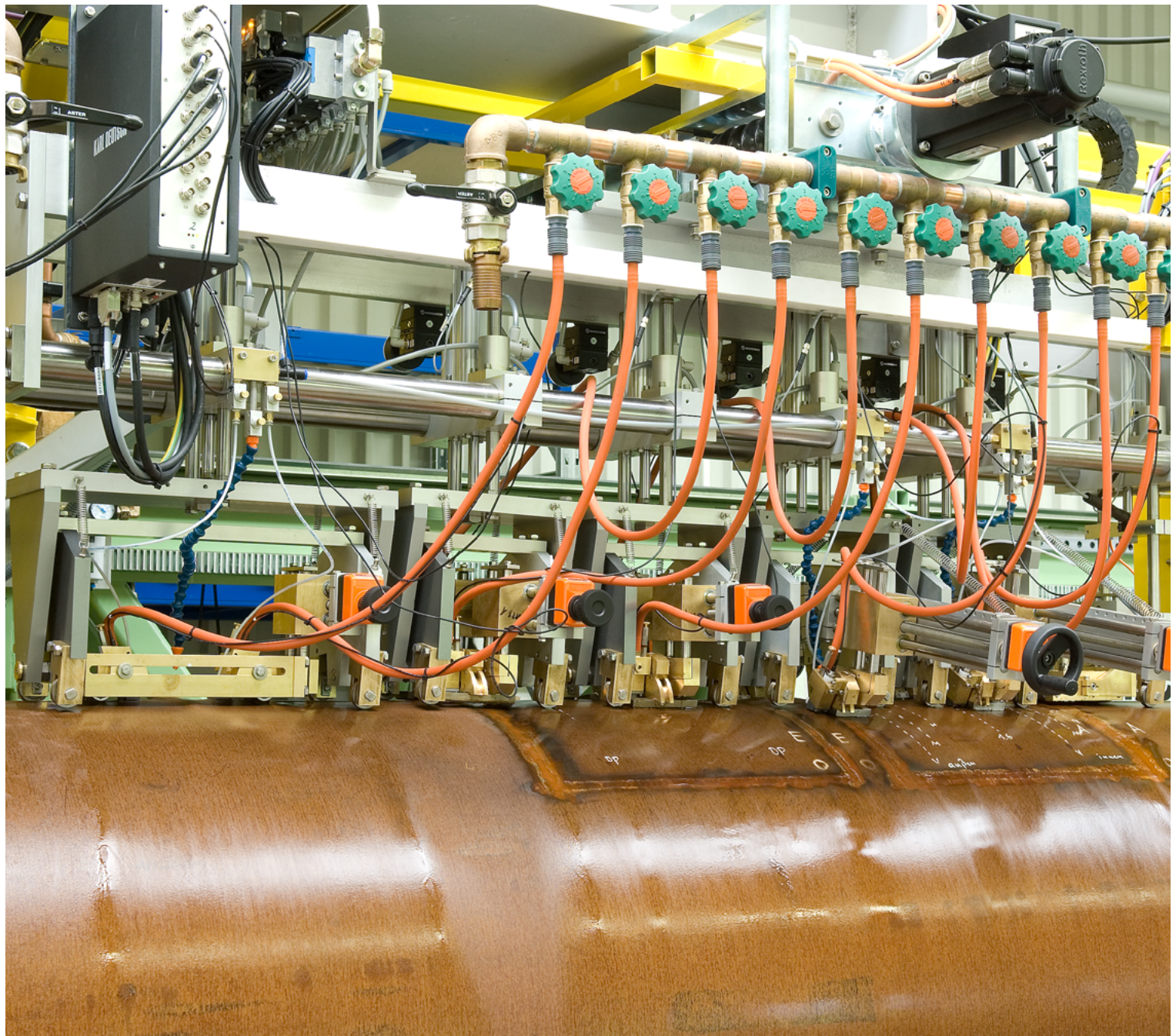




ECHOGRAPH SNUL and SNUL PAUT
Ultrasonic and PAUT Inspection of LSAW-Pipes

KARL DEUTSCH

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Ultrasonic and PAUT-Inspection of LSAW-Pipes



The testing mechanics with the probe holders is mounted to a stable machine stand. The ultrasonic probes are positioned near the weld seam in the 12 o'clock position and symmetrically to the weld seam. The height of the horizontal boom (in yellow) and the ultrasonic probes are pre-positioned in accordance with the pipe diameter.

