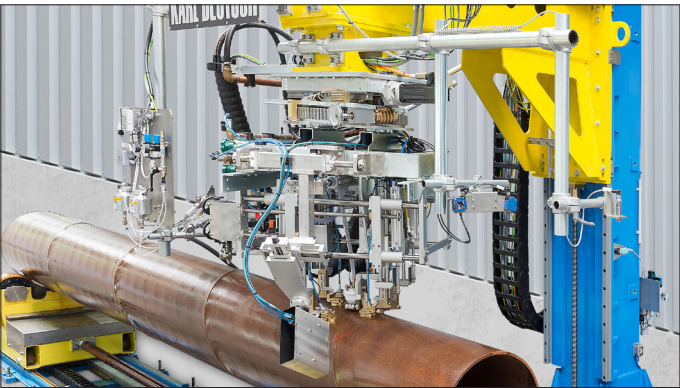


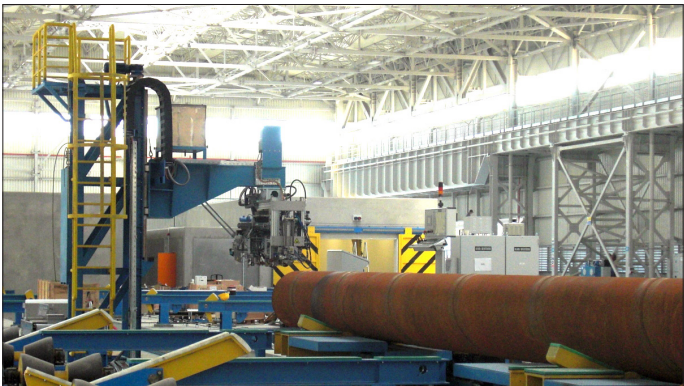
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Ultrasonic Inspection of HSAW-Pipes



The weld seam is continuously monitored by a laser-optical tracking system.



