

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

December 17, 1992

NRC INFORMATION NOTICE 92-83: THRUST LIMITS FOR LIMITORQUE ACTUATORS
AND POTENTIAL OVERSTRESSING OF MOTOR-
OPERATED VALVES

Addressees

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

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to (1) possible overstressing of motor-operated valves (MOV) during operation and testing and (2) reviews by the NRC staff of programs by two nuclear industry organizations to justify increased limits on the thrust that Limitorque motor actuators for MOVs can withstand. 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.

Description of Circumstances

During inspections of programs developed by licensees in response to Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," and its supplements, the NRC staff has found instances in which licensees have subjected MOVs to thrust or torque that exceeded their limits. In June 1992, during an inspection at the Three Mile Island Nuclear Station, Unit 1 (TMI-1), the NRC staff discovered an 8-inch crack in the main housing of a Limitorque actuator for a safety-related MOV in the steam line to an emergency feedwater pump. The crack began at a bolt hole for the upper bearing housing cover of the actuator. Licensee test records indicated that the actuator had been subjected to thrust above its rating on numerous occasions over the past few years. Upon disassembling the actuator in late June 1992, the licensee found two other cracks starting at other bolt holes in the housing cover. The licensee replaced the actuator. Other licensees have also informed the NRC staff of actuators that have been damaged at nuclear power facilities.

Upon testing MOVs, nuclear power plant licensees have found the need to increase torque switch settings for some MOVs because the torque or thrust required to operate the valves under differential pressure and flow conditions

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was greater than predicted. In certain cases, licensees have set the MOV torque switch near its maximum allowable setting, which is based on the structural and electrical capability of the MOV. At these high settings, MOVs can exceed their torque or thrust ratings because of uncertainties such as the amount of inertia exhibited by the actuator during operation, MOV diagnostic equipment accuracy, and torque switch repeatability. As a consequence, some licensees have been attempting to justify thrust and torque limits for MOV actuators greater than the ratings established by the manufacturer, Limitorque Corporation (Limitorque). The following describes two programs to increase thrust limits of Limitorque actuators.

Kalsi Engineering

On April 15, 1992, the NRC staff held a public meeting with representatives of Duke Power Company and Kalsi Engineering (Kalsi) to discuss a study by Kalsi of the capability of MOV actuators to withstand thrust greater than the ratings published by Limitorque. In August 1992, the staff reviewed the report of the Kalsi study while inspecting the GL 89-10 program at the Wolf Creek Generating Station.

In its testing program, Kalsi tested one actuator each of sizes SMB-000, -00, -0, and -1 for 4000 cycles in both the open and close directions at 200 percent of the Limitorque thrust ratings of each actuator. The Kalsi testing included seismic loading conditions for several cycles. In its Technical Update 92-01, Limitorque has endorsed the Kalsi study, with certain conditions, for up to 140 percent of the thrust ratings. In a letter to the utilities that participated in the study, and hence that can obtain the proprietary report, Limitorque has allowed those utilities to rely on the actuators to withstand thrust of up to 162 percent of the rating for 2000 cycles.

The staff documented a number of concerns about the design of the Kalsi study in a letter to Duke Power Company on June 10, 1992, and NRC Inspection Report 50-482/92-15, September 30, 1992, for the Wolf Creek Generating Station. The deficiencies identified may affect the reliability of the test results. A summary of the staff's comments on the Kalsi study can be found in Attachment 1.

Westinghouse Corporation

On July 7-9, 1992, the NRC Vendor Inspection Branch conducted an inspection at the Westinghouse Corporation (Westinghouse) to review a program intended to demonstrate that Limitorque actuators can withstand thrust greater than their published ratings.