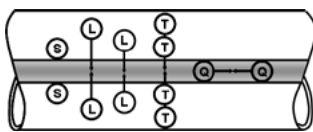
Ultrasonic Inspection of LSAW-Pipes

KARL DEUTSCH has shipped the first inspection system for the inspection of SAW-pipes (submerged arc welded) 55 years ago. In this brochure, pipes with longitudinal seam are discussed (LSAW). Over the years, we have gained a lot of experience which has led to our current state-of-the-art.

Unique about our testing system is the way to couple the ultrasound into the specimen. Water jet coupling is used, which means that the water path between probe and tube surface is in the order of several centimetres. This method of ultrasonic coupling results in little wear for the probes and the probe guiding devices. Also, the angle adjustment is carried out within the probe holder – unlike with water gap coupling where the refraction angle is fixed within the ultrasonic probe. Also for a rough pipe surface, stable coupling conditions are achieved because the water path can vary more than with gap coupling. The technique of ultrasonic water jet coupling (squirter setup) enables the positioning of the probes for on-bead transverse flaw

detection directly on the weld. This results in a very high probability for detecting transverse defects because the probes are used in pulse-echo mode.

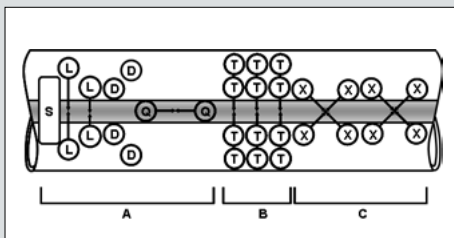
The ultrasonic probes are also KARL DEUTSCH products and are chosen in accordance with the application. For the system, immersion type probes with normal sound transmission are used. The probes are mounted into probe carriers with a water nozzle for guiding the water jet. For the weld inspection, angled transmission of ultrasound is required and is dependent on the respective wall thickness and tube diameter. The angle of the water jet (and therefore the incidence angle of ultrasound) can be infinitely variable and is precisely adjustable for all probes. The probe carriers are guided along the tube surface. The guiding elements (skids, shoes, rollers) and the probes do not have to be changed for varying tube diameter due to the coupling technique. This results in short change-over times and a long-lasting mechanical set-up.



Typical testing tasks for LSAW-pipe inspection:

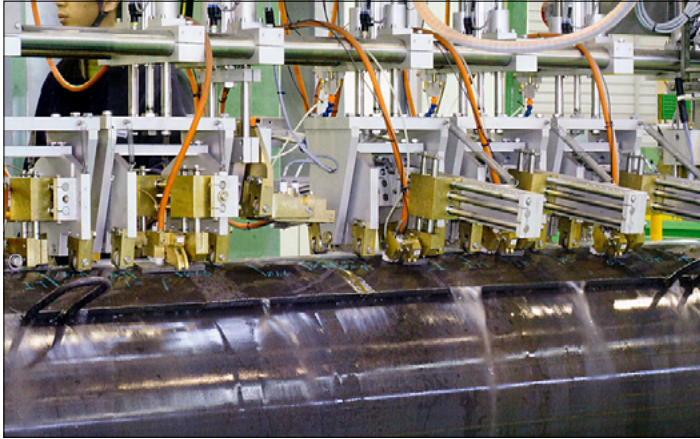
- L =** detection of longitudinal defects
- LT =** detection of longitudinal defects with the tandem technique (for heavy wall thickness, SHELL specification)
- T =** on-bead detection of transverse defects
- LAM =** detection of laminations in the heat-affected zone
- X =** off-bead detection of transverse / oblique defects
- S =** automated seam tracking device
- 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 carriage is used (e.g. 3 carriages A B C in lower example).

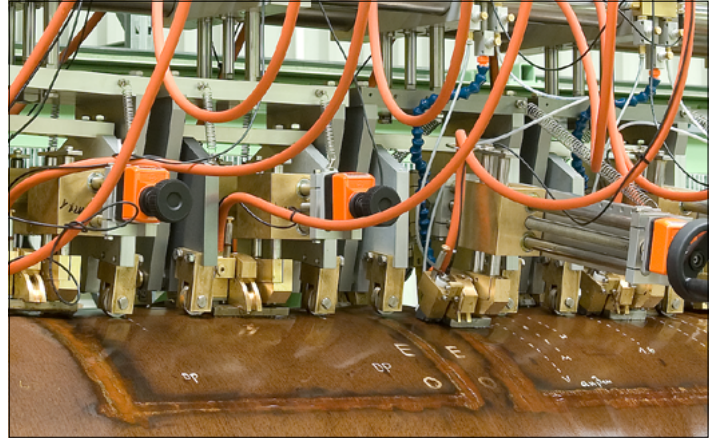


ECHOGRAPH SNUL and SNUL PAUT

Ultrasonic and PAUT-Inspection of LSAW-Pipes



Probe holders of weld testing system on pipe segment for system calibration (photo courtesy of EEW-Korea)



Probe holders for the detection of longitudinal defects: Spindles with position gauges are used to adjust the distance between the probes and the weld seam.



