

Xcel Energy • Monticello Nuclear Generating Plant RHR Swing Check Valve Seat Replacement

Project Description

The project involved successfully replacing a welded seat insert in one 10" dia. 300 lb. Anchor Darling swing check valve in the Residual Heat Removal (RHR) system, during a system outage at Monticello Nuclear Generating Station.

Failure Mechanism

Xcel Energy was unable to obtain the desired seal with the original seating surface on valve RHR-2-1. Previous attempts by Xcel Energy to lap the valve seat did not yield desired results. Xcel Energy's available options were to replace the valve or replace the seat insert.

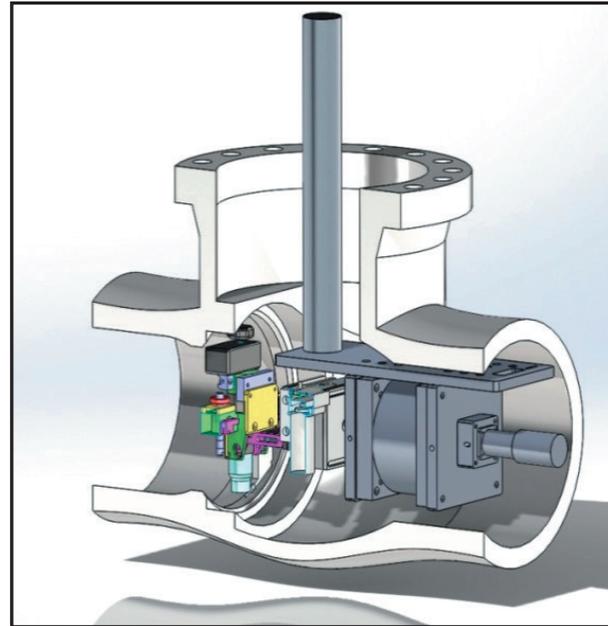
Project Challenges

Due to adjacent piping and structures, radial and axial clearances around the valve were minimal, therefore access to the valve was challenging.

The spatial envelope inside the valve was limited and prevented the use of manual welding or machining processes.

The work was located in a radiologically controlled area, and the valve inside was contaminated.

The work was performed during an RHR system outage and required strict schedule adherence.



BHI Energy Alternative Repair Approach

Through our specialized tooling design and customization capability, BHI was able to offer Xcel Energy a seat replacement versus valve replacement option. Both a purpose built machining system and remote video operated Gas Tungsten Arc Welding (GTAW) orbital weld head were customized by BHI's tooling engineers to fit within the limited spatial envelope of the RHR Swing Check Valve.

Scope Description

BHI mobilized a crew of experienced supervision, union pipefitter welders, machinists and equipment technicians to Monticello Nuclear Generating Station. Tasks performed consisted of severing and removal of the old valve seat insert and fit-up and weld-out of the replacement seat insert. The specialized machining and welding systems were both modified and tested extensively on a mockup valve prior to mobilization, additional proficiency mockups were performed onsite prior to implementation.

Once the valve was disassembled by Xcel Energy personnel, BHI personnel located and machined out the valve seat insert to valve body seal weld. Since BHI's machining system is rigidly mounted to the ID of the valve, it allows for precise control over the location and depth of the cutting tool, therefore once the cutting tool reached its prescribed depth, the seat insert was removed with ease and without the need for any mechanical or thermal assistance.

Upon removal of the old seat, the valve bore was cleaned and the new valve seat insert was seated and seal welded into position using the remote video GTAW system. The completed seal weld was examined and accepted using dye penetrant testing (PT) and visual inspection (VT). The valve was then lapped and blue checked against the disc before being assembled and leak tested by Xcel Energy.

The entire implementation scope was scheduled and completed in five shifts, with first time quality and without any safety incidents or human performance errors.

Project Challenges Resolved

The available spatial envelope inside the RHR-2-1 valve exceeded the design requirements of BHI's machining and welding systems, and therefore required modifications. The planned modifications were initially verified using 3D computer modelling and later tested on a like-for-like mockup valve prior to mobilization. The same mockup valve was also used to perform full fidelity proficiency mockups onsite. The mockups were an essential part of assuring the success of the project.

Customer's Decision Process:

Why BHI Energy

BHI was able to offer Xcel Energy a seat replacement versus valve replacement option which saved dollars, time and dose. Xcel chose BHI based on its recent positive experience at a sister plant where BHI demonstrated its ability to successfully execute a challenging project with first time quality and strict adherence to schedule.

Customer Comments

BEFORE

– “We do not understand the need nor the requirement for the setup and mock up. Currently you're the only vendor that has been requesting this type of evolution”.

AFTER

- “Our management is extremely pleased with the work your people performed. It was done with great quality and professionalism, and comments were made throughout last week that your team was among the most diligent and professional that our station has encountered”.
- “The early results from the work are looking very positive. Monitoring thus far shows little or no leakage past RHR-2-1”.