ACTION PLAN # 12

TITLE: Auxiliary Feedwater System Valve Problem Analysis (AF 599 & AF 608)

REV	DATE	REASON FOR REVISION	BY	CHAIRMAN TASK FORCE	APPR. FOR IMPL.
0	6/14/85	Initial Issue	See Rev. 0	for Approval	
1	6/16/85	General format changes. Clarifications as a result of discussion with the NRC.	See Rev. 1	for Approval	
2	6/26/85	Revise Hypothesis #7 and add step 12 to the action plan.	J. Long	E K Byer	

TITLE: Auxiliary Feedwater System Valve Problem Analysis (AF 599 & AF 608)

REPORT BY: James W. Long PLAN NO.: 12

DATE PREPARED: June 16, 1985

This report has been prepared in accordance with the "Guidelines to follow when troubleshooting or performing investigative actions into the root cause surrounding the June 9, 1985, reactor trip", Rev. 2.

INTRODUCTION

The following report is the analysis and evaluation to support the action plan for determining the root cause for the failure of AF 599 and AF 608 (AFW to SG isolation valves) to open during the June 9, 1985 reactor trip.

SUMMARY OF DATA

AF 599 and AF 608 are normally locked open valves and were open prior to the transient. During the transient, both valves went shut automatically because of the improper initiation of SFRCS. After the SFRCS was reset, both valves failed to open automatically. Operators were then sent to open the valves manually. According to the operator, the valves were placed in manual and the handwheel turned in the open direction. The handwheel was hard to turn and was only moved 1/2 turn in the open direction. The handwheel was then turned in the close direction 1/2 turn to try and get a hammerblow in the open direction. This was repeated a second time, and when turned in the close direction the second time a rattling noise came from the operator and the valves were opened electrically. This rattling noise was probably the tripper fingers being kicked out by the motor and is to be expected.

The actual differential pressure (DP) seen by these valves at the time they were attempting to open is unknown but they are designed to open against a 1050 PSID. At 1515 on 6/9/85, both valves were cycled satisfactorily within their required stroke time. At that time S/G pressure was 850 PSIG.

A review of maintenance and surveillance testing history shows that the torque switch settings were changed in March 1984 per FCR 84-0039 as a result of the Limitorque motor operated valves study and both valves were satisfactorily tested per ST5064.01 (CTMT Isolation Valve Post Maintenance Testing). During the 1984 Refueling Outage, the motors and magnetic brakes were replaced on both valves per FCR 83-0067. The brakes were replaced as part of the environmental qualification of safety related electrical equipment program (10CFR50-49 Rule Requirements). In addition, AF 599 was disassembled, 3 bearings replaced, relubricated, and reassembled. During the testing of AF 599 following this maintenance, a loose spacer was found in the spring pack. This was corrected and both valves were tested satisfactorily. The only normal testing for these valves is a stroke time per ST 5071.02 (AFW System 18 month refueling test), which was performed on 12/31/84, with satisfactory results. The brakes were replaced during the outage as noted above.

CHANGE ANALYSIS

The only changes identified from the testing performed on 12/31/84 and the 6/9/85 reactor trip is the plant condition when the valves were cycled. On 12/31/84, the plant was in Mode 5, therefore, the plant was cold and at low pressure so the valves did not see a high DP across them. During the 6/9/85 reactor trip, the plant was in Mode 1, therefore, at normal operating temperature and pressure. Because of their location in the Mechanical Penetration Rooms, they would probably have been close to the ambient temperature of the rooms. However, they would have seen full S/G pressure when shutting. If the upstream check valve leaked, any pressure trapped between the check valve and AF 599 (AF 608) would have bled off. This would have caused a high DP across the valves when attempting to open.

HYPOTHESES

Based on the information collected before, during and after the transient, it appears that both valves torqued out when opening. The following is a list of the hypothesis that could cause a valve to torque out. The Action Plan Item that will prove or disprove each hypothesis is listed.

