DMB

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September 28, 1988
NRC-88-0235

Mr. A. B. Davis
U. S. Nuclear Regulatory Commission
Region III
799 Roosevelt Rd., Bldg. 4
Glen Ellyn, IL 60137

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) Detroit Edison Letter, NRC-88-0228,
Sylvia to Davis, dated August 29, 1988

3) NRC Letter, CAL-RIII-88-024,
Davis to Sylvia, dated August 30, 1988

4) Detroit Edison Letter, NRC-88-0230,
Sylvia to Davis, dated September 3, 1988

5) Licensee Event Report 88-32

Subject: Response to CAL on Reactor Recirculation Pump B Discharge Valve

During startup testing of the Reactor Recirculation System on August 20, 1988 and again on August 28, 1988 the Reactor Recirculation Pump B Discharge Valve B31F031B failed to close when manually signalled from the Control Room. On August 29, 1988, Detroit Edison submitted an action plan (Reference 2) to the NRC, describing the formation of an investigative team and their intended actions. On August 30, the NRC issued a Confirmatory Action Letter (Reference 3) stating their understanding of planned actions. An updated action plan was submitted in Reference 4, outlining short term and long term actions.

This letter constitutes the 30-day response requested in the CAL. The status of actions taken is provided in Enclosure 1. On September 27, 1988, a meeting was held at NRC Region III headquarters between Detroit Edison and NRC representatives on this topic. A copy

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of the viewgraphs used in the Detroit Edison presentation is contained in Enclosure 2.

If you have any questions, please contact Lynne Goodman at (313) 586-4211.

Sincerely,

BRalph Sylvia

Enclosure

cc: Mr. J. Harrison
Mr. R. C. Knop
Mr. H. Miller
Mr. T. R. Quay
Mr. W. G. Rogers
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Washington, D. C. 20555

ACTION PLAN STATUS

BACKGROUND

On August 20, 1988, during Startup Testing of the Reactor Recirculation System, the "B" Reactor Recirculation Pump was tripped. The "B" loop discharge valve, B31-F031B, which was signaled to close from the Control Room, failed to move to the closed position with the plant at operating temperature and pressure, during test conditions with one recirculation pump running. Subsequent troubleshooting found 3 loose terminations on the torque switch. Because 2 of the 3 loose connections were on the "close" torque switch, it was concluded, at the time, that the failure was due to loose torque switch wires. After tightening the wires, the valve was tested under static cold conditions during plant shutdown and operated satisfactorily. On August 28, 1988 plant conditions were established to retest the B31-F031B valve under dynamic conditions similar to those existing on August 20, 1988. The "B" loop discharge valve failed to close. This was the first time since the initial repairs that the subject valve was given a signal to close from the Control Room, while at normal operating temperatures and pressures. Refer to Reference 5 for a more detailed discussion of the previous event.

The updated Action Plan submitted in Reference 4 was developed with short term actions (prior to restart) and long term actions. The plan has been modified to include other discrepancies which have been subsequently identified.

INVESTIGATION

Interviews with the electricians involved in the initial troubleshooting indicate that they had tested the continuity across the loose connections of the closed torque switch and that the flashlight continuity tester had dimmed. This indicated to the electricians that they had found the problem. They were able to tighten the nuts between 1/2 - 1 turn. The loose connections on the torque switch had apparently prevented the valve "CLOSE" contactor from energizing thus preventing the valve from closing (Note: B31-F031B was not stroked tested between the time the reactor was shut down and the loose torque switch terminations tightened on August 21, 1988). To determine if the loose torque switch connections found on B31-F031B was an isolated case or a generic problem, a sample inspection of 14 valves in the plant was performed. The inspection consisted of verifying proper tightness and the presences of

lockwashers on the torque switch connections and the tightness of all other connections at the valve operator. The 14 valves were chosen based on a review of approximately 50 work packages performed on valves during the past year.

