

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

December 26, 1989

**NRC INFORMATION NOTICE NO. 89-88: RECENT NRC-SPONSORED TESTING OF
MOTOR-OPERATED VALVES**

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is intended to alert addressees to potential problems identified as a result of recent NRC-sponsored testing of motor-operated valves (MOVs). 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 do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

The NRC-sponsored blowdown testing of six motor-operated, flexible wedge gate valves was recently completed. The test results are generally applicable to any MOV that must open or close in a high flow, a high differential pressure, or a low subcooling situation.

The tests were sponsored by the NRC and conducted by the Idaho National Engineering Laboratory (INEL) at the Kraftwerk Union (KWU) facility in the Federal Republic of Germany. The test results substantiated and expanded the concerns that were previously identified with the operational capability of MOVs in high flow, high differential, or low subcooling applications. These previous concerns were identified by INEL testing of two MOVs at the Wyle Labs facility in Huntsville, Alabama, and were reported in NUREG/CR-5406, "BWR Reactor Water Cleanup System Flexible Wedge Gate Isolation Valve Qualification and High Energy Flow Interruption Test." The expanded concerns now include (1) valves supplied by four different manufacturers; (2) valves of two different sizes (i.e., 6- and 10-inch valves); (3) water conditions, including several different subcoolings and pressures; and (4) saturated steam conditions at several different pressures.

Using experience gained from the Wyle tests, INEL adjusted the torque switches to obtain higher stem thrust values than would have been required using the standard industry design formula. This was done to assure isolation of the

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vast majority of flow through each valve during each blowdown. However, these adjustments may have resulted in the stem thrust available during the blowdown tests being above that currently being used (and possibly also above the mechanical and electrical capabilities) for some currently installed valve and motor operator assemblies. Even with the high settings used during the KWU tests, several blowdowns resulted in closure of the flow area but did not achieve full seating of the valve. During one such test, there was considerable leakage through the valve after the valve stopped its closure stroke.

The KWU test results confirm the concern raised by the Wyle testing. The KWU test data has not been fully evaluated at this time, but preliminary review indicates that

1. The valves required stem thrusts well in excess of those predicted by the industry design formula in use at the time of their design and manufacture.
2. The required stem thrust of the valves was not linearly dependent on the differential pressure across the valve at the time of closure. This circumstance precludes determination of the required stem thrust from data that could be obtained under normal plant operating conditions.
3. The thrust at which torque switch trip occurs was not constant with respect to the loading history of the valve. Many within the industry refer to this as the "rate of loading" phenomenon. However, the testing indicates that there may be more involved than variations of the torque switch spring pack's response time.
4. The stem factor (i.e., the ratio of the motor operator's output torque to the valve's stem thrust) appears to be dependent on direction and magnitude of the load being applied to the stem.
5. Several of the valves significantly damaged themselves during closure.

NRC plans to hold an information meeting to present the KWU test results for industry peer review. The meeting and a data report are planned for the early part of 1990.

Related Generic Communications:

The general concern about the ability of MOVs to function properly when subjected to design-basis loadings has been previously addressed in NRC Bulletins 81-02, "Failure of Gate-Type Valves to Close Against Differential Pressure," and 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings"; NRC Circular 77-01, "Malfunctions of Limitorque Valve Operators"; and NRC Information Notices 81-31, "Failure of Safety Injection Valves to Operate Against Differential Pressure," 85-50, "Complete Loss of Main and Auxiliary Feedwater at a PWR Designed by Babcock & Wilcox," and 89-61, "Failure of Borg-Warner Gate Valves to Close Against Differential Pressure."

In addition, Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," requested all addressees to develop a program for the testing, inspection, and maintenance of MOVs so as to provide the necessary assurance that the MOVs will function when subjected to the design-basis conditions that are to be considered during both normal operation and abnormal events in the design basis of the plant.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contacts listed below or the appropriate NRR project manager.



Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contacts: Hugh W. Woods, RES
(301) 492-3908

Richard J. Kiessel, NRR
(301) 492-1154

Attachment: List of Recently Issued NRC Information Notices

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*Draft IN forwarded to OGCB by WMinners memo 11/20/89

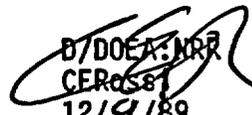
Document Name: NRC SPONSORED MOV TEST RESULTS

*SEE PREVIOUS CONCURRENCES

*OGCB:DOEA:NRR
RJKiesel
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*D/DSIR:RES
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LBMars
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CHBerlinger
12/18/89
*RPB:ARM
TechEd
12/11/89

*D/DET:NRR
JERichardson
12/06/89

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RJKiessel	WMinners	LBMarsh	CERossi	CHBerlinger
11/30/89	11/20/89	12/06/89	12/ /89	12/18/89
			*D/DET:NRR	*RPB:ARM
			JERichardson	TechEd
			12/06/89	12/11/89

Related Generic Communications:

The general concern of the ability of MOVs to function properly when subjected to design basis loadings has been previously addressed in NRC Bulletins 81-02, "Failure of Gate Type Valves to Close Against Differential Pressure," and 85-03, "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings;" NRC Circular 77-01, "Malfunctions of Limitorque Valve Operators;" and NRC Information Notices 81-31, "Failure of Safety Injection Valves to Operate Against Differential Pressure," 85-50, "Complete Loss of Main and Auxiliary Feedwater at a PWR Designed by Babcock & Wilcox," and 89-61, "Failure of Borg-Warner Gate Valves to Close Against Differential Pressure."

In addition, Generic Letter 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," requested all addressees to develop a program to provide for the testing, inspection, and maintenance of MOVs so as to provide the necessary assurance that they will function when subjected to the design basis conditions that are to be considered during both normal operation and abnormal events within the design basis of the plant.

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