January 22, 2002

MEMORANDUM TO: Eugene V. Imbro, Chief
Mechanical and Civil Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation

FROM: Daniel H. Dorman, Chief ***/RA/***
Engineering Research Applications Branch
Division of Engineering Technology
Office of Nuclear Regulatory Research

SUBJECT: PERFORMANCE OF MOV STEM LUBRICANTS AT ELEVATED TEMPERATURE

The subject report, "Performance of MOV Stem Lubricants at Elevated Temperature, " NUREG/CR-6750,October 2001, is being submitted for your use. This document summarizes the results of research on MOV (motor operated valve) stem lubricants at elevated temperature to address the need to provide assurance that MOVs are able to perform their intended safety function under design basis flow and pressure loads. One of the parameters that can effect a MOVs's operability is variation in the stem-stem nut coefficient of friction with temperature and age.

Accelerated aging tests on motor operated valve (MOV) performance indicated that an elevated temperature environment could lead to significant increases in the coefficient of friction at the stem-to-stem nut interface in motor operated valves (MOVs). Increases in this coefficient of friction may affect the operation of safety-related MOVs under design basis flow and pressure loads. Since most qualification and in-service testing of MOV actuators occurs at ambient plant temperatures (usually 70 to 100°F) rather than at design basis conditions (which can lead to valve operating temperatures in the 200 to 300°F range), the effects of an increase in the stem-to-stem nut coefficient of friction as a result of elevated temperatures would not be detected during normal operation and/or surveillance testing.

To evaluate the performance of MOV lubricants at elevated temperatures, five different lubricants on four different valve stems and stem nuts were tested. The test series included a collection of baseline data at room temperature, single step temperature tests where the temperature of the test setup was elevated directly to 250°F, and step testing where the temperature was elevated in steps to 130, 190, and 250°F, then returned to 70°F. The following conclusions were reached as a result of these tests:

The physical characteristics of each lubricant change with increasing temperature, changing the frictional performance of each stem and stem nut.

The consistency of the stem-to-stem nut coefficient of friction from one stroke to another changes significantly with increasing temperature.

The stem/stem nut coefficient of friction can increase significantly at elevated temperature.

The end of stroke friction behavior is highly dependent on the unique stem/stem nut tested, the lubricant, and temperature.

Each individual stem and stem nut combination has unique characteristics with regard to variation between strokes, elevated temperature performance, and end of stroke friction behavior.

The subject report reflects comments provided by NRR in a memorandum dated July 27, 2001, E. Imbro to D. Dorman and in verbal comments provided during a July 18, 2001 meeting with INEEL to discuss the results of the MOV stem lubricant testing at elevated temperature. The subject report is publicly available in the ADAMS system under the accession number ML020150282.

If you have any questions on the report, please contact Jerry Jackson (415-6656) of my staff.

Attachment: As stated

cc: M. Fields
D. Terao
T. Scarbrough

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