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Ultra High Pressure Cavitation Peening

Challenge

Reactor vessel head (RVH) nozzle penetrations, bottom mounted nozzle (BMN) instrumentation penetrations, and reactor vessel primary nozzles are comprised of Alloy 600 welded with Alloy 82/182 — are highly susceptible to primary water stress corrosion cracking (PWSCC), caused by a combination of three factors:

- A susceptible material — in this case Alloy 600 and Alloy 82/182
- A corrosive environment — in this case the primary system borated water at high temperatures and pressures
- Tensile stresses at the wetted surface created during the manufacturing process — specifically, welding heat-affected zones

Industry-wide, inspections have continued to reveal indications of PWSCC in these aging components. Plant operators have historically had two options — component replacement or repairs — both of which are costly and significantly impact outage critical path.

Solution

As the industry addresses these challenges to ensure safe extended operation, Framatome brings the right experts to the table to provide a real, highly cost-effective option — surface mitigation — to stop PWSCC before it starts without draining your capital budget.

Framatome's UHP cavitation peening process uses submerged, ultra-high-pressure water jets to work the surface of reactor vessel components. The high-pressure water flow creates vapor bubbles. As these vapor bubbles collapse on the component's surface, shock waves travel into the material and create compressive residual stresses. Rather than allowing operational stresses to create multiple, random fractures on a component's surface, cavitation peening creates compressive stresses on the surface of the material in a controlled manner, preventing PWSCC initiation.

Customer benefits

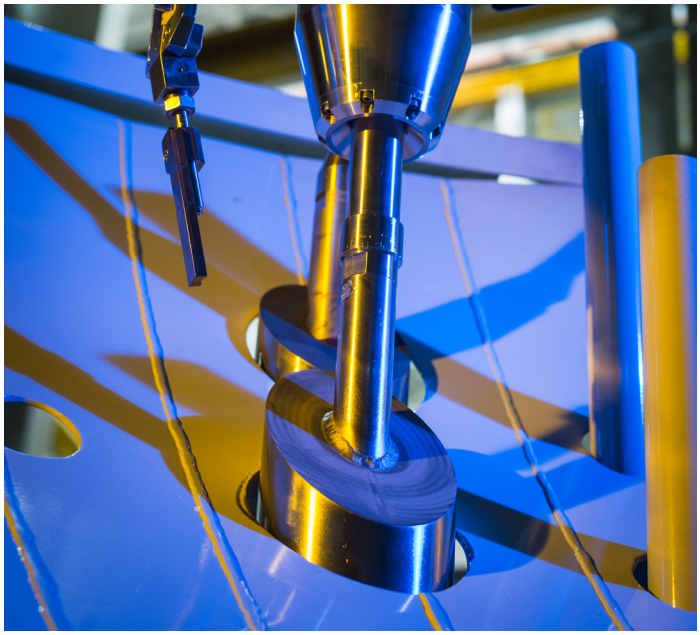
- Prevents PWSCC
- Provides asset life extension by stopping the degradation process
- Compressive stress depths exceed MRP requirements
- Reduces the risk of emergent repairs
- Lower cost than future repairs or replacements
- All wetted nozzle surfaces are mitigated
- Additional schedule and cost savings when in-service inspection and surface mitigation scopes are combined
- No harm to component surfaces
- Process uses only water; no FME concerns
- Does not leave abrupt edges between peened and non-peened regions
- Mitigation with inspection provides asset warranty which could help with asset capitalization
- Potential Relief Requests for inspection frequency

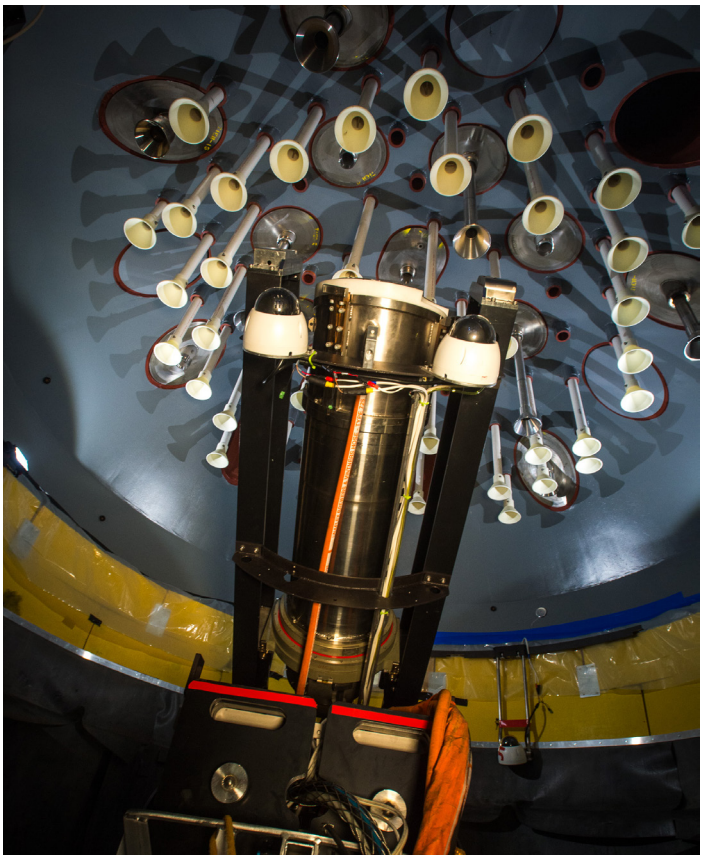
Your performance
is **our** everyday **commitment**

Framatome's innovative process operates at a higher pressure with less restrictive parameters than other mitigation alternatives, achieving a higher depth of compression and allowing a more efficient overall implementation schedule.

The long-term value of cavitation peening far outweighs the initial investment. You can always do a component replacement, or keep addressing indications with expensive repair methods. Or you can deploy one simple mitigation technique to significantly reduce risk.

Mitigate PWSCC risk for the remaining life of your plant using a proven process — at a lower cost and outage impact than traditional component replacement or repair methods.





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