PDR 81

# INFORMATION ONLY

ACTION PLAN # 27

TITLE: AUXILIARY FEED PUMP TURBINE MAIN STEAM INLET ISOLATION VALVE (MS-106) PROBLEM ANALYSIS

| REV | DATE | REASON FOR REVISION | BY | CHAIRMAN TASK FORCE | APPR. FOR IMPL. |
|---|---|---|---|---|---|
| 0 | 6/25/85 | Initial Issue | See Rev. 0 | for approvals | |
| 1 | 7/3/85 | Revised Report Text and Added Action Plan Steps | | | |
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Title: Auxiliary Feed Pump Turbine Main Steam Inlet Isolation Valve (MS-106) Problem Analysis

Report by: Neal L. Bonner Plan No. 27

Date prepared: June 26, 1985 Page 1 of 3

This report has been prepared in accordance with the "Guidelines to Follow When Troubleshooting or Performing Investigative Actions into the Root Causes Surrounding the June 9, 1985 Reactor Trip," Rev. 4.

## INTRODUCTION

This report is intended to analyze known information concerning the apparent interruption of the open control circuit to Auxiliary Feed Pump Turbine 1-1 Main Steam Inlet Isolation Valve (MS-106). During the event, MS-106 apparently cycled in about one third of the expected stroke time. It will be the intent of this report to support the action plan for determining the root cause of the anomalous operation of MS-106.

## SUMMARY OF DATA

Valve MS-106 is a normally closed valve and was closed prior to the transient.

Early into the transient steam generator levels decreased to the Steam Feedwater Rupture Control System (SFRCS) low level trip setpoint. From this SFRCS steam generator low level trip the open circuitry to MS-106 received an initiation. Activation of the SFRCS trip and indication of MS-106 opening is indicated by the alarm printout respectively. Approximately two seconds after MS-106 showed position change, the operator action of manually tripping the SFRCS on main steam line low pressure occurred and is also recorded on the alarm printout. From the initial activation of SFRCS, MS-106 should have gone open to the full open position. The operator initiation of SFRCS should have given MS-106 a close circuit permissive. Once MS-106 had reached full open, its close circuitry would have been completed via one of its own limit switch contacts. MS-106 would then have started in the close direction. MS-106 was indicated closed by the alarm printout approximately 19 seconds after the original SFRCS steam generator level signal to the alarm printout was received.

## MAINTENANCE AND SURVEILLANCE/TESTING HISTORY

Based upon a review of data from ST 5071.01 it was determined that MS-106 normal stroke time from closed to open is approximately 25 seconds. Likewise, the open to close cycle occurs in approximately 25 seconds.

In a review of past maintenance data both on Davis-Besse Maintenance Management System (DBMMS) and from Records Management the most recent Maintenance Work Orders (MWO) were 2-82-0119-00 and 1-82-2787-00. Both of these MWOs were completed in 1983.

Based on the review of the above mentioned MWO's and that of recent ST 5071.01 data (5-23-85), there is no information which would indicate that MS-106 should perform other than as designed.

CHANGE ANALYSIS

The operation of MS-106, in the manner observed during the transient, apparently went from closed to open to closed position in approximately 19 seconds. The most recent test data from ST 5071.01, which was reviewed, indicates a time of approximately 25 seconds for MS-106 to open and approximtaely 25 seconds to close. A total time of approximately 50 seconds for a close to open to close operation. It is the evident difference between operating times (19 seconds versus 50 seconds) which will be the basis for hypotheses. These hypotheses will be contingent upon one of two assumptions:

1. The valve operator motor for MS-106 significantly increased in speed (rpm).

2. The open control circuit failed in such a manner to preclude MS-106 from going to full open. Thus MS-106 would have stopped in some intermediate position and then returned closed. This would decrease the overall time for close to open to close operation.

