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Processes and Practices Related to Occupational Dose

ID: 2

AUTOMATIC OR SEMI-AUTOMATIC ULTRASONIC INSPECTION SYSTEMS

Keywords: AUTOMATIC ULTRASONIC INSPECTION; IN-SERVICE INSPECTION; ULTRASONIC INSPECTION; NON-DESTRUCTIVE TESTING; REMOTE INSPECTION; REMOTE SURVEILLANCE; AUTOMATIC INSPECTION; SEMI-AUTOMATIC INSPECTION

Description:

Utilities typically use manual ultrasonic testing (UT) methods for preservice and in-service inspection (PSI &ISI) of piping welds. In recent years, automatic and semi-automatic inspections techniques have superceded manual testing for certain defects as inspection requirements have become more severe. One such example is the higher inspection requirements for the problem of intergranular stress corrosion cracking (IGSCC) in BWR plants. A second reason for automatic testing is that ISI has been identified as the third largest dose contributor for repetitive high-dose jobs at BWRs.

The need for more sophisticated and reliable inspection methods has spurred the development of a variety of advanced automatic and semi-automatic UT inspection systems. These commercially available inspection systems help to solve manual UT inspection problems, and may be used for both preservice and in-service inspections. They also reduce the inspector's exposure to radiation.

EPRI research project 2057-6 reviewed some advanced UT systems, including: FEDA, INTRASPECT, P-Scan, UDRPS, and SMARTUT. These advanced systems feature new principles for interpreting data from automated UT systems and characteristics of signal sources encountered in pipe examinations. They typically consist of signal processing and imaging software, computers, and state-of-the-art electronics.

The advanced systems have shown significant long-term benefits associated with automatic or semi-automatic U.T. systems. Among them are: (a) better and more complete inspection coverage, (b) higher inspection speed of welds, (c) automatic archiving of data, (d) promise of more accurate detection of ZFSCC, (e) reduced radiation exposure to the limited number of inspectors, and (f) lower costs (about half that of equivalent manual techniques).

References and Selected Abstracts:

1. Neeley, V.I., et al., "Utility Guide to Advanced Ultrasonic Systems for Preservice and In-Service Inspection," EPRI Report NP-5086 February 1987.

ABSTRACT: EPRI has been instrumental in the development of several advanced UT systems over the last decade (EPRI reports NP-3538, NP-4034, and NP-4796). Industry, spurred by EPRI's work in this area, has independently developed advanced UT systems for utility NDE needs. Because the number of systems on the market has grown so rapidly over the past five years, it has been difficult to keep pace with the systems'changing capabilities. This guide is intended to provide the information that

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NDE managers need to confidently specify and select the system that best meets their requirements.

2. Sasahara T., Ammirato, F.V., "Automated Ultrasonic Pipe Examination and Data Interpretation," EPRI Report NP-5760, April 1988.

ABSTRACT: Automated systems are now available for ultrasonic examination of BWR piping welds. This report describes automated system operation and how systems are applied to piping examination.

Characteristics in BWR piping examination are described that can be used to classify the signal source. Example decision trees are developed to assist operators to properly discriminate the various sources of conflicting signal sources. Possibilities for using expert system technology for automated decision-making are explored.

3. Edelmann, X., Zehnder, H., and Ulrich, J., "The Swiss Achieve Reliability in IGSCC Detection and Sizing," Nuclear Engineering International, January 1986, pp. 33, 36, and 37.

4. "Automated Ultrasonic Equipment Meets IGSCC Inspection Need." Nuclear Engineering International, June 1984, pp. 34-35.

5. Mattu R.K., Anderson, W.R., and Connor, L., "Nuclear Plant In-Service Inspection Requirements and Practices in Different Countries A Comparative," EPRI Report NP-5PIP, Interim Report, July 1988.

6. Dionne, B.J., and Baum, J.W., "Occupational Dose Reduction and ALARA at Nuclear Power Plants," NUREG/CR-4254 April 1985, p. 45 & 70.

7. Smith, T.D., "Improved Ultrasonic Inspection Techniques for Creviced Safe Ends," EPRI Report NP-4796, October 1986.

8. Glass, S.W. and Shackelford, S.W., "Inspecting Steam Generator Tubes with a Rotating U.T. System," Nuclear Engineering International, April 1989, p. 41 & 42.

9. "Ultrasonic Aids the Identification of Failed Fuel Rods," Nuclear Engineering International, February 1985, p. 41 and 42.

10. Heumuller, R. and Rathgeb, W. "ALOK 3 Offers Faster Ultrasonic Inspection," Nuclear Engineering International, April 1989, p. 46 & 47.