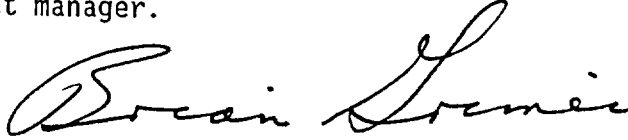
After comparing actuator parameters, Westinghouse placed the SMB-000, -00, and -0 actuators in one group and the SMB-1 and -2 actuators in another group. Westinghouse selected an SMB-00 actuator to represent the actuators of size SMB-000, -00, and -0 and selected an SMB-2 actuator to represent the actuators of size SMB-1 and -2. The plan for each tested SMB actuator consisted of an initial torque test, mechanical aging tests, a seismic test, a final thrust overload test, and a final torque test. The test plan required the tested actuators to be operated in the open and close directions under various load conditions for many cycles.

In NRC Inspection Report 99900404/92-01, August 14, 1992, the NRC staff concluded that the Westinghouse study did not adequately address certain issues and, therefore, that utilities should not currently be using the results from the Westinghouse program. However, the staff stated that some of the data in the test reports could be useful for evaluating temporary justifications for the operability of actuators in individual cases. A summary of the staff's principal concerns with the Westinghouse program can be found in Attachment 2.

Related Generic Communications

The NRC has issued other generic communications on MOV actuators. For example, on September 25, 1992, the NRC issued Information Notice 92-70, "Westinghouse Motor-Operated Valve Performance Data Supplied to Nuclear Power Plant Licensees," to alert licensees to the possibility of overestimating the thrust output capability of actuators when using performance data from valve manufacturers.

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 project manager.



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Leonard Prividy, Region I
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Attachments:

1. Summary of NRC Staff Comments on the Kalsi Study.
2. Summary of NRC Staff Comments on the Westinghouse Program
3. List of Recently Issued NRC Information Notices

Summary of NRC Staff Comments
on the Kalsi Study

1. Kalsi lubricated the stem more frequently than it would be lubricated in a normal application. As the lubricant deteriorates over time, the internal parts may exhibit greater wear than indicated in the Kalsi results.
2. Kalsi found certain internal components that experienced torque to have failed or have significant wear.
3. In Technical Update 92-01, Limitorque indicated that the actuator bolts must be tightened to a certain torque before applying the increased allowable percentage thrust above the ratings. The Arkansas Power and Light Company, the licensee for Arkansas Nuclear One, informed the staff that, after tightening the bolts, the thrust delivered when the torque switch tripped was up to 50 percent less than the thrust delivered before tightening the bolts. The licensee stated that it had determined that the probable cause was the overcompression of the housing cover gasket caused by the increased torque requirements of the housing cover bolts. Kalsi is reassessing the need to tighten the bolts to a specific torque value.
4. Kalsi used new actuators in its testing program, and did not consider possible differences in manufacturing over the years or the effects of aging.
5. Kalsi had not ensured that tightening of the actuator bolts after seismic testing did not affect reliance on the results of the tests for the remaining cycles.
6. During the April 1992 presentation, Dr. Kalsi stated that the total number of cycles that an actuator has operated from the beginning of its life must be counted in the 2000 cycle limit stated in the study.
7. In the Kalsi study, the motor pinion key on some MOVs failed, and the manual declutch lever spuriously engaged during tests of an actuator.
8. The Kalsi study did not ensure that the actuator bolts, stem, or stem nut had adequate strength for specific plant applications.

Summary of NRC Staff Comments
on the Westinghouse Program

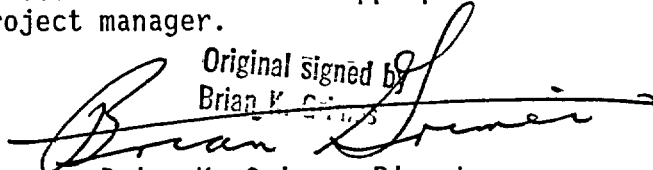
1. Westinghouse did not adequately establish similarity in grouping actuators for testing.
2. Westinghouse did not adequately address the margin necessary to account for statistical variations among actuators within each group of actuators when sampling only one actuator from each group for testing.
3. Westinghouse did not clearly indicate that actuator bolts, stem, or stem nuts were not included in its study.
4. Westinghouse stated that its program may only be applied to actuators for which the total number of operating cycles and thrust conditions are known.
5. Westinghouse did not address any margin provided to account for the inaccuracy of test equipment used in the Westinghouse program or used by licensees applying thrust allowable limits from the program.
6. Westinghouse had not resolved an issue of spurious engagement of the manual declutch lever during testing of an actuator.