HYPOTHESES

The information collected and reviewed from before, during and after the transient, indicates that a much shorter ($\sim$1/3 the normal time or $\sim$19 seconds) time elapsed for the close to open to close cycle of MS-106. The following is a list of the hypotheses which could cause MS-106 to act in this manner. These hypotheses were reviewed and discussed for plausability with F. R. Miller, Nuclear Systems and Analysis Engineer, and S. C. Jain, Davis-Besse staff Senior Nuclear Engineer.

1. An open in the field circuit to the compound wound dc motor driving the operator of MS-106.

2. An open or misoperation in the 42a/0 contact seal in circuit.

3. Improper operation of MS-106 valve operator open and close circuitry due to possible wiring errors of SFRCS contacts into valve control circuitry.

4. Improper operation of pressure switch PSL 4930A and/or its auxiliary relay PSL 4930X1 which provides a permissive for both the SFRCS open initiation and the 42a/0 seal in contact.

5. Improper operation of either relay R1 or R3 contacts 2-7 or their associated coils. These are auxiliary relays in the main steam line pressure switch logic which provides a permissive to the SFRCS open circuit logic and the 42a/0 open seal-in. This particular hypothesis may be discounted based on the following reasons.

a. The low steam line pressure logic takes 25 seconds to pick up after MS-106 has given the logic a full open permissive. As has been shown previously MS-106 opened and closed in ~19 seconds. Therefore, MS-106 was never open long enough to maintain the permissive to allow the logic time to pick up.

b. MS-106 opened successfully after the improper manual operation of SFRCS was reset and SFRCS returned to its previous trip state. This would not have happened if either R1 or R3 contact 2-7 had failed opened during a previous operation of the logic. This would require a one time only failure of one of the two contacts.

c. Since the pressure switch logic is normally deenergized (with pressure available) there is no reason to believe that the 2-7 contacts of relays R1 and R3 ever changed state to provide for a mode of failure.

d. No alarm was received giving an indication of activation of logic.

6. Improper operation (opening) of the torque switch open, due to improper setting of the torque switch 33/t0.

7. Out of adjustment setting on the open limit switch contact No. 4 (33/b0).

Hypothesis #1 deals with the assumption of the valve motor increasing in speed.

Hypotheses #2-#7 deal with the assumption that MS-106 open circuitry malfunctioned causing the valve to reverse direction at some intermediate position.

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TITLE

AUXILIARY FEED PUMP TURBINE MAIN STEAM INLET ISOLATION (MS-106) PROBLEM ANALYSIS

| DATE PREPARED | PREPARED BY |
|---|---|
| 6/20/85 | N. Bonner |

SPECIFIC OBJECTIVE

To determine the root cause of motor operated valve MS106 to operate in a shorter amount of time, during the transient of June 9, 1985, than the recorded stroke test data.

| 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". | | | | | |
| | NOTE: All steps to be performed in sequence. | | | | | |
| | NOTE: Vendor support from MOVATS is required for steps 13,14&15 | | | | | |
| 1 | Before beginning troubleshooting work at the MCC D1NA starter D135, document the as-found conditions of the starter. In performing this step, it will require that the door to the starter be opened. In performing this step, limit the gathering of the as-found information to that which can be recorded without changing conditions, i.e., general conditions, environmental conditions, etc. | N. Bonner | | | | |
| 2 | Before beginning troubleshooting work at the valve, document the as-found condition of the valve and operator MS106. In performing this step limit the gathering of the as-found information to that which can be recorded without changing condi- | N. Bonner | | | | |

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| | tions, i.e., valve position, general condition, environmental conditions, etc. | | | | | |
| 3 | Remove the cover on MS106 valve operator and inspect the operator limit switches, torque switch and all wiring. Record the torque switch settings. These settings should be 2.5 open and 1.5 close. | N. Bonner | | | | |
| 4 | Perform a wiring check of the valve operator compartment. Verify the wiring with Bechtel drawing E-557A, sheets 77A and 77B. Pay particular attention to possible bad connections. | N. Bonner | | | | |
| 5 | Perform a wiring check at MCC D1NA of starter D135. Verify the wiring using Bechtel drawing E280A, sheets 29 and 29A and the Westinghouse starter internal wiring diagram 6798A39WD-1 (Bechtel vendor drawing #7749-E-8-139-3). Pay particular attention to loose connections or broken wires. | N. Bonner | | | | |
| 6 | Perform bridge resistance readings of the series and shunt field windings. These readings are to be taken (if practical) at the MCC starter D135. | N. Bonner | | | | |