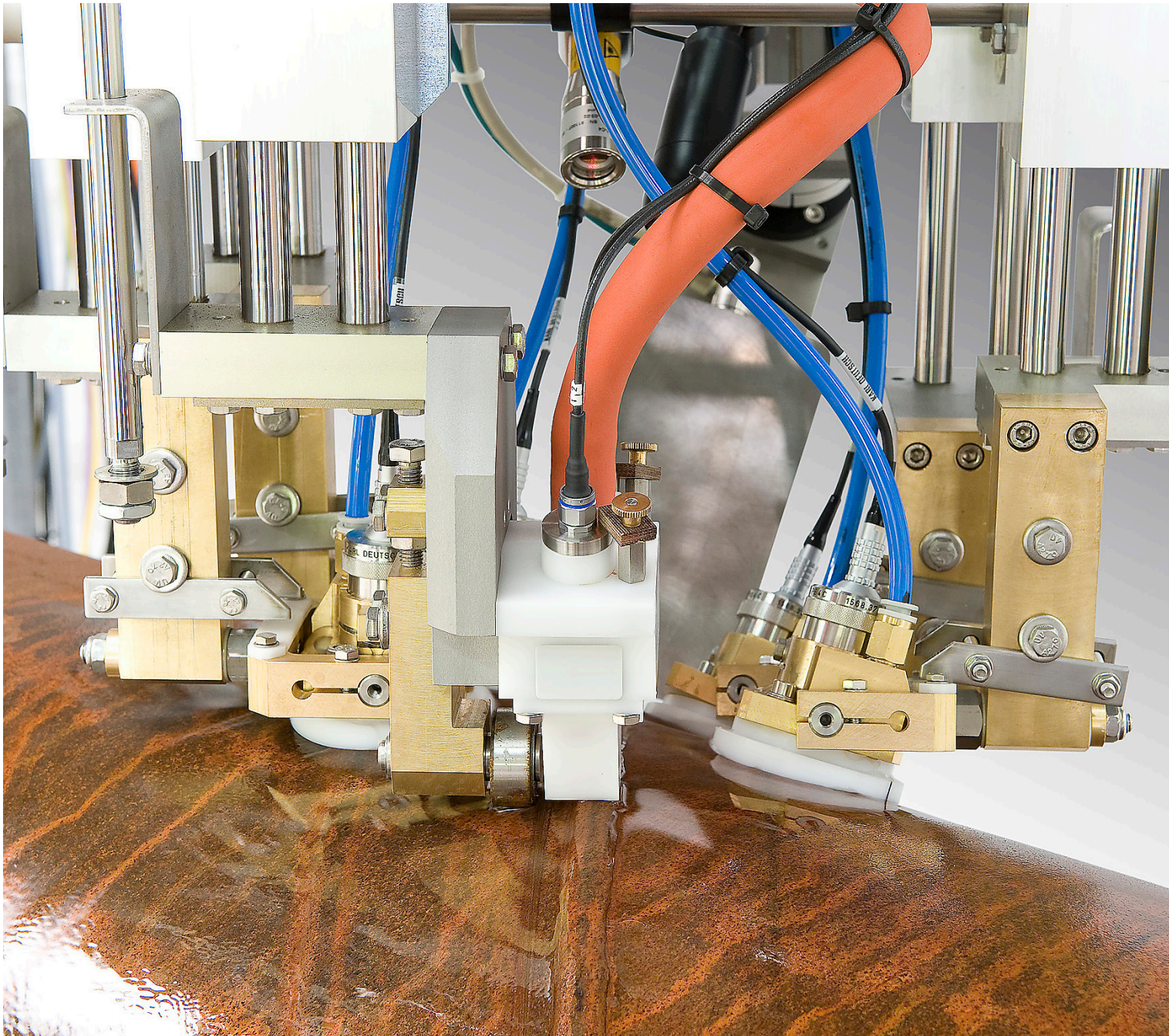
The weld testing mechanics is mounted to a height-adjustable boom. Due to the large pipe diameter range, an operator platform is often required.



The pipe is handled by means of a pipe carriage. Linear and rotational feeding must be perfectly synchronised (picture as courtesy of Borusan Mannesmann Turkey).

Specimens and typical project data	
Helical SAW-Tubes	
Base material	hot rolled coils
Diameter	300 – 3600 mm
Wall thickness	3 – 25 mm
Strip width	200 – 2000 mm
Width of weld seam	8 – 30 mm
Testing tasks	detection of longitudinal and transverse defects and laminar defects beside the seam; option: oblique defects in weld, laminations in the base material and in pipe end
Specifications	API, DNV, ISO (others like Shell, Ghost etc. on request)

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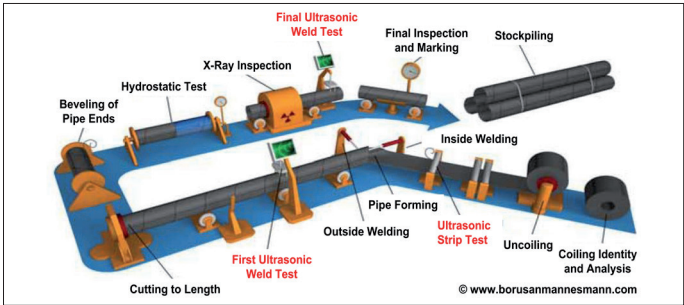
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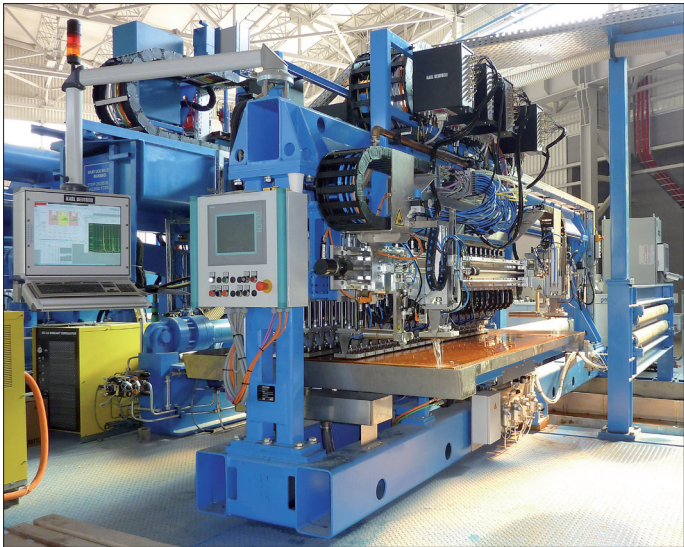
Three ultrasonic testing systems are typically required for the production of helically submerged-arc-welded pipes (HSAW), if they are later used for oil or gas pipelines.