The criteria used for choosing the 14 sample valves were as follows:

1. Other valves which are subjected to the same flow dynamics as the B31-F031B (i.e., B31-F031A and B31-F023B)

2. Valves which were subjected to springpack inspection that the B31-F031B was subjected (28 valves fell into this category).

3. Review of the above (item 2) 28 valve work packages to determine if termination verification was performed.

4. Availability of valve for inspection.

5. A review of other high speed valves similar in operation to B31-F031B.

Based on inspections of the 14 valves, it was determined that the loose torque switch connections found on B31-F031B was an isolated case and not a generic problem. Because 2 of the 3 loose connections found on B31-F031B were on the "CLOSE" torque switch, there was convincing evidence to believe, at the time, that the failure to close was due to loose torque switch wires. This was substantiated at the time by stroking of the valve during reactor shutdown after tightening the loose connections.

However, valve B31-F031B failed to close again when tested dynamically on August 28, 1988, when the conditions of startup test STUT.06B.030 were re-established and the valve retested. This failure was the first attempt to close the valve with the Reactor at pressure and Recirculation Pump A operating since the original failure on August 20, 1988.

Valve B31-F031B was tested under normal operating temperature by depressing the close pushbutton from the main control room. The close contactor stayed closed for only approximately one-half second. (Normal valve stroke time is 30 seconds). The close contactor was then manually closed for 2.5 seconds and released. The close contactor immediately reopened. If the valve were operating properly the close contactor would have sealed-in until the valve completed its full stroke at which time the torque or limit switches would open the close contactor stopping the valve. Motor currents were normal during this test. Initial investigation implied that either the limit or

torque switches were improperly set causing the close contactor to open thus stopping the valve prior to completion of its full stroke.

On August 29, 1988, the plant was shutdown and cooled down, and further testing was conducted. Tests were performed on valve B31-F031B and its sister valve, B31-F031A, Reactor Recirculation Pump A Discharge Valve. These tests were conducted under both static and dynamic conditions. Both valves opened and closed normally when their associated control room pushbuttons were depressed. Running motor currents and stroke times were normal except that there was no current increase as valve B31-F031B was closed into its valve seat. Current should have increased as the gate made contact with the valve seat. The valve motor's increasing torque is sensed by the torque switch that subsequently opens the close contactor in the valve's control circuitry stopping the valve's stroke in its closed position.

On August 30, 1988, a visual inspection was conducted of valve B31-F031B. All wires were tight and all contacts appeared satisfactory. It was found that the torque switch was set at 2.00 vs. the manufacturer's recommended setting of 2.75 for the original motor operator. It was subsequently identified that the correct manufacturer's torque switch setpoint is 4.75. The torque switch setpoint should have changed (from 2.75 to 4.75) in 1984 when the motor operator was replaced as a result of environmental qualification concerns. The torque switch was also found to have been preloaded i.e., it was not properly centered resulting in a preloaded condition. Thus, for a given switch setting actuation in the closed direction, it took less displacement of the springpack than in the open direction. It is believed that the valve's torque switch was incorrectly installed following springpack rework during the Spring 1988 outage. Therefore, the B31-F031B valve was prevented from fully closing under normal operating conditions because the torque switch was incorrectly set. The torque switch being installed in a preloaded condition also contributed to the problem. Preloading a torque switch is one of several problems which will result in torque switch unbalance as referred to in INPO Significant Event Report No. 38-87, "Valve Inoperability Due to Unbalanced Limitorque Torque Switches".

Motor Operator Valve Analysis Testing (MOVAT) was then performed on both recirculation discharge valves. Valve B31-F031B testing validated that the generated stem thrust was lower than the specified target thrust and the torque switch was improperly installed. The torque switch was replaced and the torque switch setting was increased to the value specified by Nuclear Engineering (4.75). MOVATS testing was re-performed and the results were determined to be acceptable. Valve B31-F031A testing determined that its torque switch was also incorrectly set.

