

ECHOGRAPH-SNUS

Ultrasonic Inspection of SSAW-Pipes

KARL DEUTSCH

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KARL DEUTSCH has developed ultrasonic testing equipment since 1951 and has shipped the first inspection system for automated weld inspection on SAW-pipes in 1967. Many improvements on 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 9001:2000.

For the inspection of the weld and the heat affected zone (parent material of the strip next to the weld), several probe pairs are used to test the pipe weld in the 12 o'clock position. All probe pairs can be rotated to

match the weld angle of the pipe. Each probe is flexibly mounted for perfect guidance on the pipe surface. In addition, each probe pair can be individually lowered and lifted by pneumatic means (important to achieve short untested ends in case of an off-line inspection).

Ultrasonic coupling is achieved by means of a narrow water gap between the protective face of the probe and the pipe surface. Curved skids (guiding shoes) are used to guide each probe on the pipe surface.

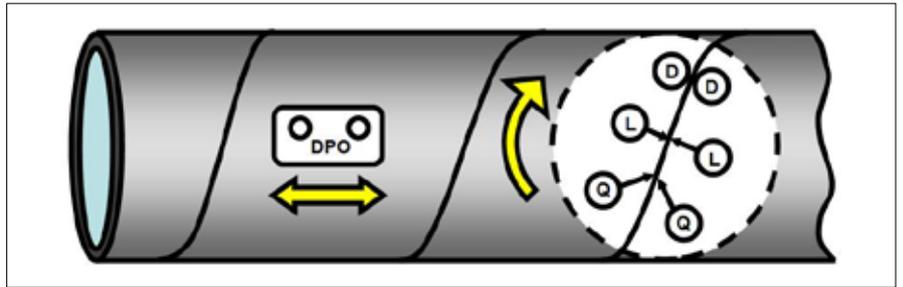
For centred guidance of the probe pairs with respect to the weld, an automated seam tracking system is provided. The weld is illuminated by a laser pointer and the op-

erator can also manually correct the probe positions in case of uneven weld crown geometry.

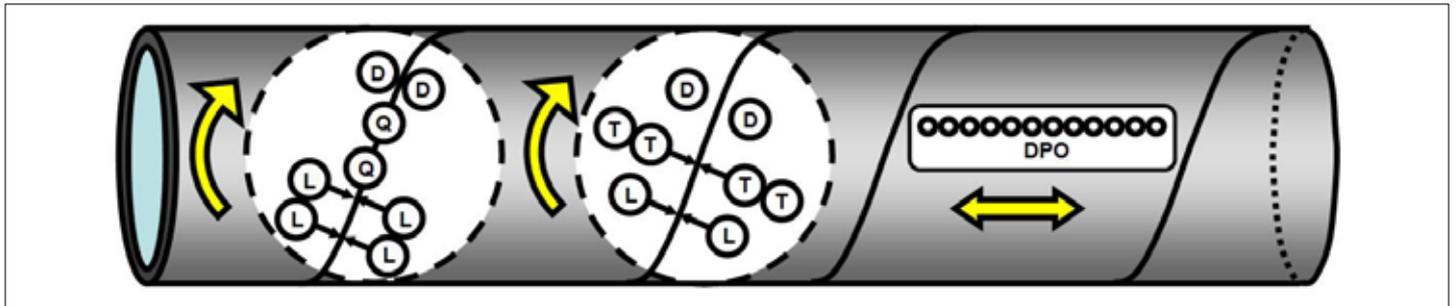
The machine frame consists of the machine stand(s) and the height-adjustable horizontal boom(s). An online testing system is usually located several metres from the welding point. An endless pipe is then inspected. An off-line testing system is used to inspect single pipes. In that case, a pipe carriage produces a helical transportation of the pipe. Rotation and linear movement of the carriage have to match the respective pipe geometry (diameter and weld angle) to achieve a weld test position at 12 o'clock.



ECHOGRAPH-SNUS spiral pipe testing system (online)



Two separate testing mechanics are employed for this online testing system: The pipe weld is inspected with six ultrasonic probes and the strip is tested with two probes. In order to increase the coverage, the strip testing probes perform an oscillating motion.



Typical testing tasks for SSAW-pipe inspection:

L = detection of longitudinal defects

T = detection of longitudinal defects with the tandem technique (for heavy wall thickness, SHELL specification)

Q = on-bead detection of transverse defects

D = detection of laminations in the heat-affected zone

DPO = detection of laminations in the pipe body with oscillating probes

PE = pipe end testing can be carried out in the same system (not shown) or in a separate testing system (ECHOGRAPH-REPS)

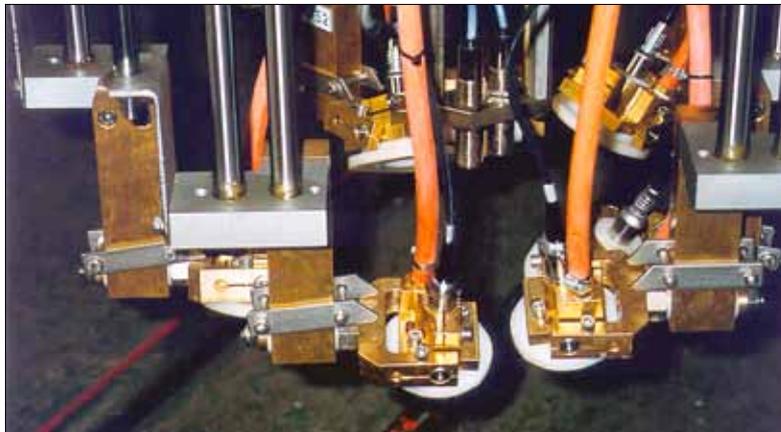
In dependence of the number of probes, more than one testing mechanics is used (here 2 mechanics for the weld and one mechanic for the pipe body).

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Testing system during assembly: The system consists of two separate machine stands, one for the weld inspection and a second stand for the strip (pipe body) inspection



Probe holders with gimble-mounted ultrasonic probes. The probes are pneumatically lowered into the test position. The wear shoes (in white) rest on the pipe surface. The sensors for the automated seam tracking device are shown in the centre of the photograph.



Mechanics for the oscillating strip inspection (pipe body test): The pipe is transported in a helical motion. The strip material between the welds is inspected with oscillating probes. The required coverage determines the number of probes (2 probes in the shown case).

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This photograph shows the probe holders being perfectly centered with respect to the weld. The seam tracking is carried out in an automated manner. The operator can observe the status of the seam tracking device by checking the illumination of a laser pointer. A red line can be seen on the weld crown.

Specimens

Helical SAW-Tubes

Material	cold- or hot-rolled coils
Diameter range (D)	300 - 3600 mm
Wall thickness (s)	4 - 30 mm
Strip (coil) width	200 - 2000 mm
Width of weld seam	8 - 30 mm
Detectable flaws	longitudinal, transverse and oblique flaws, laminations besides the weld

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