UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

March 27, 1992

NRC INFORMATION NOTICE 92-23: RESULTS OF VALIDATION TESTING OF MOTOR-OPERATED VALVE DIAGNOSTIC EQUIPMENT

Addressees

All holders of operating licenses or construction permits for nuclear power reactors and all vendors of motor-operated valve (MOV) diagnostic equipment.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the final results of validation testing of MOV diagnostic equipment conducted for the MOV Users Group (MUG) of nuclear power plant licensees. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Background

In 1990, the MUG initiated a program to conduct tests of MOV diagnostic equipment to validate the accuracy asserted by the equipment vendors. The MUG requested the Idaho National Engineering Laboratory (INEL) to provide a test stand for the program. The NRC Office of Nuclear Regulatory Research (RES) provided funds for INEL to participate, with the stipulation that the results of the testing would be made available to the NRC and the public. The MOV diagnostic equipment vendors participating in the MUG test program were ASEA-Brown Boveri (ABB) Impell, ITI-MOVATS, Liberty Technologies, Siemens/KWU, Teledyne, and Wyle Laboratories. The INEL test stand included a Limitorque motor operator which pushes a valve stem into a water reservoir with a compressed air overcharge, providing various loading conditions on the valve stem. INEL obtained accurate measurements of thrust using a stem-mounted load cell as a reference standard. Each diagnostic equipment vendor installed and operated its own equipment to measure various parameters so as to obtain estimates of stem thrust.

At a public meeting on July 30, 1991, the MUG released a progress report of its program to validate the accuracy of MOV diagnostic equipment. During the meeting, the MUG stated that licensees and diagnostic equipment vendors should review the progress report for its applicability to MOVs installed in nuclear power plants. The MUG also alerted licensees and diagnostic equipment vendors to their responsibilities under Part 21 of Title 10 of the Code of Federal Regulations (10 CFR Part 21). The NRC issued Information

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Notice 91-61 (September 30, 1991), "Preliminary Results of Validation Testing of Motor-Operated Valve Diagnostic Equipment," to alert licensees to the issues raised by the MUG progress report.

Description of Circumstances

At a public meeting on February 3, 1992, the MUG released "Final Report - MUG Validation Testing as Performed at Idaho National Engineering Laboratories (Volume 1)." The report has been placed in the NRC Public Document Room (PDR), 2120 L Street, N.W., Washington, D.C. 20555 (telephone (202) 634-3273). Upon receiving the remaining three volumes, which will provide data traces, test documentation, and torque measurement information, the staff will place these volumes in the PDR. On March 4, 1992, the NRC staff discussed the MUG final report with members of the MUG committee that conducted the validation program. The MUG final report presents the findings of the validation program and specifies whether or not the tested diagnostic equipment provided the accuracy claimed by its vendors in predicting stem thrust. The MUG final report indicates that the MOV diagnostic equipment that relied on spring pack displacement to estimate stem thrust did not meet the accuracy claims of its vendors. MOV diagnostic equipment that relied on other parameters such as stem or yoke strain was shown, in general, to meet the applicable accuracy claims, although certain equipment did not meet the accuracy claims in certain individual tests.

ABB Impell and ITI-MOVATS are two MOV diagnostic equipment vendors that have equipment commercially available that relies on spring pack displacement to estimate stem thrust. At the MUG meeting in February 1992, ABB Impell representatives stated that they would work with their two licensee customers to develop new accuracy values. On March 2, 1992, the NRC staff held a public meeting with representatives of ITI-MOVATS to discuss the accuracy of the thrust measuring device (TMD) used by ITI-MOVATS to estimate stem thrust based on spring pack displacement. During the meeting on March 2, the representatives of ITI-MOVATS described the results of their own field validation program that had been initiated to address the preliminary concerns raised in the MUG progress report. However, the ITI-MOVATS program addressed only the accuracy of the TMD under static (zero differential pressure and flow) conditions and not the accuracy of this equipment under differential pressure and flow conditions. Nevertheless, the results of the field validation program showed that the inaccuracy of the TMD may be larger than assumed in some instances by licensees. The ITI-MOVATS representatives also discussed the results of their efforts to resolve concerns regarding the fact that the TMD is calibrated in the valve opening direction, but is also used to predict the thrust delivered by the actuator in the valve closing direction. Although this study of valve directional effect by ITI-MOVATS focused on static conditions, the study indicated that the effect of the direction that the valve moves could increase significantly the uncertainty of the TMD.