However, field verification indicated that the torque switch was installed correctly (i.e., not preloaded) for B31-F031A.

ASSESSMENT OF INITIAL ROOT CAUSE ANALYSIS

The root cause analysis for the first B31-F031B stroke failure has been assessed to determine if any improvements to our root cause methodology are necessary.

It is felt that root cause determination of the original event was adequate based on available information. However, reviews of root cause analysis on other problems and interviews with evaluators have indicated the need to improve training for determination of root cause and corrective action to prevent recurrence. This course is being developed.

ROOT CAUSES

The program for specifying and controlling torque switch settings and installation was ineffective in that it allowed the following:

Primary Factor

1. The torque switch setting was not properly adjusted when the Motor Operator was replaced (i.e., the actual torque switch setting was not increased). No controlled data base existed to track minimum, actual and maximum torque switch settings.

Contributing Factors

2. The torque switch was improperly installed resulting in a preloaded condition.

3. Loose terminations on torque switch wiring (August 20, 1988 failure only).

4. Inadequate training of personnel.

5. Ineffective post maintenance test practices.

STATUS OF SHORT TERM ACTIONS (PRIOR TO RESTART)

This program consists of several major activities:

- Engineering validation of minimum and maximum torque switch settings.

- Field inspection and documentation review of a sample population to validate existing data on actual torque switch settings, and to determine if there are any other preloaded torque switches.

- A program to reset all safety-related torque switches when actual was below minimum or above maximum.

- Inspection of limit switch settings on 42 valves.

It is expected that field inspection, Visicorder traces or MOVATs testing will have been performed on 120 of the 176 safety-related motor operated valves at Fermi 2. In addition, documentation was reviewed on 32 valves included in the NRC Bulletin 85-03 MOVATs program.

A. Engineering Validation

An Engineering list of minimum and maximum torque switch settings for all 176 safety-related valves has been generated and validated. The validated list resulted in changes to the previously available requirements for 76 valves, some of which required resetting the actual torque switch as described in Section C.

B. Field Inspection and Documentation Review

Field inspection and documentation review of the below listed categories of MOVs are underway. The inspection includes actual torque switch settings, proper torque switch installation and determination of maximum limiter plate size. MOVATS testing is being performed on selected valves based on the as-found condition.

32 - Torque Switch documentation was reviewed on thirty-two MOVs for which MOVATS testing had been previously performed in Fall 1987 & Spring 1988.

8 - MOVs which had their motor operators replaced in 1984 for environmental qualification concerns were inspected. There are a total of 14, but 6 are included in other categories.

19 - MOVs were inspected as an additional sample to obtain 59 valves for a statistical sample.

59 TOTAL Original Sample (NOTE: 27 required field inspection and testing and 32 required verification by a documentation review.

Based on discrepancies discovered during inspections and review of other design changes which could have impacted torque switch settings or installation, the following were added:

10 - Added all other MOVs which had springpack work performed on them during the Spring 1988 outage not included above. Initial inspections had found other preloaded torque switches, so it was decided to inspect all valves in this group.

4 - Inspection based on questions which developed during review of documentation of 32 valves which had been previously MOVATs tested.

29 - Review of as-found data on torque switch settings showed generally good correlation with previously recorded valves, but differences of up to 1 division found. All valves for which the previously recorded value was less than 1 division above the minimum and which were not already included in the inspection or testing program based on other criteria were added.

These additions resulted in a total of 70 valves requiring field inspection. The field inspection has been completed on 40 valves, as of September 25, 1988.

Including B31F031B, 5 valves were found with the torque switch installed in a preloaded condition. All of these valve operators were previously disassembled to check the springpacks for grease intrusion which required removal and reinstallation of the torque switches. This work was performed by short term non-licensed contractor personnel hired to support the 88-01 Spring Outage. They received some general training but no specific training dealing with Motor Operated Valve maintenance. Since all five of the preloaded torque switches were found in this population, it has been determined that no additional inspections are required for preloaded torque switches.

