Item A-14: Flaw Detection (Rev. 1)

DESCRIPTION

Historical Background

After the 1970 issuance of inspection requirements in Section XI of the ASME Boiler and Pressure Vessel Code,[1] the staff recognized the need to quantify the uncertainty in the existing inspection requirement techniques. Also, the staff recognized its responsibility to upgrade these requirements, if necessary, when improvements in inspection techniques became commercially available.

This item was identified in NUREG-0371[2] and consisted of quantifying and upgrading the reliability of existing ISI techniques and of developing, evaluating, and validating improved techniques for flaw detection and evaluation during ISI of primary system components. The results were to be used in improving ASME Code Section XI14 inspection provisions, and preparing Regulatory Guides as needed. At the time of the evaluation of this issue in 1983, a major part of the NRC effort on the issue was being carried out under the RES program on NDE (RES Long Range Research Plan, Program 6.3). This program resulted in the issuance of a new Regulatory Guide 1.150[3] and preparation of improved piping inspection provisions which were to be incorporated into Section XI14 of the ASME Code.

Safety Significance

As part of the defense-in-depth approach, components and structures are inspected in order to detect and repair flaws well before they reach a critical size and lead to undesirable consequences ranging from small leaks to a large LOCA.

It was believed that improvements in flaw detection reliability and capability could contribute to reducing the risk associated with specific safety issues that were open at the time this issue was evaluated: Issue 15, "Radiation Effects on Reactor Vessel Supports," and Issue 29, "Bolting Degradation or Failure in Nuclear Power Plants." This issue was also part of USIs A-3, A-4, and A-5 which addressed steam generator tube integrity. It was believed that improved flaw detection would provide a longer-term contribution to the resolution of USI A-12, "Fracture Toughness of Steam Generator and Reactor Coolant Pump Supports," and USI A-49, "Pressurized Thermal Shock." Resolution of this issue was expected to provide the experimental basis for the technical position of a planned Regulatory Guide on ISI of austenitic stainless steel piping.

Possible Solution

If successfully resolved, this issue would quantify: (1) the uncertainties concerning the smallest size defect which could reliably be detected by required inspection techniques; and (2) the dimensions of identified defects. Thus, the uncertainty in the resolution of other safety issues could be reduced and, possibly, could allow for modifications of some inspection requirements.

CONCLUSION

This item was not a safety issue by itself but was only amenable to risk reduction value/impact assessment by reference to other issues. This was an ongoing task that was sponsored by RES, with the

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[1] ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," American Society of Mechanical Engineers, 1974.
[2] NUREG-0371, "Task Action Plans for Generic Activities (Category A)," U.S. Nuclear Regulatory Commission, November 1978.
[3] Regulatory Guide 1.150, "Ultrasonic Testing of Reactor Vessel Welds during Preservice and Inservice Examinations," U.S. Nuclear Regulatory Commission, June 1981 [8108040038], (Rev. 1) February 1983. [8808230046]

results of development efforts on the part of both NRC and industry (EPRI) to be used for improving the inspection provisions of Section

XI[4] of the ASME Code and for providing the technical basis for Regulatory Guides related to ISI. These efforts were to be closely monitored by the users of the results to ensure that they were directly applied to the resolution of the safety issues identified above. Since this item was largely an RES program which served a number of generic issues, it was DROPPED from further consideration as a separate issue.

[4] ASME Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," American Society of Mechanical Engineers, 1974.