Risk-informed In-service Inspection

Background

The key purpose of an in-service inspection (ISI) is to identify a flaw before it becomes a structural failure. In general, inspections have historically been performed based on such mandated requirements as those for nuclear power plant components in the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, insurance requirements or company policy. Most previous inspection requirements were based on past experience and engineering judgment and had only an implicit consideration of risk-informed information, such as failure probability (given the specific material, operation and loading conditions) and consequences.

A risk-informed ISI application provides justification for an inspection program based on risk-informed insights (i.e., core damage frequency and large early release frequency, along with the inclusion of deterministic insights).

Westinghouse uses the risk-informed ISI process to improve the effectiveness of examining structural components, as it is better able to do so by concentrating inspection resources and enhancing inspection strategies on high-safety significant piping and by reducing inspection requirements at other locations.

Description

The purpose of the application is to provide a risk-informed basis for changing the current ISI program, such as the ASME Section XI ISI Program for piping, to a risk-informed ISI program that meets the U.S. Nuclear Regulatory Commission (NRC) Regulatory Guidance.

Risk-informed ISI provides:

* The means for improving the effectiveness of inspecting high-safety significant piping

* Reduction of inspection requirements on other piping

* Evaluation of improvements to plant availability and enhanced safety measures, and reduction of personnel radiation exposure

* Reduction of overall operation and maintenance costs while regulatory compliance is maintained

Westinghouse is the recognized leader in the development and implementation of risk-informed technology for application of ISI to nuclear plant piping systems. It actively participates in the industry groups and ASME research and code-writing organizations that are leading the development, implementation and standardization of risk-informed technology applications. Westinghouse has experience in the implementation of multiple methodologies developed for risk-informed ISI of piping, including the Pressurized Water Reactors Owners Group (PWROG) methodology developed by Westinghouse and the Electric Power Research Institute (EPRI) methodology. Both methodologies provided by Westinghouse are approved by the NRC and other nuclear regulatory bodies. Westinghouse also has experience in evaluating intergranular stress corrosion cracking in boiling water reactor plant piping systems using probabilistic methods.

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Risk-informed (RI) ISI programs are required to be maintained as a living program through periodic updates. Westinghouse has experience in developing and updating RI-ISI programs utilizing the PWROG and EPRI methodologies.

Benefits

- Fewer exams required: The PWROG method uses a statistically based technique that typically results in fewer exams being required. The EPRI method uses a prescribed percentage of risk-significant piping segments.

- Maintained or enhanced safety

- Reduced radiation exposure

- Risk-informed ISI provides a foundation for other applications beyond ISI piping inspections

Experience

Westinghouse, together with its subsidiary WesDyne International, can offer all ISI services, including risk-informed ISI applications (utilizing the PWROG and EPRI methodologies), engineering flaw evaluations, augmented inspection program development and application, piping ISI examinations (both nondestructive examination [NDE] and pressure testing), Section XI ISI Program development, and vessel NDE examinations.

Westinghouse has developed (or assisted to develop), as well as maintained and updated, risk-informed ISI programs utilizing the PWROG or EPRI methodology at numerous plants in the United States and worldwide.