Although not a part of the original sample, inspections are being performed for preloaded torque switches, actual torque switch settings and limiter plate size (when obtainable) if other work is performed inside the MOV compartment as described below.

C. Adjustments Needed As A Result Of 100% Review of Actual vs. Minimum And Maximum.

Based on review of recorded information on torque switch settings of safety-related valves vs. approved minimum and maximums, 42 valves required adjustment of torque switch settings. As-found torque switch setting information may cause this number to change slightly. Some of these valves were already selected for work based on other criteria. As of September 25, 26 valves either had their torque switch settings changed to match the minimum/maximum setting or were readjusted based on results of MOVATs testing. The remainder of this effort will be completed before restart. The effects of actual torque switch settings on operability are being evaluated.

D. Limit Switches

During the investigation, questions were raised on proper setpoint and tolerances for the limit switches used to provide bypass function for the torque switch to allow unseating of the valve. On many valves, the same limit switch rotor provides both position indication and the torque switch bypass function. There is a conflict between the criteria of setting the limit switch as close as possible to full open (full closed) to provide accurate position indication vs. setting the limit switch towards mid-stroke to ensure valve unseating. Interviews with field personnel indicated that they were setting it as close as possible to the end of travel. It was also clear that the meaning of valve stroke and how setting tolerances should be applied was not consistent. A new definition of mechanical stroke, as the distance between the point of unseating and the backseat was established and tolerances were provided for setting these limit switches (first 2-5% of the mechanical stroke). This change will affect valve stroke time as measured by valve position indication lights. This will be integrated into the surveillance program as applicable.

Engineering reviewed 183 motor operated valves, including all 176 safety-related MOVs, for valve operating mode and safety function. Forty-two valves were selected for limit switch inspection or testing. The remaining 141 valves were eliminated as a concern for the following reasons:

- 14 valves were eliminated because they do not perform an active safety function.

- 94 valves were eliminated because they operate using emergency control modes in which the torque switch is bypassed with a limit switch contact for 95% of the valve stroke in one or both directions.

- 14 valves were eliminated because they are not automatic, their function allows ample time for manual operator control and they are not located in a potentially harsh environment.

- 7 valves were eliminated based on MOVATs testing results. (Note that other valves that were MOVATs tested fall into other categories also.)

- 12 valves were eliminated because their safety function is to open and a torque switch is not utilized in the opening control circuit.

The testing consists of monitoring the valve motor current and limit switch position on a Visicorder or MOVATS trace which provides a plot of these parameters vs. time. As of September 25, 1988, 24 valves have had Visicorder traces taken. Some were outside of the 2-5% tolerance. Twenty-one valves have been accepted, including 7 which required adjustment of the limit switches to meet the 2% minimum requirement.

E. Anamolies

Part of the process for resolving the motor operated valve concerns involved the field adjustment of the torque switch settings. These settings were adjusted to meet dynamic open/closure requirements and where necessary were validated by calculation by the manufacturer of the actuator. During testing following adjustments made due to this activity, several valves encountered stalling. Case by case evaluations are underway to resolve these isolated instances.

When local inspections and rework were performed on a valve operator for any reason during this program, a general inspection was also performed inside the MOV compartment. Some minor isolated deviations, such as a loose screw, were found during these thorough inspections and dispositioned.

F. Maintenance Procedures

Maintenance Procedures used for torque switch installation and settings and limit switch settings have been reviewed by site

personnel, Limitorque and Stone & Webster. Procedures were revised as necessary.

G. Training

Maintenance & QC personnel have been trained, with Limitorque representatives' assistance, in the proper torque switch installation methods and adjustments. Further training has been provided in proper verification of limit switch settings by Maintenance personnel.