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
92-82	Results of Thermo-Lag 330-1 Combustibility Testing	12/15/92	All holders of OLs or CPs for nuclear power reactors.
92-81	Potential Deficiency of Electrical Cables with Bonded Hypalon Jackets	12/11/92	All holders of OLs or CPs for nuclear power reactors.
92-80	Results of Thermo-Lag 330-1 Combustibility Testing	12/07/92	All holders of OLs or CPs for nuclear power reactors.
92-79	Non-Power Reactor Emergency Event Response	12/01/92	All holders of OLs or CPs for test and research reactors.
92-78	Piston to Cylinder Liner Tin Smearing on Cooper-Bessemer KSV Diesel Engines	11/30/92	All holders of OLs or CPs for nuclear power reactors.
92-77	Questionable Selection and Review to Deter- mine Suitability of Electropneumatic Relays for Certain Applications	11/17/92	All holders of OLs or CPs for nuclear power reactors.
92-76	Issuance of Supple- ment 1 to NUREG-1358, "Lessons Learned from the Special Inspection Program for Emergency Operating Procedures (Conducted October 1988 - September 1991)"	11/13/92	All holders of OLs or CPs for nuclear power reactors.
92-75	Unplanned Intakes of Airborne Radioactive Material by Individuals at Nuclear Power Plants	11/12/92	All holders of OLs or CPs for nuclear power reactors.

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Original signed by
Brian K. Grimes



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Document Name: 92-83.IN

*SEE PREVIOUS CONCURRENCES

*OGCB:DORS:NRR RJKiessel:mkm 10/19/92	*TECH ED JMain 10/21/92	*RSIB:DRIL:NRR JBJacobson 11/02/92	*C/RSIB:DRIL:NRR EVImbro 11/03/92	*D/DRIL:NRR CERossi 11/04/92
*EMEB:DE:NRR TGScarbrough 11/10/92	*C/EMEB:DE:NRR JANorberg 11/17/92	*D/DE:NRR JERichardson 11/17/92	*C/OGCB:DORS:NRR GHMarcus 12/08/92	D/DORS:NRR BGrimes 12/14/92

In NRC Inspection Report 99900404/92-01, August 14, 1992, the NRC staff concluded that the Westinghouse study did not adequately address certain issues, and therefore, that utilities should not currently be using the results from the Westinghouse program. However, the staff stated that some of the data in the test reports could be useful for evaluating temporary justifications for the operability of actuators in individual cases. A summary of the staff's principal concerns with the Westinghouse program can be found in Attachment 2.

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Attachments: see page 4

Document Name:	NRCIN.283	*SEE PREVIOUS CONCURRENCES			
*OGCB:DORS:NRR	*TECH ED	*RSIB:DRIL:NRR	*C/RSIB:DRIL:NRR	*D/DRIL:NRR	
RJKiessel:mkm	JMain	JBJacobson	EVImbro	CERossi	
10/19/92	10/21/92	11/02/92	11/03/92	11/04/92	
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TGScarbrough	JANorberg	JERichardson	GHMarcus	BKGrimes	
11/10/92	11/17/92	11/17/92	12/8/92	11/ /92	

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*with
comments*

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10/10/92	10/ /92	10/ /92	10/ /92	10/ /92

on # 10/10/92 with comments

for NRC
for Imbro
for Norholm

RIZ with comments

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