1. Improperly adjusted torque switch bypass contact (this hypothesis covered by Action Items 3 and 5).

2. Improper torque switch setting (this hypothesis covered by Action Item 2).

3. Wrong or improperly adjusted spring pack (this hypothesis covered by Action Item 7).

4. Failure of motor brake to release when energized or engage when deenergized (this hypothesis covered by Action Items 3 and 4).

5. Improper torque switch setting calculations (this hypothesis covered by Action Items 8-11).

6. Improper torque switch installation (this hypothesis covered by Action Item 6).

2 7. High DP across valve (this hypothesis covered by Action Item 12).

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6/26/85	M. Bajestani

TITLE

AFW SYSTEM VALVE PROBLEM ANALYSIS (AF 599 and 608)

SPECIFIC OBJECTIVE

To Determine the Root Cause of Motor Operated Valve AF 599 and 608 Failure to Open

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
	ALL STEPS OF THIS ACTION PLAN ARE TO BE PERFORMED IN ACCORDANCE WITH THE LATEST REVISION OF "GUIDELINES TO FOLLOW WHEN TROUBLE-SHOOTING OR PERFORMING INVESTIGATIVE ACTIONS INTO THE ROOT CAUSES SURROUNDING THE JUNE 9, 1985 REACTOR TRIP".					
1	Before beginning troubleshooting work, document the as-found condition of the valves (limit to those conditions which can be recorded without changing conditions - i.e., valve position, general condition, environmental conditions).	J. Long				
2	The torque switch settings were changed for MV 599 and 608 under FCR 84-039 (1.5 open and 1.0 closed). These settings should be verified.	J. Long				
3	The stem thrust load should be measured to verify the thrust calculation. MOVATS (Motor Operated Valve Analysis & Test System) should be used to measure valve stem thrust, time of control switch actuation, and dynamic motor current).	J. Long				

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6/26/85	M. Bajestani

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AFW SYSTEM VALVE PROBLEM ANALYSIS (AF 599 and 608)

SPECIFIC OBJECTIVE

To Determine the Root Cause of Motor Operated Valve AF 599 and 608 Failure to Open

TEP MBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETED
4	MV 599 and 608 are fast speed operators. A magnetic brake is provided to oppose the motor inertia after the power is removed from the motor. The brake and motors were replaced last refueling outage. These brakes should be checked for proper operation.	J. Long				
5	Verify number of turns on the handwheel of the valve from fully closed position, the limit switch contact 33/AC bypass; the torque switch contact 33/TO.	J. Long				
6	With valve in midposition (spring pack relaxed) verify that the torque switch is not preloaded.	J. Long				
NOTE	STEP 12 should be performed before STEP 7.					
7	Verify by visual inspection the spring pack model number. If the heavy spring number 60-600-0068-1 is used - no problem. However, if light spring number 60-600-0062-1 is used, the torque switch should prevent valve opening.	J. Long				
*8	Motor horse power calculations should be performed in order to determine if the motor is capable of providing enough torque.	J. Long				

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6/26/85	M. Bajesta

TITLE

AFW SYSTEM VALVE PROBLEM ANALYSIS (AF 599 and 608)

SPECIFIC OBJECTIVE

To Determine the Root Cause of Motor Operated Valve AF 599 and 608 Failure to Open

STEP NUMBER	ACTION STEPS	PRIME RESPONSIBILITY	ASSIGNED TO	START DATE	TARGET DATE	DATE COMPLETE
*9	Actuator size should be checked to determine if it is capable of operating against a 1050 psi differential pressure.	J. Long				
*10	Tortional stem stress and tensile stress should be checked to verify that these stresses do not exceed the ASME design allowable values.	J. Long				
*11	Torque dial settings should be established by opening and closing positions based on the extreme stem operation loads expected during the hot and pressurized condition.	J. Long				
12	Test operate the valves individually with up to a 1050 PSIG pressure differential across the seat.	J. Long				
	* Steps 8-11 are not dependent on Steps 1-7 and can be performed in any order					

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