H. Industry And Site Documentation Review

Applicable industry and site documentation has been reviewed to identify related experiences. The documents identified are being used to ensure that the long term corrective action addresses all identified problems.

LONG TERM ACTIONS

A Long Term MOV Action Plan is being established. This plan, which will include Actions A-D below, will be developed by November 4, 1988.

A. Validation of Setting For Non-Safety-Related MOV's

Torque switch settings for non-safety related MOVs will be reviewed by Engineering. A determination will be made of which settings require validation. After validation of these settings, the information will be included as controlled information under the existing design control program.

B. Preventive/Corrective Maintenance Program

Preventative/Corrective Maintenance programs will be reviewed with respect to work activities and controls for MOVs. Procedures will be revised as necessary to ensure activities which can affect torque switch or limit switch settings are correct and comply with current configuration control practices.

C. Post Maintenance Testing

The post maintenance testing program is being reviewed and revised as necessary to provide confidence of valve operability after maintenance. Expected completion is January 1, 1989. Increased emphasis is now being placed on performing these tests with dynamic conditions at normal temperature and pressure when

possible and/or performing diagnostic testing (Visicorder or MOVATs).

D. Procedure Review

All applicable procedures will be reviewed to assure that MOVs and their settings will be properly controlled from procurement to installation.

E. Maintenance Training

The ongoing training program for maintenance personnel has been and will continue to be updated to incorporate applicable lessons learned.

F. Contractor Training

Contractors who are normally used during an outage who perform safety-related activities will be task qualified through specific training or work under the close supervision of qualified utility personnel.

COMMITTEE REVIEW

The Nuclear Safety Review Group reviewed and approved the root cause determination and status of corrective actions on September 2, 14 and 23, 1988. The Onsite Safety Review Committee reviewed the root cause determination and corrective actions on September 15, 1988 and will review the status prior to reactor startup.