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| 7 | Perform a visual inspection of PSL4930A and document the as-found condition of this pressure switch. In performing this step, limit the gathering of the as-found information to that which can be recorded without changing conditions, i.e. general condition, environmental conditions, or system conditions, etc. | N. Bonner | | | | |
| 8 | Perform a wiring check of PSL4930A. Verify the wiring using Bechtel drawing E632B, sheets 2 and 6. Pay particular attention to bad connections. | N. Bonner | | | | |
| 9 | Perform a calibration check of PSL4930A. | N. Bonner | | | | |
| 10 | Perform a functional check of PSL4930A and its auxiliary relay PSL4930X1. This step will require that starter D135 control circuit power be made available by closing the main disconnect to D135. This step includes, but is not limited to the following: | N. Bonner | | | | |
| | a. Activate PSL4930A by means of an appropriate pressure source. | | | | | |
| | b. Monitor and time contact 4-6 of relay PSL4930X1 upon depressurizing of the source to PSL4930A. This monitoring and | | | | | |

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| | timing of contact 4-6 of relay PSL4930X1 should be done at MCC D1NA starter D135. | | | | | |
| 11 | Perform a visual inspection of cable 1CD135G at control room cabinet C5762A. Note general conditions of terminations without physically disturbing them. | N. Bonner | | | | |
| 12 | Perform a wiring check of cable 1CD135G terminations at control room cabinet C5762A using Bechtel drawing E545 sheet #1. | N. Bonner | | | | |
| 13 | Stroke MS106 and monitor the operation of the valve/operator using Motor Operated Valve Analysis and Test System (MOVATS) and any additional instruments as necessary. During the operation of the valve MS106 the following should be done: | N. Bonner | | | | |
| | a. Set up the control circuit (i.e. jumpers/lifted wires for permissives and initiation) to cause the valve to cycle open and then shut, via initiation from the SFRCS cabinet C5762A. | | | | | |
| | Initiate the open of MS106 via a momentary jumpering of the output contact from SFRCS to the valve open circuitry. | | | | | |
| | Approximately 2 seconds later jumper out the output from | | | | | |

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| | | SFRCS to the valve close circuitry to provide a main- | | | | | |
| | | tained close contact permissive to close MS-106. | | | | | |
| 1 | | b. Record time required for the closed to open to closed | | | | | |
| | | operation of MS106. | | | | | |
| | | c. Observe operation of the limit switches and torque switches. | | | | | |
| | | (See NOTE on page 1) | | | | | |
| 1 | 14 | Stroke MS106 open and monitor the operation of the valve using | N. Bonner | | | | |
| | | MOVATS. (See NOTE on page 1) | | | | | |
| 1 | 15 | Stroke MS106 close and monitor the operation of the valve using | N. Bonner | | | | |
| | | MOVATS. (See NOTE on page 1) | | | | | |
| 1 | 16 | Manually operate the valve MS106 from close to open counting | N. Bonner | | | | |
| | | the number of turns to each of the following: | | | | | |
| | | a. Torque switch 33/TO bypass contact 33/aC-#5. | | | | | |
| | | b. Limit switch contact 33/bO-#4 contact to drop out open | | | | | |
| | | circuitry. | | | | | |
| | | c. Valve full open. | | | | | |
| 1 | 17 | Open connections to isolate the series field winding, shunt | N. Bonner | | | | |

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| | field winding and shunt field resistor. Measure resistance of each of these components. This may be done at the starter D135. | | | | | |
| 1 18 | If the above steps do not produce a root cause, additional valve exercising and testing may be conducted with the system pressurized. | | | | | |