



NEW ULTRASONIC PHASED ARRAY METHOD "HUGE-NDT"

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The certain, simple and reproducible testing of circumferential welds on pipes is an important task in non-destructive testing, particularly in coal-fired power plants and chemical industry. In that area, the testing of thin-walled pipes with a wall thickness below 6 mm is only possible with the radio-graphic inspection regarding the current standardization. However, this very elaborate method extends the maintenance time due to small time periods for radiation. Using the ultrasonic method, such circumferential welds can be tested much faster, also in shift operating system. Evidently, defects with notch effect in the weld can be detected more easily using ultrasonic methods in comparison to radiographic inspection.

For testing thin-walled circumferential welds on pipes, suitable phased array equipment including semi-automated scanners is meanwhile available on the market. In the past, ultrasonic phased array methods could not be applied due to the complex sound propagation in the thin walls with wall thicknesses below 6 mm. Nowadays, the strong defocusing of the sound beam with extremely short sound paths between the defects are manageable with this method.

The HUGE-NDT test method was developed, optimized and then validated by the certified testing laboratory of Fraunhofer IKTS in close cooperation with the Ingenieurbüro Prüfdienst Uhlemann. The method consists of a special arrangement of phased array probes, special adjustment of the system, a special calibration as well as a selected assessment of the signals. Using this procedure, it is possible to detect defects with notch effect in welds of thin-walled pipes with a high detection probability of more than 95 %.

So far, more than 6000 welds of that kind have been tested in the controlled area of coal-fired power plants applying this method. These tests were randomly controlled by using radiographic inspection as well as metallography, and confirmed the high defect detection probability of the validation.

By using this procedure, the maintenance times in the power plants and chemical plants could be divided in more than half, which brings enormous economization for the operators. HUGE-NDT has the potential to completely replace the radiographic inspection for these components. Consequently, elaborate radiation protection can be omitted, which is very advantageous for the health protection of the employees. Additionally, this method can be successfully applied to alternative materials, such as austenites, which are hard to test using radiography due to the high scattering caused by columnar crystals in the welds. Another advantage of this technique is the fact, that it can be used at narrow points of the pipe construction, where radiographic testing cannot be used. Therefore, the number of tested welds can be considerably increased.

The Fraunhofer IKTS offers test services with the HUGE-NDT method. Furthermore, the qualification of external partners for the method or cooperations for further developing the test method with regard to specific applications is possible.

- 1 Semi-automated scanning system for the HUGE-NDT method in practical use.
- 2 Example of a sector scan showing a lack of side-fusion.