Enclosure 2
NRC-88-0235

VIEWGRAPHS FROM SEPTEMBER 27, 1988
PRESENTATION AT NRC REGION III HEADQUARTERS

DETROIT EDISON / NRC MEETING

MOTOR OPERATED VALVES

REGION III
September 27, 1988

Introduction..... B. R. Sylvia

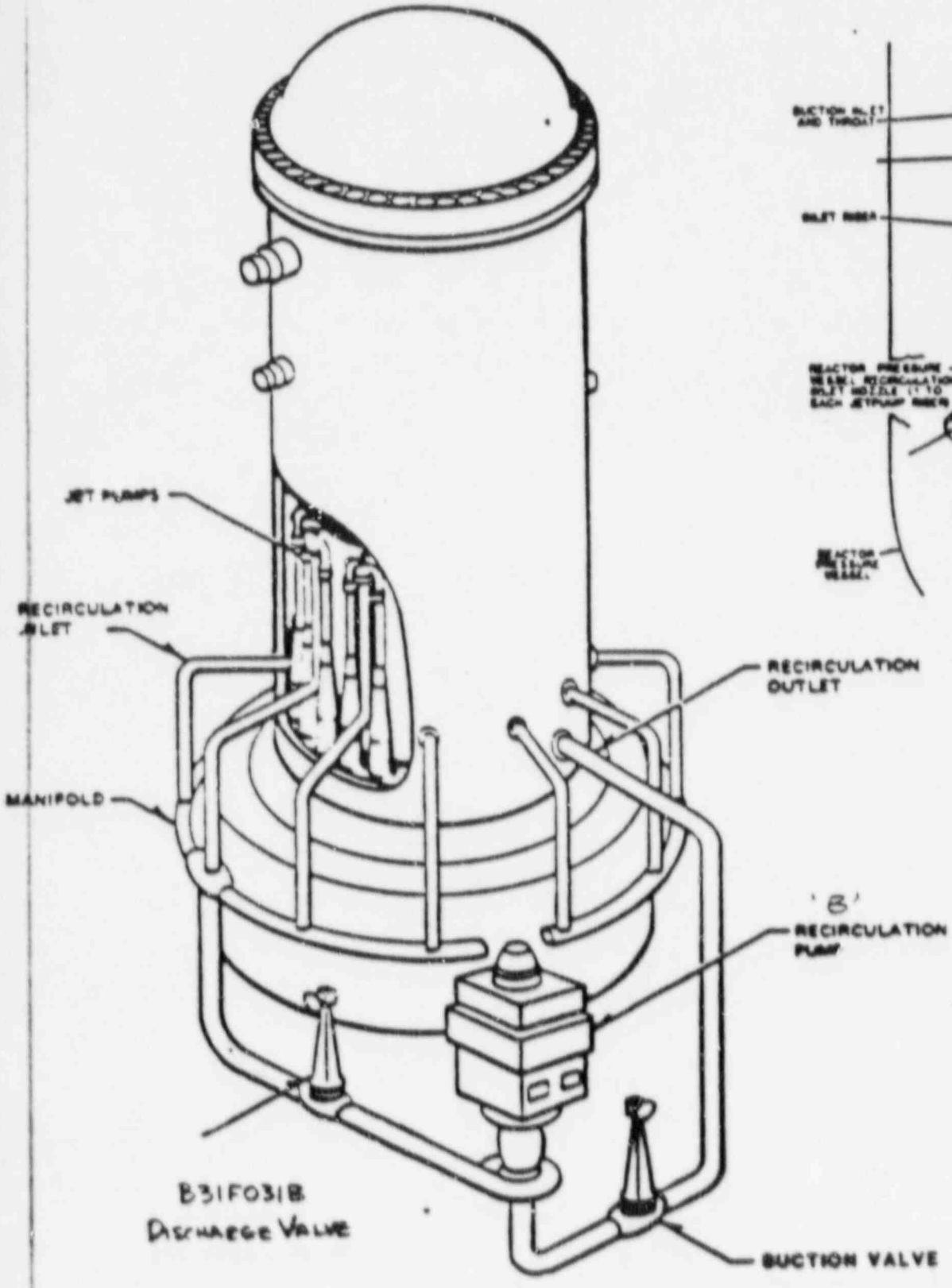
Investigation Team Report..... R. Stafford
- Background/History
- Root Cause
- Short Term Actions
  - Validation of Settings
  - Field Inspection of Torque Switches
  - Reset of Torque Switches
  - Limit Switch Inspection/Adjustment
  - Inspection Results to Date
  - Procedures and Training
  - Industry & Site Documentation Review
- Long Term Actions
  - Review of Non-Safety Related Valves
  - PM/CM Program
  - Post-Maintenance Testing
  - Procedure Review
  - Training
- Assessment of Root Cause Analysis of 8/20 Failure

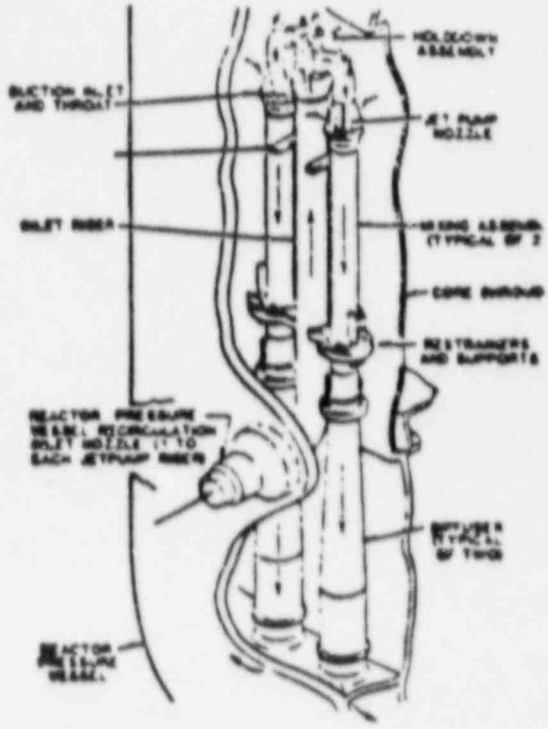
Engineering Activities..... S Catola/L. Fron
- Historical Background
- Validation of Torque Switch Settings
- Limit Switch Testing
- Short Term Program
- Long Term Program

