Dominion Engineering, Inc.

JASPER™ - SCC Risk Assessment Tool for Nuclear Reactors

Partial-Penetration Welded J-groove Nozzles

Background

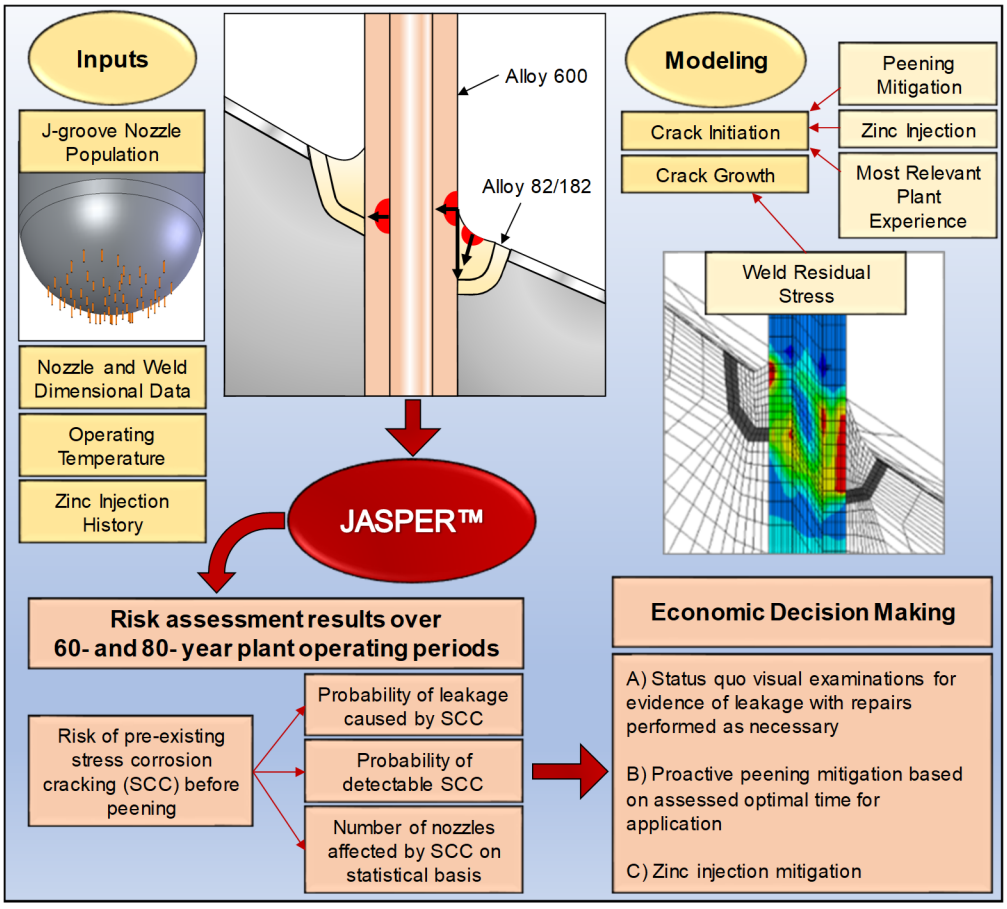
J-groove partial-penetration welded nozzles, which are installed at various locations in both PWRs and BWRs, are often fabricated with nickel-based Alloy 600 material and attached with Alloy 82 or 182 weld metal. These materials are susceptible to stress corrosion cracking (SCC) degradation due to the high tensile weld residual stresses that are present. In BWRs, some J-groove nozzles are fabricated using austenitic stainless steel, and are also susceptible to SCC at the heat affected zones. SCC has led to costly inspections, repairs, and component replacements.

Description

DEI has developed and implemented a probabilistic Monte Carlo simulation code, JASPER (J-groove Adapter SCC Probabilistic Evaluation for Reactors), to assist utilities in the economic decision-making process to assess the benefit of mitigation options such as peening or zinc injection on a plant-specific basis. This code applies generally to any set of J-groove partial-penetration welded nozzles in a plant, including bottom mounted nozzles (BMNs), reactor vessel head top head J-groove nozzles (such as CRDM nozzles), and cold-leg instrumentation nozzles in PWRs.

Key Benefits

- Provides quantitative results to guide long-term strategic planning to manage the SCC risk, including whether peening mitigation is warranted
- Applies latest plant experience to model the frequency of cracking occurring
- Simulates SCC initiation and growth in both the nozzle base metal and the J-groove weld metal
- Models the risk of pre-existing cracking present at the time mitigation is applied
- Results may be applied in utility economic models, or DEI can perform net-present value or probabilistic economic assessments



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