Probe holders for the on-bead detection of transverse defects: Water jet coupling enables the positioning of the probes directly on the weld crown.

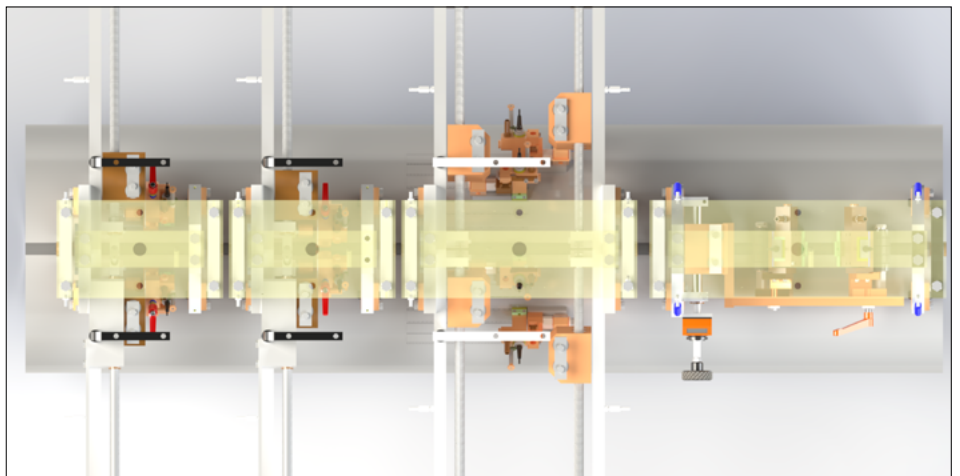


Upon customer request one (or all) test functions can also be implemented using the phased array (PAUT) technique (picture courtesy of EEW-Germany).

ECHOGRAPH SNUL PAUT

Key Features

- Gapless angle adjustment of probes
- Hybrid electronic system: PA probes for L inspection, UT probes for T, LAM and HAZ inspection, LT probes either PAUT or UT
- Water jet and gas coupling for UT probes
- Water gap coupling for PAUT probes
- Optional pipe end tester
- Automatic laser seam tracking system



ECHOGRAPH SNUL and SNUL PAUT

Ultrasonic and PAUT-Inspection of LSAW-Pipes



ECHOGRAPH SNUL		ECHOGRAPH SNUL PAUT (hybrid)
Applications	SAW-tubes with longitudinal seam	
Material	hot-rolled plates, formed (UOE or 3-roll bending) and welded	
Pipe diameter range	254 – 2,200 mm	400 – 2,200 mm
Wall thickness range	14 – 150 mm	4 – 150 mm
Pipe length	6.0 – 18.5 m (scalable as required by the customer)	
Ovality	± 2% of diameter	
Straightness deviation	max. 3 mm/m	
Width of weld seam	8 – 70 mm	
Seam position	12-o'clock ±100 mm	
Inspection capabilities	▪ Flaw inspection for longitudinal (L) defects. ▪ Optional: Tandem technique LT for heavy wall thicknesses ▪ Flaw inspection for transverse defects on-bead T, transverse and oblique off-bead defects with X-configuration ▪ Flaw inspection for lamination (LAM) defects in the heat-affected zone besides the weld ▪ Pipe end testing PE in the same or a separate testing system	
Inspection speed	up to 500 mm/s	
Untested ends	40 mm depending on wall thickness	50 mm depending on wall thickness
Standards and compliance	ISO 10893 (Parts 8, 10, 11), ASTM E273, API 5L, ISO 3183, DNV-OS-F101, DEP 31.40.20.37 (Shell), IOGP S-616, Chevron, Saudi Aramco	ISO 10893, API 5L, DNV, Shell, GOST
System options	▪ Flaw marking device for location-true marking of all flaws ▪ Extended diameter or wall thickness ranges ▪ Integration into Level 2 or MES systems ▪ Automated data exchange and reporting ▪ Remote service and diagnostics ▪ Roller stations	

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