Committee Review
- OSRO..... W Orser
- NSRG..... S Catola

Schedule..... W Orser

Single Loop Flow with Recirc Pump B Shutdown
Attempted to Close B31F031B To Allow
Pump Restart ~ Would not close





DETAIL JET PUMPS

FIGURE 2-4 JET PUMPS AND RECIRCULATION PUMP SYSTEM

2

TESTING

Aug 20, 1988	- Valve will not close at rated temp/pressure (Single loop with backflow)
Aug 21, 1988	- Plant shutdown/cooled down
	- Found 3 loose wires, tightened
	- Valve stroked (cold, no flow)
	- Inspected 14 Other Valves for Loose Wires
	- Restarted
Aug 28, 1988	- Valve will not close at rated temp/pressure (Single loop with backflow)
	- Contactor held in, valve stroked
Aug 29, 1988	- Tested cold (Dynamic conditions)
	- Valve stroked - no current spike when seating
Aug 30, 1988	- Inspected wiring - OK
	- Torque Switch Set at 2.0
	- Torque Switch also Preloaded
	- MOVATS - 3K closed, vs. 31K target
	- Reset torque switch to 4 3/4

Purpose of Testing

Root Cause

The program for specifying and controlling torque switch settings was ineffective which resulted in not properly setting the torque switch.

Contributing factors –

- **Track and control program weak**
- **Preloaded**
- **Loose connections (1st incident)**
- **Training**
- **Post Maintenance Testing**

