Pressurizer Nozzle WOL

Addressing Primary Water Stress Corrosion Cracking (PWSCC)

WSI℠
An Avail Infrastructure Solutions Company

Alloy 600 Pressurizer Nozzle Mitigation – Almaraz Units 1 & 2

Primary water stress corrosion cracking (PWSCC) continues to be a concern in nickel-based alloys (Alloy 600 and the associated weld metals, Alloys 82 and 182) in both Boiling Water (BWR) and Pressurized Water reactors (PWRs). It has caused cracking and leakage in a number of components, including steam generator tubes, vessel penetrations, and most recently, the dissimilar metal butt welds (DMWs) commonly used to connect vessel nozzles to PWR primary system piping.

In a proactive collaboration with industry, EPRI's Materials Reliability Program, issued guidelines in 2005 for U.S. utilities to take mandatory decisive action against primary water stress corrosion cracking in susceptible PWR locations. The guideline focused first on the pressurizer because many of these welds could not be inspected with qualified methods and the high operating temperature of the pressurizer increases susceptibility to PWSCC. International utilities taking action against stress corrosion cracking in primary system piping are also turning to MRP-139 to guide inspection and mitigation of susceptible welds.

The most practical method found to date to mitigate these issues is to apply a structural overlay using Alloy 52M. Weld overlays have been used extensively in the past to repair nuclear plant piping that has been found to be cracked or leaking due to stress corrosion cracking. WSI has been at the forefront of this mitigation approach in the global nuclear markets.

Project Summary

WSI successfully provided project planning and Weld Overlay (WOL) repairs for Alloy 600 Pressurizer locations at the Almaraz 1 & 2 units in Spain. The WOL repair tasks were performed with proprietary remote-operated automated technology: included training, equipment, filler material, welding, and requisite surface preparation. Repair design and licensing support were provided by Structural Integrity. Project planning and support were provided in partnership with Iberdrola Engineering.

Highlights:

Almaraz Unit 2 – April 2009:

- Repair of one 4" Spray Nozzle
- Repair of three 6" Safety Nozzles
- Repair of one 6" Relief Nozzle
- Repair of one 14" Surge Nozzle

Timing/Dose/Crew Size: Unit 2

- 6 Repair Locations – Total WOLs
- 12.5 Days – Duration of WOLs
- 37 – Crew size excluding NDE support
- 4,922 mR – Final Dose for Project

Almaraz Unit 1 – November 2009:

- Repair of one 4" Spray Nozzle
- Repair of three 6" Safety Nozzles
- Repair of one 6" Relief Nozzle
- Repair of one 14" Surge Nozzle

Timing/Dose/Crew Size: Unit 1

- 6 Repair Locations – Total WOLs
- 13.8 Days – Duration of WOLs
- 38 – Crew size excluding NDE support
- 6,600 mR – Final Dose for Project

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