



FIELD NOTES

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WOLF CREEK NUCLEAR GENERATING STATION REDUCES COST OF FEEDWATER HEATER REPAIRS

MONITORING OF THE SHELL wall thickness of feedwater heaters at Wolf Creek Nuclear Generating Station in Kansas in 2003 revealed erosion of three of the 12 low-pressure feedwater heater shells. Further investigation determined that the shells were eroding to a point approaching minimum allowable wall thickness.

Normally the feedwater heaters would have been repaired or replaced. Unfortunately both solutions would have involved extensive costs, which had not been budgeted for in the 2003 budget. As a result, the engineers started to look for alternate less costly solutions.

During the subsequent investigation Terry Bradley, welding engineer, Wolf Creek came across an EPRI report "Repair Technology for Degraded Pressure Vessel and Heat Exchanger Shells." In that report, the application of a MLEA "PMCap" was described. The PMCap appeared to the Wolf Creek team to be a perfect repair application for the feedwater heater problems. The PMCap is a customized repair that provides a quick and cost effective alternative to flush patch and weld overlay repair methods.

After contacting Paul Manzon, MLEA vice president and chief structural engineer, and reviewing the technology, it was agreed that the PMCap could provide a cost-effective alternative to a flush patch repair or replacement of the heaters. The cap is attached to the feedwater vessel with full penetration welds and is inherently stronger than the original vessel wall. Because there is no need to cut the shell, draining and purging of the vessel is not required. Another plus is the time to install the cap is significantly less than that required for conventional flush patch repair methods.

The PMCaps are customized for each application and can be supplied with corrosion resistant materials or with erosion/corrosion resistant linings. The design satisfies all ASME Code criteria and has been accepted for application by the National Boiler Inspection Code, state

jurisdictional authorities and major insurance carriers.

However, to gain acceptance for this type of repair, Wolf Creek and MLEA engineers met with Kansas State Boiler Inspection personnel to discuss the PMCap technology. After reviewing the repair procedures, Wolf Creek was allowed to use the PMCap technology to repair the feedwater heaters but subject to overview by the Kansas State Boiler Inspector.

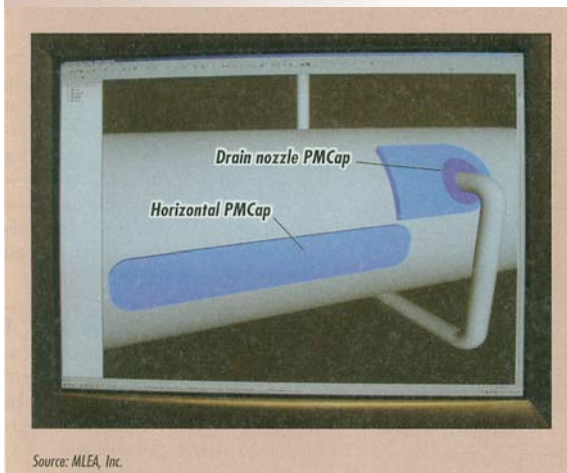
Two different caps were required for each heater, one surrounding a six-inch drain nozzle and the other covering a horizontal wear path that extended inside the condenser, Figure 1. To assure successful installation of the caps and repair of the feedwater heaters, the plant's welding engineers developed welding processes, welding instructions and tests.

Before actually installing the caps the plant performed numerous pre-installation activities. Fabricated weld coupons, machined to the cap edge configuration, were used to practice welding techniques that would be required for different weld configurations. The plant also practiced NDE testing techniques.

Work began on October 20, 2003 and the last welds were completed on November 3, 2003. During that time period a total of six caps were fitted, welded and tested. The work required two shifts of three welders, three fitters, and dedicated quality control and engineering support. All of the work was completed on schedule and under budget. Overall cost of the repair per heater was approximately 10% of the initial estimated cost of using more traditional methods of repair.

Donna Jacobs, Wolf Creek Generating Station plant manager, stated, "Once we had sound engineering bases for use of the caps, and a go ahead from the State, the decision was relatively simple, given the product's integrity, the absence of intrusion into our heater shells, short installation time and the relative low cost. It is very important to our owner companies to implement least cost repair technologies where we do not sacrifice personnel or plant safety. With this application we found an opportunity to accomplish all our goals."

Figure 1
TWO DIFFERENT PMCAPS REQUIRED FOR
EACH FEEDWATER HEATER REPAIR



Source: MLEA, Inc.