

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

March 21, 1985

IE INFORMATION NOTICE NO. 85-22: FAILURE OF LIMITORQUE MOTOR-OPERATED
VALVES RESULTING FROM INCORRECT
INSTALLATION OF PINION GEAR

Addressees:

All nuclear power reactor facilities holding an operating license (OL) or a construction permit (CP).

Purpose:

This information notice is provided to alert recipients of a potentially significant problem pertaining to the incorrect installation of pinion gears in Limitorque motor-operated valves. It is expected that recipients will review the information for applicability to their facilities and consider actions, if appropriate, to preclude a similar problem occurring at their facilities. However, suggestions contained in this notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

On December 21, 1984 and February 20, 1985, the Tennessee Valley Authority reported [Licensee Event Report (LER) 84-013] failure of the outboard high pressure coolant injection (HPCI) valve to open at the Browns Ferry Nuclear Power Station Unit 3. Operators observed the failure while attempting to perform an operability surveillance on the HPCI system.

An inspection of the Limitorque operator revealed that the pinion gear had been installed in a reversed position. This reversed installation resulted in only about one third of the normal gear mesh surface and the complete wearing away of the portion of the pinion gear teeth that were in contact with the shaft (drive) gear. With the pinion gear teeth worn away, the motor could no longer operate the valve. This inspection also revealed that the DC shunt field for the operator had failed. With the shunt field open, the valve travel speed was limited only by load. A review of completed surveillances since 1980 revealed that the travel time for the valve had been about 8 seconds. This is approximately one half of the normal travel time of 16 seconds and may have accelerated the gear tooth erosion.

Discussion:

A similar problem was found at Browns Ferry Nuclear Power Station Unit 1 (LER 79-035 reported January 2 and March 11, 1980, and February 12, 1981) and at Unit 2 (LER 80-2 reported March 11, 1980).

Several factors contribute to the potential for the reverse installation of the pinion gear, including the following: (1) the reverse installation is relatively easy and not readily detected by observation, (2) the reverse installation is not revealed in postmaintenance testing (except for Limitorque operator Types SMB 00 and SMB 000), and (3) the pinion is installed in one direction in certain types of Limitorque operators while in others it is properly reversed 180°. Because Limitorque valve operators are used for many safety-related valve applications, the unexpected failure of a valve to operate electrically could be very significant.

Corrective actions initiated by the licensee include:

1. Conducting a sampling of accessible safety-related Limitorque valve operators to ensure correct pinion gear installation. Should the sampling give a positive indication that other safety-related Limitorque valve operators are suspect, develop a program for their inspection to precede corrective action 4 below.
2. Adding a requirement for independent verification of the correct installation of pinion gear to applicable maintenance procedures.
3. Adding a caution statement to applicable maintenance and electrical procedures to ensure that personnel verify the correct Limitorque valve operator model, and to warn that incorrect installation cannot be detected in postmaintenance testing and can lead to unexpected failure of the valve.
4. Adding inspection of the pinion gear installation and gear tooth wear to the preventive maintenance program for Limitorque valve operators.
5. Adding the inspection of the shunt field for primary containment isolation valve dc operators to the Limitorque valve operator inspection program.
6. Providing training on proper pinion gear installation and the failure mode for Limitorque valve operators to all responsible crafts personnel, including electricians.

No specific action or written response is required by this information notice. If you have any question about this matter, please contact the Regional Administrator of the appropriate NRC regional office or this office.



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and Engineering Response
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Attachment: List of Recently Issued IE Information Notices

LIST OF RECENTLY ISSUED
 IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
85-21	Main Steam Isolation Valve Closure Logic	3/18/85	All PWR facilities holding an OL or CP
85-20	Motor-Operated Valve Failures Due To Hammering Effect	3/12/85	All power reactor facilities holding an OL or CP
85-19	Alleged Falsification Of Certifications And Alteration Of Markings On Piping, Valves And Fittings	3/11/85	All power reactor facilities holding an OL or CP
85-10 Sup. 1	Posstensioned Containment Tendon Anchor Head Failure	3/8/85	All power reactor facilities holding an OL or CP
84-18	Failures Of Undervoltage Output Circuit Boards In The Westinghouse-Designed Solid State Protection System	3/7/85	All Westinghouse PWR facilities holding an OL or CP
83-70 Sup. 1	Vibration-Induced Valve Failures	3/4/85	All power reactor facilities holding an OL or CP
85-17	Possible Sticking Of ASCO Solenoid Valves	3/1/85	All power reactor facilities holding an OL or CP
85-16	Time/Current Trip Curve Discrepancy Of ITE/Siemens-Allis Molded Case Circuit Breaker	2/27/85	All power reactor facilities holding an OL or CP
85-15	Nonconforming Structural Steel For Safety-Related Use	2/22/85	All power reactor facilities holding an OL or CP
85-14	Failure Of A Heavy Control Rod (B4C) Drive Assembly To Insert On A Trip Signal	2/22/85	All power reactor facilities holding an OL or CP

OL = Operating License
 CP = Construction Permit