N171. Electropolishing Of Replacement Steam Generator Channel Heads At Millstone-2 PWR

A first-of-a-kind demonstration of the EPRI qualified electropolishing process for replacement steam generators was done at Millstone-2 with the objective of controlling radiation fields.

Plant tests of electropolished specimens indicated that radiation buildup can be reduced by a factor of five by electropolishing (EPRI report NP-6616). These results have been confirmed by results from one cycle of operation at a new PWR plant in France.

Electropolishing process vendors, steam generator suppliers, and Northeast Utilities personnel arrived at a set of procedures which were applied to channel heads to produce a smooth surface finish without damaging the construction materials. Based on the results of previous EPRI programs, a set of most promising electropolishing variables was selected. The application was verified by procedural quality controls, visual inspection and scanning electron microscopy examination.

The application of surface smoothing techniques for the Millstone-2 steam generators began at the fabrication shop, where the interior channel head surfaces were mechanically conditioned. This was the first use of machine controlled mechanical conditioning of the curved surfaces (bowl, stay cylinder). Electropolishing was applied while the steam generators were stored at the reactor site in a horizontal position. Preparation of the unit interiors, electropolishing activities, and final cleanup were accomplished in 25 working days. An alternate additive to the electrolyte (H_2SO_4) was also qualified; this will replace chromate and thus reduce used electrolyte disposal costs.

Analyses performed by Northeast Utilities indicated that the costs of electropolishing can be recovered within a few reactor fuel cycles after the installation of the replacement components. Projected cost saving details are as follows:

- Radiation exposure avoidance is estimated to be 18 man-rem per outage. If man-rem value is assigned at $20,000, potential savings are $360,000 on cost recovery for doing electropolishing after one outage. If a more industry-acceptable and conservative value of $3,000 is assigned to radiation exposure, the cost will be recovered in five fuel cycles.
- For the $20,000 man-rem value, ten years of operation (6.7 fuel cycles) are estimated to save $1,300,000.
- Additional undocumented benefits are likely to be realized because of lower radiation exposures contributing to high worker morale and higher productivity.

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