

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

July 20, 1993

NRC INFORMATION NOTICE 93-54: MOTOR-OPERATED VALVE ACTUATOR THRUST VARIATIONS
MEASURED WITH A TORQUE THRUST CELL AND A STRAIN
GAGE

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 a possible error in their diagnostic evaluation of motor-operated valve (MOV) actuators. 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

Diagnostic testing of MOVs is performed to satisfy the commitments made in response to NRC Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," and its supplements. Actuator output thrust is measured by a combination of transducers. The transducers include, but are not limited to, the ITI MOVATS torque thrust cell (thrust cell) and the Teledyne quick stem sensor (stem sensor).

On November 9, 1992, ITI MOVATS engineers working at the Turkey Point plant noticed that thrust measurements taken with the torque thrust cell were different from the stem-mounted strain gage readings after the thrust cell was removed. Review showed that all of the readings of the valves that had been tested using the stem sensor changed somewhat when the thrust cell was removed from the valve. Data indicated that thrust readings degraded by approximately 20 percent when the thrust cell was removed.

On November 10, 1992, ITI MOVATS management and a licensee engineer began to investigate the cause.

Discussion

As discussed above, to meet the commitments made in response to GL 89-10, most licensees rely on MOV diagnostic equipment to set the thrust delivered by the actuator in opening or closing its valve. Failure to properly account for inaccuracies introduced by the use of diagnostic equipment could result in

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either the MOV not being able to perform its intended safety function because of inadequate actuator output or the failure of a component in either the valve or the actuator because of excessive motor torque.

The devices discussed in the Description of Circumstances operate on the following principles:

- The ITI MOVATS torque thrust cell is a radial web calibrated load cell. The inner ring of the cell is bolted to the top of the valve yoke and the outer ring to the bottom of the actuator. The rings are connected by eight webs that have strain gages to measure actuator torque and thrust simultaneously. Installation of the thrust cell requires that the actuator be raised a distance equal to the thickness of the thrust cell. This means that the actuator stem nut is in a new position on the valve stem.
- The Teledyne quick stem sensor is a strain gage mounted on a strip of foil with tabs on each end to facilitate installation on the valve stem. The sensor comes with leads preconnected to the gage. Epoxy is used to install the stem sensor on the valve stem.

During the test, the valve is stroked and the thrust cell is used as a calibration reference for the stem sensor. Once the stem sensor is calibrated, it can be used for future MOV tests without using the thrust cell. The Limitorque actuator torque switch is then set to produce the required valve stem thrust. After the thrust cell is removed, a full valve stroke signature is obtained to evaluate overall actuator performance.

As a result of their review, ITI MOVATS and licensee personnel concluded that the most significant contributors to the observed changes in thrust when the thrust cell was removed are stem engagement and stem lubricant.

- Stem engagements of less than one stem diameter tend to increase the thrust at torque switch trip by improving the stem factor. This effect is more pronounced when Neolube is used than when EP-0 is used as a stem lubricant.
- Test results indicate that stroke-to-stroke variations in thrust at torque switch trip are greater with Neolube than with EP-0. For Neolube, the variations tend to be high on initial lubrication and then decrease as the valve is stroked.

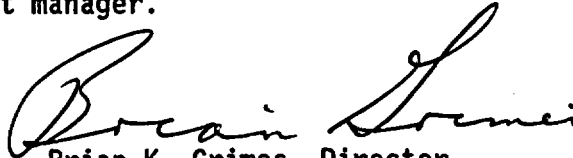
In January 1993, ITI MOVATS engineers issued the attached report of their investigation of the discrepancies in thrust measurements which confirms that the primary causes are stem lubrication and stem nut wear.

Related Generic Communications

NRC has issued a number of information notices pertaining to the accuracy of MOV diagnostic equipment. Most recently, these have included NRC Information Notice (IN) 93-01, "Accuracy of Motor-Operated Valve Diagnostic Equipment Manufactured by Liberty Technologies;" IN 92-23, "Results of Validation Testing of Motor-Operated Diagnostic Equipment;" and IN 91-61, "Preliminary Results of Validation Testing of Motor-Operated Valve Diagnostic Equipment."

NRC also issued Supplement 5 to GL 89-10, "Inaccuracy of Motor-Operated Valve Diagnostic Equipment," on June 28, 1993.

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.



Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contacts: Francis Jape, RII
(404) 331-5607

Thomas G. Scarbrough, NRR
(301) 504-2794

Attachments:

1. ITI MOVATS Report dated January 1993
2. List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-53	Effect of Hurricane Andrew on Turkey Point Nuclear Generating Station and Lessons Learned	07/20/93	All holders of OLs or CPs for nuclear power reactors.
93-52	Draft NUREG-1477, "Voltage-Based Interim Plugging Criteria for Steam Generator Tubes"	07/14/93	All holders of OLs or CPs for pressurized water reactor (PWRs).
93-51	Repetitive Overspeed Tripping of Turbine-Driven Auxiliary Feed-water Pumps	07/09/93	All holders of OLs or CPs for nuclear power reactors.
93-50	Extended Storage of Sealed Sources	07/08/93	All licensees authorized to possess sealed sources.
93-49	Improper Integration of Software into Operating Practices	07/08/93	All holders of OLs or CPs for nuclear power reactors.
93-48	Failure of Turbine-Driven Main Feedwater Pump to Trip Because of Contaminated Oil	7/6/93	All holders of OLs or CPs for nuclear power reactors.
92-06, Supp. 1	Reliability of ATWS Mitigation Systems and Other NRC-Required Equipment not Controlled by Plant Technical Specification	07/01/93	All holders of OLs or CPs for nuclear power reactors.
93-47	Unrecognized Loss of Control Room Annunciators	06/18/93	All holders of OLs or CPs for nuclear power reactors.
93-46	Potential Problem with Westinghouse Rod Control System and Inadvertent Withdrawal of A Single Rod Control Cluster Assembly	6/10/93	All holders of OLs or CPs for Westinghouse (W)-designed nuclear power reactors.

OL = Operating License
 CP = Construction Permit

Manufactured by Liberty Technologies"; IN 92-23, "Results of Validation Testing of Motor-Operated Diagnostic Equipment"; and IN 91-61, "Preliminary Results of Validation Testing of Motor-Operated Valve Diagnostic Equipment." In addition, NRC is preparing a supplement to GL 89-10 to request that licensees address potential accuracy problems with MOV diagnostic equipment.

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OFFICE	*OGCB:DORS:NRR	*TECH ED.	*RII	*RII	EMEB:DEJ <i>with comment</i>
NAME	RJKiessel	DGable	AGibson	FJape	TGScarbrough
DATE	05/04/93	05/10/93	03/30/93	03/30/93	05/19/93

C:EMEB:DEJ	D:EMEB:DEJ	C:OGCB:DORS	D:DORS:NRR
JANberg	ERichardson	GHMarcus	BKGrimes
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DATE	05/4/93	05/10/93	03/30/93	03/30/93	05/ /93

C:EMEB:DET	D:EMEB:DET	C:OGCB:DORS	D:DORS:NRR
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orig /s/'d by BKGrimes

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licensees are adequately addressing the problems associated with MOV diagnostic equipment inaccuracies, NRC is preparing Supplement 5 to GL 89-10, "Inaccuracy of Motor-Operated Valve Diagnostic Equipment."

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