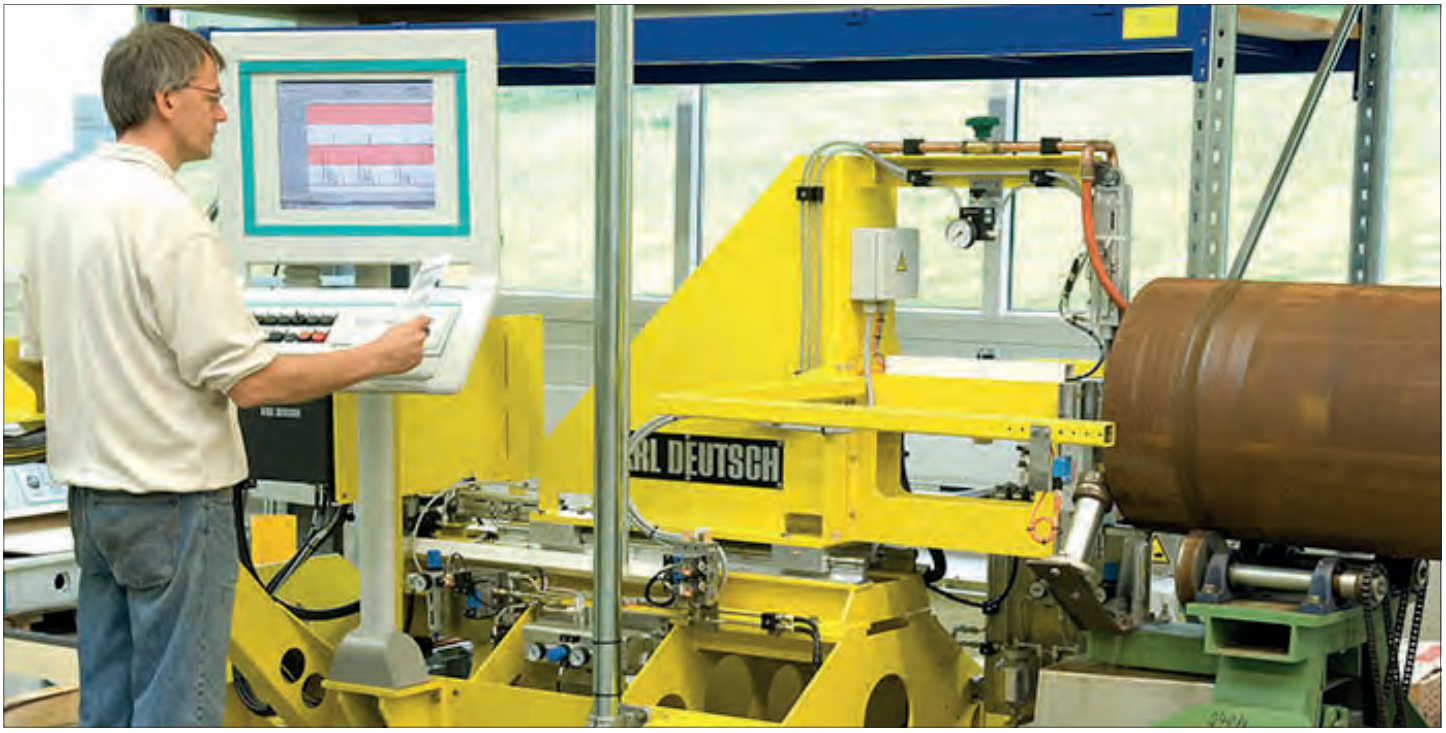

Entering the test parameters and checking the calibration of the test system

Summary of Technical Data:	
Specimen	• seamless or welded tubes • in case of welded tubes the weld crown needs to be reomved on the surface where the ultrasonic probes are applied
Possible testing task(s)	detection of defects within the tube ends • longitudinal defects • transverse defects • laminations and wall thickness measurement
Test procedure	• probe is positioned on external tube surface in 12 o'clock position or on internal tube surface in 6 o'clock position • rotation of the tube and linear probe movement (helical test traces for seamless tubes) or one full rotation only (SAW-pipes)
Testing speed	typical rotational speed: 0.3 - 1.5 m/s
Volume to be tested	typically 100 -150 mm on each tube end
Untested ends	dependent on tube end condition, typically 10 mm

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