TS application news

FOERSTER

EC Test of welded Tubes

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Technological changes in the welding process are impacting on eddy current testing. In this article we describe new potential applications of eddy current testing in the manufacture of welded Stainless Steel-, NiCr alloy- and Ti-Tubes.

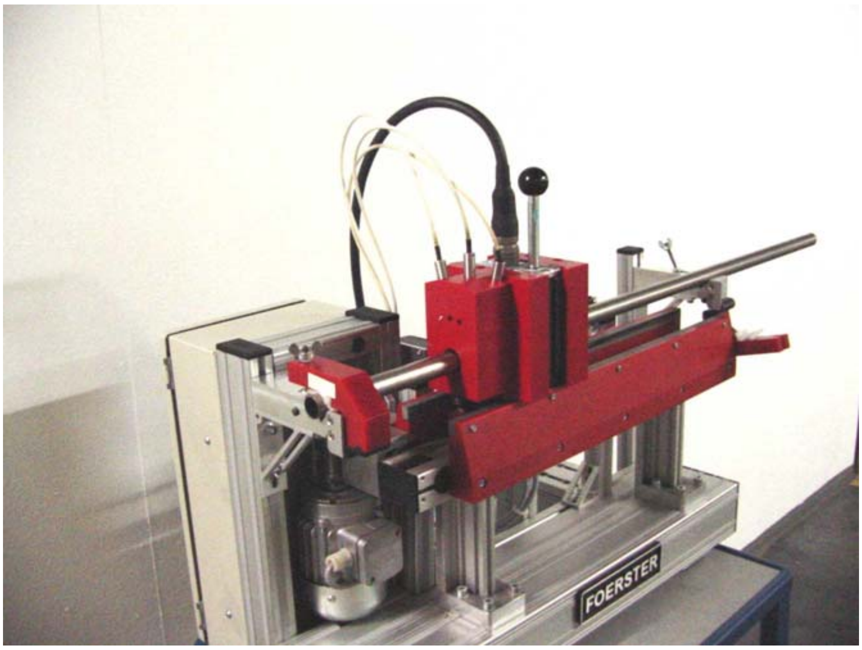
Those tubes are normally TIG or Laser welded. The advantage lies in the higher welding speeds and the smaller area that is actually affected by welding. The weld seam is therefore very narrow. Consequently welding flaws are much smaller; the tiniest of pores must be detected. Neither encircling nor segment coils are sufficiently sensitive. Small sensors such as those used with CIRCOGRAPH® and STATOGRAPH® are perfectly suitable, however.

This type of eddy current testing is used principally for tube welder process control; it is thus a type of condition monitoring to optimize the production process.

As a replacement for the leak-tightness test, however, the test standards for tubes generally demand a test of the complete tube with encircling through-type coils. Either only the differential channel or both the differential and absolute channel is used.

To combine the two test procedures, condition monitoring for the welder process control and eddy current testing for the whole tube, the **DEFECTOMAT® DS** is perfectly suited thanks to its multiple channel performance.

Test Configuration



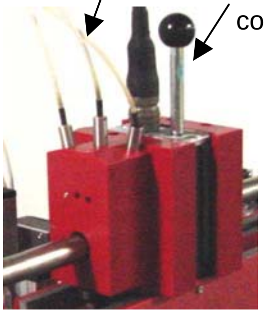
This is realised by setting up two test stations, one station equipped with a sensor array, the second station with an encircling coil. Each station works with separate signal recording up to the sorting and / or marking stage. The results of both stations are collated again for the report and for data saving.

In order to cover the weld seam completely, even where the seam drift is minimal, three sensors (6.223-787, 2 mm track width each) are set up immediately after welding. The tracks may even overlap to be quite sure that the minutest pores are also detected.

In keeping with the low conductivity of titan and stainless steel, frequencies of around 100 kHz are used for optimal testing.

3 sensor array

Encircling coil



Test Results

In the following you will find some defect pictures, formed by laser dropout. They typically can be detected with the obove mentioned sensor array.

