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Docket No. 50-423
B18340

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Millstone Nuclear Power Station, Unit No. 3
Motor-Operated Valve Program
Determination of Friction Coefficients for Stainless Steel Guide Surfaces

The purpose of this letter is to close a commitment and provide an update to the findings associated with Northeast Nuclear Energy Company's (NNECO) efforts to determine by test, appropriate Coefficient of Friction (COF) values for stainless steel guide surfaces in Motor-Operated Valves (MOVs) at temperatures greater than 100°F. In letters dated April 25, 1998,⁽¹⁾ and May 28, 1999,⁽²⁾ NNECO committed to sponsor this test program with the Electric Power Research Institute (EPRI). This testing was performed to validate the use of EPRI carbon steel based data for analysis of gate valves with stainless steel guide surfaces.

Testing is complete and NNECO has evaluated the test results and concludes that the default COF values used in the EPRI Performance Prediction Methodology (PPM) gate valve model for carbon steel adequately bound the majority of Millstone Unit No. 3 self-mated stainless steel applications. Exceptions were noted for those configurations demonstrated by test to be susceptible to guide galling. NNECO plans to perform modifications to reconfigure Millstone Unit No. 3 MOV applications susceptible to guide galling. The proposed modifications are further discussed in the balance of this document.

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- (1) NNECO letter, "Millstone Nuclear Power Station, Unit No. 3, Reply to a Notice of Violation in Motor-Operated Valve Inspection Report No. 50-423/98-82," dated April 25, 1998 (B17178).
- (2) NNECO letter, "Millstone Nuclear Power Station, Unit No. 3, Response to Request for Additional Information (TAC No. M97069), Regarding the Generic Letter 96-05 Program," dated May 28, 1999 (B17378).

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Observations Regarding the Completed Testing and Final Report

NNECO contracted EPRI to manage testing to support determining the COF of stainless steel on stainless steel guide surfaces under different configuration, temperature, stress and environmental conditions. Battelle performed the actual testing under contract to EPRI. Testing was similar to that performed previously as part of the EPRI MOV Performance Prediction Program. Testing is complete and NNECO has evaluated the final report from Battelle (TR-113559) that was issued in December 2000.⁽³⁾

Review of the test data leads to the conclusion that previously obtained parameters for self-mated carbon steel, which were being used as "best available information" for fluid temperatures over 110°F, remain appropriate to use for stainless steel unless galling occurs. Test results also suggest that self-mated stainless steel showed a greater propensity for galling with resulting higher COFs than self-mated carbon steel. In general, the COF factors, determined from the coupon tests, could not be meaningfully applied for use in the EPRI PPM gate valve model for predicting thrust requirements for valves with self-mated stainless steel guides and guide slots under galling conditions.

Initial laboratory testing at low temperature was found to be inconsistent with Millstone Unit No. 3 specific data and EPRI dynamic test results. Galling was observed in laboratory test coupons at low contact stresses at room temperature when tested at constant loads. Millstone Unit No. 3 and EPRI gate valves with self-mated stainless steel guides and guide slots have exhibited very limited and minor guide galling after being dynamically tested at room temperature conditions.

To investigate this apparent discrepancy, coupon tests were modified to resemble the predicted guide loading conditions in a valve with self-mated stainless steel guides that was flow loop tested by EPRI (EPRI valve #4) as part of the EPRI MOV Performance Prediction Program. The contact stress was varied over the stroke length of preconditioned test coupons to match as closely as possible the guide loading stress profile predicted by the EPRI PPM gate valve model. These test coupons did not gall at the temperature at which EPRI valve #4 was dynamically tested. However, when tested at a high temperature under the same guide loading profile, minor guide galling did occur with a COF that slightly exceeded that predicted for self-mated carbon steel contact in the EPRI PPM gate valve model test program.

Modifications to Prevent Guide Galling

Based on test results that are described in the Battelle report, NNECO retained MPR Associates, Inc. to perform an evaluation of the 35 valves with self-mated stainless steel guides and guide slots at Millstone Unit No. 3. MPR determined there were 24 valves not susceptible to galling on the basis of stroke length, guide contact stress and

⁽³⁾ Battelle Memorial Institute Report, "Friction and Galling Performance of SA351-CF8 Stainless Steel," EPRI, Palo Alto, CA, December 2000, TR-113559.

fluid temperature, and that 11 valves may be susceptible to guide galling. In refueling outage 7, the wedges of five valves were replaced with wedges having stellite guide slots. It is expected that the remaining six valves will have their wedges replaced or be appropriately modified during future refueling outages. These activities are being addressed under the Millstone Station Corrective Action Program.

Closure of Commitment

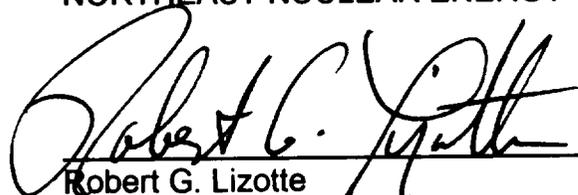
NNECO concludes that the 24 valves with stainless steel guide slots, not susceptible to galling conditions, are acceptable as-is on the basis of the Battelle test data. Additional testing to fully characterize self-mated stainless steel sliding COFs under galling conditions is not being pursued on the basis of planned modifications to the six valves remaining in this population. NNECO has evaluated these six valves and concluded that they remain operable for the current fuel cycle. This evaluation will be updated as necessary until modifications are complete.

On the basis of the above, NNECO considers its previous commitment to be complete. There are no new regulatory commitments contained within this letter. The regulatory commitment that is closed is listed in Attachment 1.

If you should have any questions on the above, please contact Mr. David W. Dodson at (860) 447-1791, extension 2346.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY



Robert G. Lizotte
Master Process Owner - Assessment

Attachment (1)

cc: H. J. Miller, Region I Administrator
V. Nerses, NRC Senior Project Manager, Millstone Unit No. 3
A. C. Cerne, Senior Resident Inspector, Millstone Unit No. 3

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Attachment 1

Millstone Nuclear Power Station, Unit No. 3

List of Regulatory Commitments

List of Regulatory Commitments

The following table identifies the action previously committed to by NNECO and closed in this document.

Number	Commitment	Due
B17378-01	Millstone plans to sponsor a test program with EPRI that will determine the appropriate friction coefficients to use (in stainless steel guide and slot surfaces) above 100°F. The test results will be incorporated into the applicable MOV Program thrust calculations.	Closed