The base material, i.e. the steel coil is either tested before welding with a strip testing machine ECHOGRAPH BAPS or after welding on the finished pipe. The ultrasonic coverage for the base material depends on the number of ultrasonic probes and if an oscillating probe movement is added. In recent years, solutions with 100% coverage were presented which is typically accomplished with a strip testing system before welding.

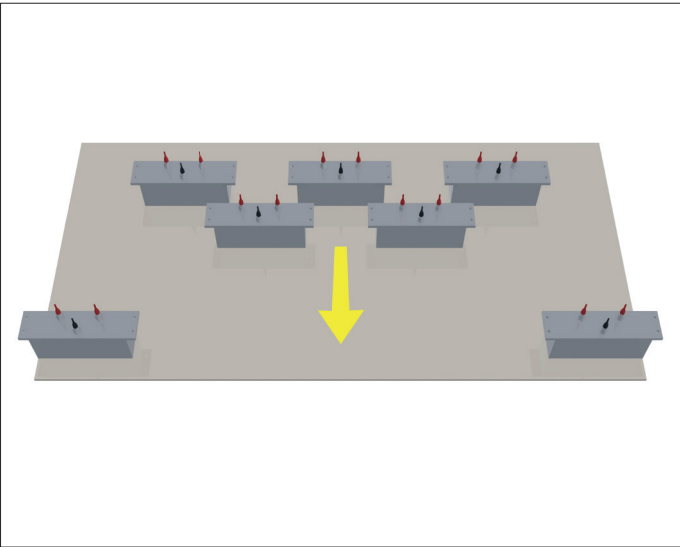
Directly after welding, the weld is checked by a first ultrasonic testing machine (on a virtually „endless“ pipe). Therefore, the weld quality can be checked in an early stage of the production. After cutting the pipes to their specified length and after undergoing the hydrostatic test, a final ultrasonic test is performed. The detection of laminations within the pipe body, the heat-affected zones besides the weld and the pipe ends is performed with straight beam ultrasonic incidence (TR-probes). Angle beam incidence detects longitudinal and transverse defects in the helical weld. A special feature is the on-bead probe pair for transverse defect detection using the squirter coupling technique. The K- or X-setup can therefore be avoided.



Production chart for helically (spirally) welded SAW-pipes (as courtesy of Borusan Mannesmann Turkey): After uncoiling of the steel strip, an ultrasonic strip test is performed. After pipe forming and welding, a first weld test is carried out. The pipes are cut to their final length, undergo the hydrostatic test and the final ultrasonic test.