Laser welded stainless steel tubes

54 x 1,5 mm

Fig. 1 and 2:
Laser dropout at the tube inside

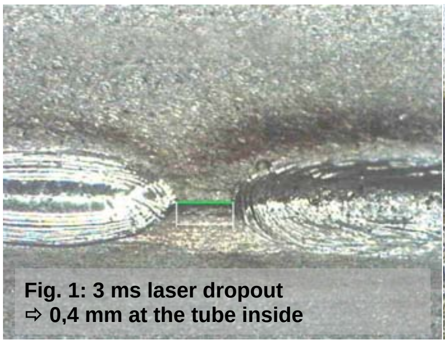


Fig. 1: 3 ms laser dropout
⇨ 0,4 mm at the tube inside

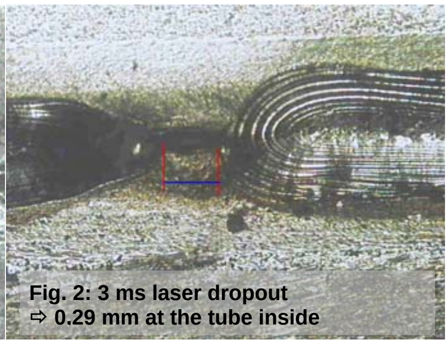


Fig. 2: 3 ms laser dropout
⇨ 0.29 mm at the tube inside

At the tube outside the laser dropout form one or two pores;
see fig. 3 and 4

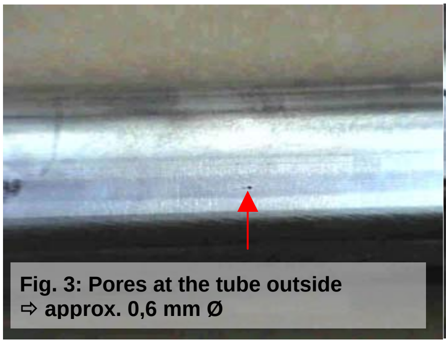


Fig. 3: Pores at the tube outside
⇨ approx. 0,6 mm Ø

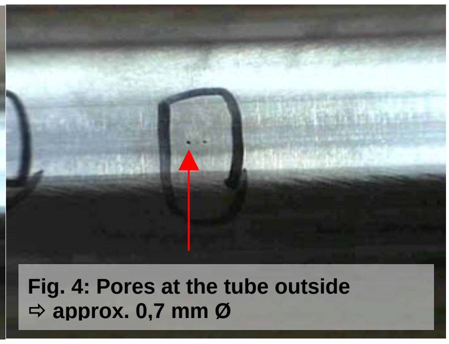


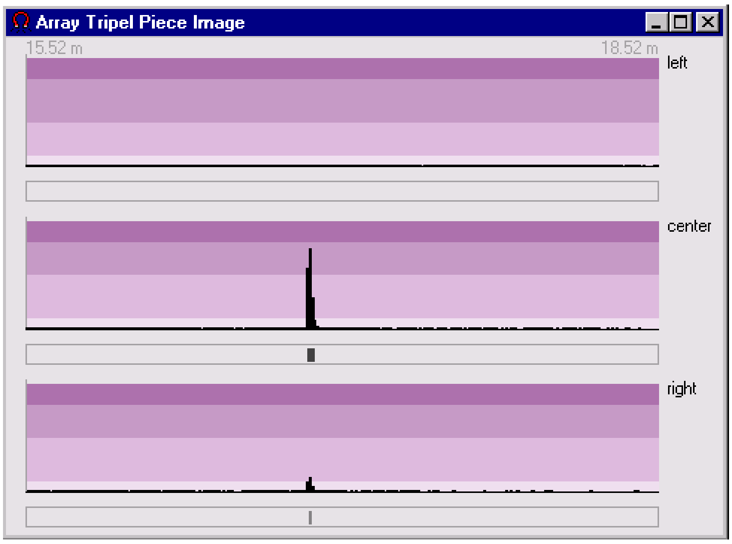
Fig. 4: Pores at the tube outside
⇨ approx. 0,7 mm Ø

Signal of a 1 ms laser dropout, detected by a 3 sensor array as discribed above.

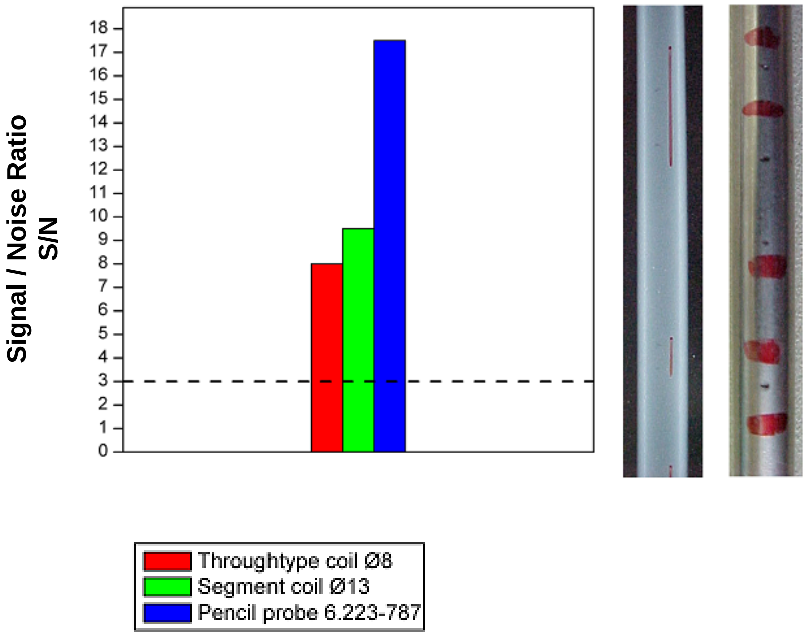
Only 1 sensor can see the small pore.

