



Presented at NDE2002, to predict. assure. improve. www.nde2002.org
National Seminar of ISNT, the Indian Society for Non Destructive Testing
Hotel Taj Connemara and Raja Muthiah Hall, Chennai, 05. – 07. 12. 2002

Phase Controlled EMAT Antenna for the Inspection of Coated Pipes

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Abstract

Pipe inspection in the production and inspection of pipeline systems during maintenance are tasks, which require improvement of NDE-techniques. The reasons are the unification of norms according to technical progress and increased understanding of quantitative contribution of NDE to the reliability and safety of industrial objects. The modern trends in NDE are in the automation of the inspection processes and in automated documentation of data. This follows the maintenance strategy, which should be able to quantify the current condition of the industrial equipment under consideration.

Some of the diverse inspection tasks may demand an original technical solution, which is optimized for special conditions, such as defect type, material and geometry of object, inspection speed etc. The development and application advantages of such an optimized technique can be achieved by an appropriate platform. In this paper we present such an optimized inspection system that allows the detection of corrosion damage as well as fatigue cracks in coated pipelines by use of an innovative inspection technique.

The new inspection technique for the testing of pipes and pipelines by the EMAT-antenna was demonstrated. The technique allows carrying out fast pipeline inspection. It was shown, that the pipes with bitumen coating can be inspected without removal of the coating. Some advantages of presentation and documentation of inspection data were elaborated, which improve evaluation of inspection results.

The inspection technique can also be applied to pipes and pipelines with coating of polymers, concrete or bitumen of thickness up to 3 mm. The inspection system is optimised for the detection of corrosion damages. It is demonstrated that with proper design the sensitivity of EMAT-sensors can be improved. The necessary signal-to-noise ratio is achieved by the application of an averaging algorithm in combination with an optimised phased addition of signals from the receiving channels. Special algorithm for optimal focusing increases the amplitude of the resultant signals. An inspection system for field applications using the described features is under development.