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Processes and Practices Related to Occupational Dose

ID: 73

ISI EXPOSURE REDUCTION METHODS

Keywords: ISI DOSE REDUCTION; OPERATIONAL AND MAINTENANCE TECHNIQUES; ISI; IN-SERVICE INSPECTION; ACOUSTIC EMISSION; ULTRASONIC TESTING; PHOTO DOCUMENTATION; INSPECTION AND SURVEILLANCE; REMOTE SYSTEMS; ROBOTICS

Description:

In-service inspection has been identified as the third largest dose contributor for the repetitive high-dose job. Tens of person-rem collective dose are typically incurred during in-service inspections on reactor vessels and reactor piping. Removal and replacement of thermal insulation accounts for a large fraction of the total exposure. These exposures can be reduced through a number of options including: (a) installation of acoustic emission instrumentation on the reactor vessel and reactor coolant loops, (b) use of ultrasonic testing scanners, (c) improving pre-shift briefings for inspectors and insulators, (d) providing weld location maps, photographs, and video films of important locations, (e) use of fixed ladders and sky jacks instead of scaffolding , and (f) advanced planning of ISI both in the design and operational phases.

References and Selected Abstracts:

1. Mattu, R.K. Anderson, W.R., and Connor, L., "Nuclear Plant In-Service Inspection Requirements and Practices in Different Countries; A Comparative Review," EPRI Report NP-5919, July 1988. (Available from Research Reports Center, Box 50490, Palo Alto, CA 94303.)

ABSTRACT. Countries with operating nuclear power plants have some basic standards, known as Regulations or Orders which require mandatory compliance. These standards require implementation through the use of inservice inspection (ISI) rules, criteria documents, supplementary guidance, etc. These rules are generally consensus documents prepared by knowledgeable and practicing specialists in the field of nuclear power plant examinations, testing, inspection, etc. of significant systems and components. This report provides a comparison of requirements and practices for inservice inspection of nuclear power plant systems and components in different countries. comparisons made are based on responses received from selected countries (regulatory agencies and power plant operators) in the area of ISI regulation regarding non-destructive examinations, testing, and examination of major components, e.g., reactor vessel, steam generator, reactor collant pump, recirculation pipe, feedwater piping, etc.

Comparisons are made using ASME Section XI as the standard since most countries use it as a mandatory requirement or as a basis for their guidelines for inservice inspection of their nuclear power plant.

2. Atakan Y. "In-Service Inspection Planning to Reduce Ocupational Radiation Exposures to ALARA Levels", Nuclear Safety, Sept.-Oct. 1984.

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3. Stone R.M. et al., "EPRI Nondestructive Evaluation Center; 1986 Annual Report" EPRI Report-NP-5419, September 1987 and "1987 Annual Report," EPRI-NP-6026, September 1988. (Available from Research Reports Center, Box 50490, Palo Alto, CA 94303.)

4. Dionne B.J. and J.W. Baum, "Occupational Dose Reduction and ALARA at Nuclear Power Plants - Study on High Dose Jobs, Radwaste Handling, and ALARA Incentives," NUREG/CR-4254 p. 45., 70 & 71. (Available from National Technical Information Service, Springfield, VA 22161).

5. Zima G.E., Lyon, G.H. Doctor, P.G. Hoenes, G.R. Petty, S.E. and Wyakley, S.A., "Some Aspects of Cost/Benefit Analysis of In-Service Inspection of PWR Steam Generators," NUREG/CR-1490, May 1981. (Available fro

6. Khan, T.A., Dionne, B.J., and Baum, J.W., "Data Base on Nuclear Power Plant Dose Reduction Research Projects," NUREG/CR-4409, December 1985, E-85-13 and E-85-47. (Available from National Technical Information Service, Springfield, VA 22161.)

7. Walker, S.M. Ammirato, F.V., "Nondestructive Evaluation of Ferritic Piping for Erosion-Corrosion: Topical Report," EPRI-Report EPRI-NP-5410, September 1987, p. 192. (Available from Research Reports Center, Box 50490, Palo Alto, CA 94303.)

ABSTRACT. This report was generated to assist utilities in their inspection programs to detect wall thinning caused by erosion/corrosion in nuclear and fossil fuel plant piping. Included is a logical approach or "road map" to step utilities through an inspection program. This report provides guidance on selection of examination technques for specific plant situations, discusses the capabilities of various nondestructive examination (NDE) techniques (both currently available as well as those under development), describes the specific essential variables associated with each NDE technique, and gives suggestions for additional detailed examinations if erosion/corrosion is detected. Ultrasonic, radiographic, and visual examination methods are discussed in detail; other NDE techniques are briefly monitored. This report addresses NDE considerations only; selection of piping for examination, disposition of findings, and pipe repair or replacement are not within the scope of this work and are discussed briefly only to show their role in the overall inspectin program.