Laser welded austenitic tube

22 x 1,2 mm

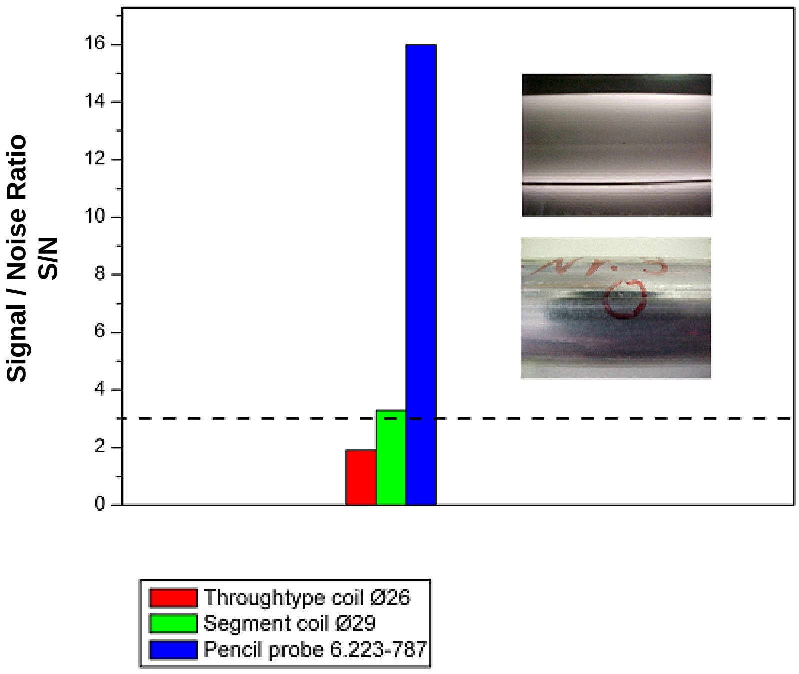


Further Test Results



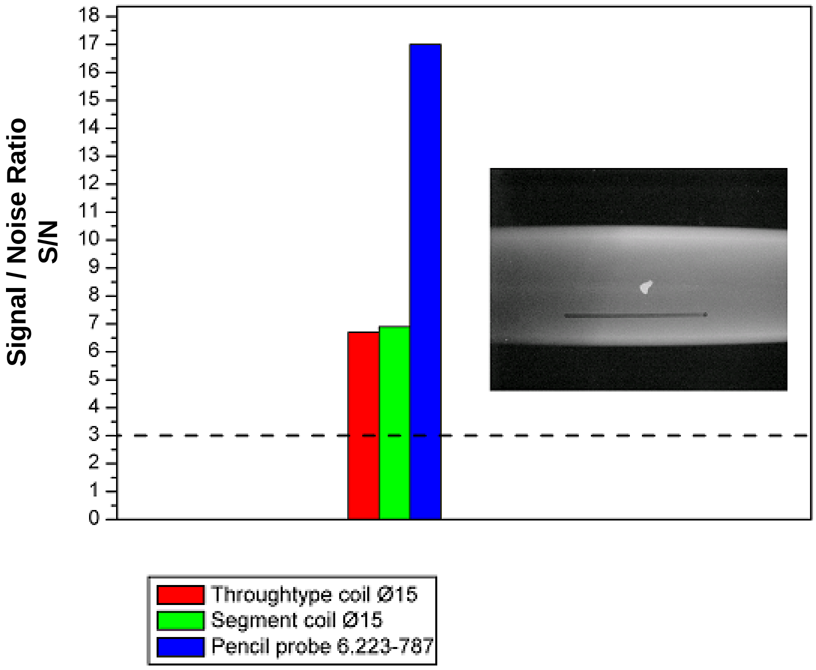
TIG welded hot short NiCr alloy tubes

Sensor comparison for transverse cracks



TIG welded Ti tubes

Sensor comparison for pores



TIG welded austenitic tubes

Sensor comparison for inclusions

Summary

Because of its multiple channel performance the DEFECTOMAT DS provides the possibility for a simultaneous eddy current testing with several sensor systems for individual statistics concerning welding process monitoring and final inspection according to international standards.

Of course the DEFECTOTEST® DS platform with its modern computer technology is a great additional benefit. This means simple operation by a touch sensitive active matrix display with an online help-function. A relational database system offers the opportunity for extended analysis of test data. Worldwide standardized data inferfaces are implemented, allowing with the use of the FOERSTERnet® a decentralized operation and data storage. Via internet or phone our experts in Reutlingen can directly communicate with the equipment at your plant.