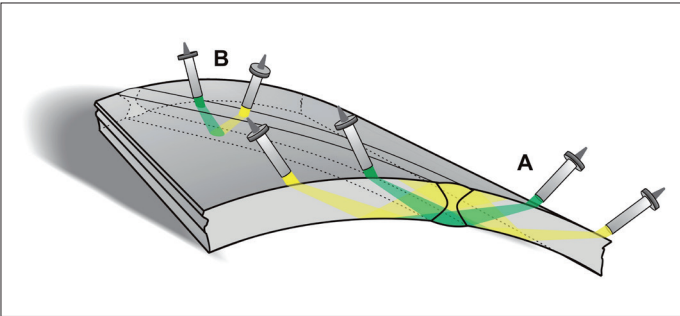
A strip testing machine consists of a testing bridge which is twice as wide as the coil width. The probe holders can be moved between the test position (online) and the calibration position (offline, see picture). For further details see our brochure ECHOGRAPH BAPS.



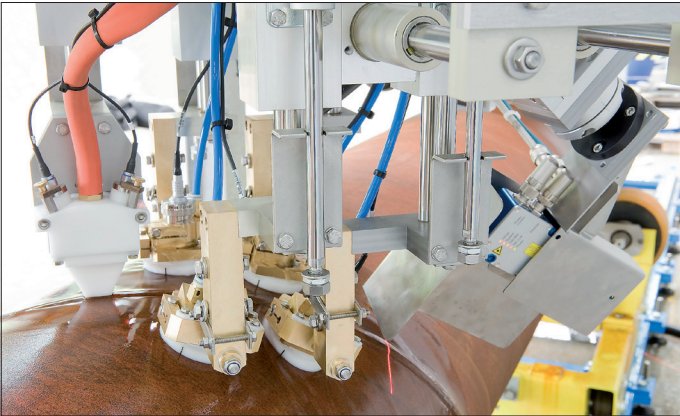
Testing of the pipe body before welding with 100% coverage. Separate probe holders are used for the strip edges. They are guided along the edges by steel rollers. The strip middle is covered by overlapping probes in two rows (100% coverage).

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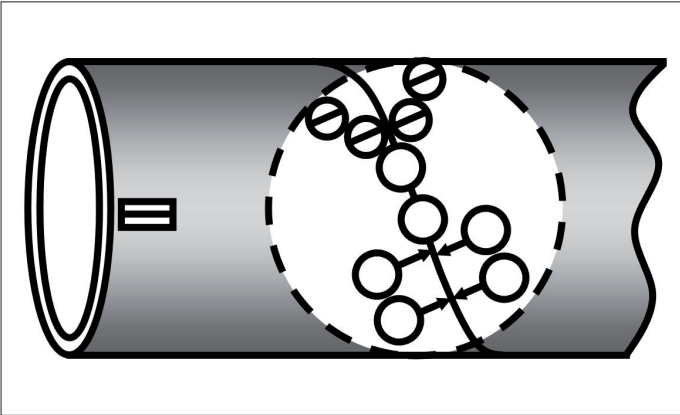
Ultrasonic Inspection of HSAW-Pipes



First ultrasonic weld test with six probes: Two probes for external longitudinal defects, two probes for internal longitudinal defects and two on-bead probes for transverse defects.



Six ultrasonic probes follow the weld crown which is monitored by a laser-optical seam tracker. The distance of the longitudinal probes with respect to the weld (skip distance) can be comfortably adjusted. The on-bead transverse probes are mounted into one common probe holder (left in picture).



Final ultrasonic test with 11 probes: Two probes for external longitudinal defects, two probes for internal longitudinal defects and two on-bead probes for transverse defects, four probes for laminations (HAZ) and one probe for the pipe end.



Due to the compact design of the probe holders, all required probes could be mounted into one test frame (right in picture). The separate pipe end probe holder is seen on the left.



Pipe end testing is carried out using a paintbrush probe with a 50 mm test track. Perfect guidance along the pipe end is achieved by two sets of steel rollers. The same probe holder is used for both pipe ends (second set of steel rollers is lifted).



The pipe body can also be tested after welding (instead of testing the strip). Dependent on the required coverage and the welding speed the number of probes can be accordingly chosen. The coverage can be further increased with an oscillating probe movement.