Discussion

Many licensees rely on MOV diagnostic equipment to provide information on the thrust required to open or close the valve and on the thrust delivered by the motor actuator. The various types of MOV diagnostic equipment estimate valve stem thrust using different parameters, such as the displacement of the spring

pack or the strain in the stem, mounting bolts, or yoke. Some licensees make decisions regarding the operability of safety-related MOVs based on the thrust information obtained from the diagnostic equipment. Therefore, the use of MOV diagnostic equipment can affect significantly the safe operation of a nuclear power plant.

The MUG validation program indicated that the accuracy of MOV diagnostic equipment that relies on spring pack displacement has not been verified to be within its original stated accuracy under differential pressure and flow conditions. Further, the field validation program and valve directional effect study by ITI-MOVATS have shown an increase in the uncertainty of this MOV diagnostic equipment under static conditions. Therefore, licensees who use MOV diagnostic equipment that relies on spring pack displacement to make decisions regarding the capability of MOVs to operate under design-basis conditions may have overestimated the capability of those MOVs. A particular concern arises where a licensee has lowered the torque switch settings of its MOVs below the settings recommended by the actuator manufacturer based on thrust estimates from diagnostic equipment during tests conducted under static or partial design-basis differential pressure conditions.

The NRC will address each case individually for MOV diagnostic equipment that was not included in the MUG validation program. For example, the concerns regarding the accuracy of MOV diagnostic equipment that relies on spring pack displacement apply to all commercial or plant-specific MOV diagnostic equipment that relies on spring pack displacement to estimate stem thrust. Similar concerns might be present for other MOV diagnostic equipment that also predicts stem thrust by indirect means, such as spring pack force.

"Load-sensitive behavior" in an MOV has been shown to result in less thrust delivered by the actuator under differential pressure conditions than delivered under static conditions. "Load-sensitive behavior" is independent of the type of MOV diagnostic equipment used and such behavior can lead licensees to overestimate the capability of their MOVs.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

Charles E. Rossi

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Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-22	Criminal Prosecution and Conviction of Wrongdoing Committed by A Commercial-Grade Valve Supplier	03/24/92	All holders of OLs or CPs for nuclear power reactors.
92-21	Spent Fuel Pool Reactivity Calculations	03/24/92	All holders of OLs or CPs for nuclear power reactors.
92-20	Inadequate Local Leak Rate Testing	03/03/92	All holders of OLs or CPs for nuclear power reactors.
92-19	Misapplication of Potter & Brumfield MDR Rotary Relays	03/02/92	All holders of OLs or CPs for nuclear power reactors.
92-18	Potential for Loss of Remote Shutdown Capability during A Control Room Fire	02/28/92	All holders of OLs or CPs for nuclear power reactors.
92-17	NRC Inspections of Programs being Developed at Nuclear Power Plants in Response to Generic Letter 89-10	02/26/92	All holders of OLs or CPs for nuclear power reactors.
92-16	Loss of Flow from the Residual Heat Removal Pump during Refueling Cavity Draindown	02/25/92	All holders of OLs or CPs for nuclear power reactors.
92-15	Failure of Primary System Compression Fitting	02/24/92	All holders of OLs or CPs for nuclear power reactors.
92-14	Uranium Oxide Fires at Fuel Cycle Facilities	02/21/92	All fuel cycle and uranium fuel research and development licensees.

OL = Operating License
CP = Construction Permit

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