4

Validation of Torque Switch Settings

- o 176 Safety Related Valves - Done
- o Min - Max Values
- o Controlled data

6

As Found VS. Maintenance Recorded

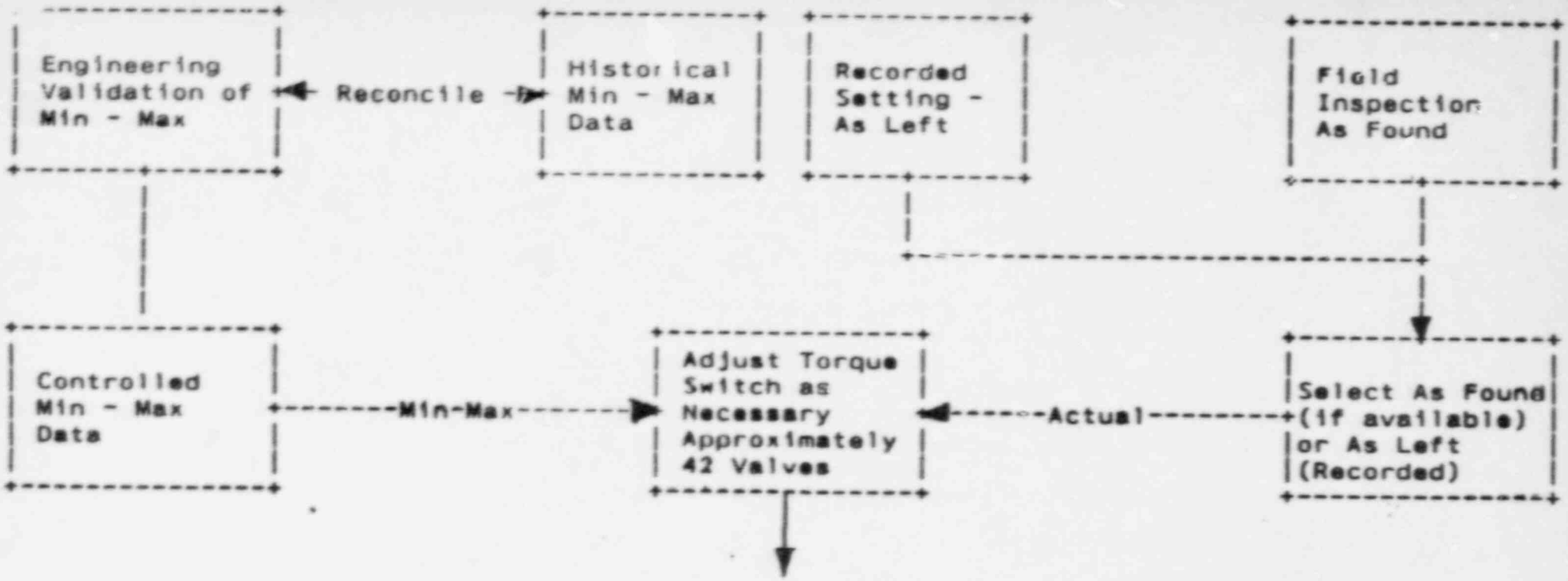
Open and Close Torque Switch Settings

To Date

No Difference	26
± .25	9
± .50	9
± 1.0	2

Notes

1. Above count exclude 28 valves where spring pack work was done



Field Inspection If

a) Operator Replace
b) Sample Population
c) Spring Pack Work
d) MOVATS
e) Recorded Valve Less Than 1 Division Above Minimum
f) Other Work On MOV

8

Valve Torque Switches Reset

26	Increased to date
0	Decreased to date
52	Total Inspected to date
42	Valves will require reset based on recorded VS. Min/Max valves. As found values may cause this number to change slightly.

Inspection Results

1) Preloaded Torque Switches

- o 5 Valves
- o All had Spring Pack Rework
- o Short term contractor personnel

2) Following torque switch reset, motor stalled on 5 MOV's before torque switch opened

- o Case by case review, all resolved

3) Minor hardware problems -

- o documented & corrected

- Procedures

  - Torque switch installation

  - Limit switch setting

  - Determination if Dynamic testing and/or Visicorder traces are required

- Training

  - Torque switch installation

  - Limit switch setting

  - Visicorder

- DER/OER Review

Limit Switch

- Mechanical Stroke - 0-100% point of unseating to backseat

- Limit Switch Setting Tolerance for Torque Switch Bypass is 2-5% of mechanical stroke

- 42 Valves to be Inspected

Status - To Date

24	Inspected
21	Accepted by NE
3	In Review
7	Required Adjustment

12

Long Term Actions

- Review of other valves
- PM/CM program
- Post maintenance testing
- Training
- Procedures

13

ADEQUACY OF ROOT CAUSE DETERMINATION

1st Problem

Problem Identified, Fixed, & Tested

- High Resistance
- Loose Connections
- Nuts Tightened
- Valve Operated @ Cold Conditions
- Inspected 14 Other Valves - OK

14

TORQUE SWITCH FIELD INSPECTIONS & DOCUMENTATION REVIEW

32	MOVAT TESTED VALVES
8	VALVES FROM BOB BAILEY EDP REVIEW
19	VALVES RANDOM SAMPLE
59	VALVES ON ORIGINAL SAMPLE
27	VALVES FIELD INSPECTION FOR TORQUE SWITCH SETTINGS
10	VALVES ADDED TO PERFORM 100% INSPECTION OF SPRING PACK REWORKED VALVES
4	VALVES ADDED FROM PRIOR MOVATS TESTED VALVES AT THE REQUEST OF NRC
41	VALVES TO FIELD INSPECT FOR TORQUE SWITCH SETTINGS
18	VALVES ADDED BY ENGINEERING THRU PDC 9466
5	VALVES ADDED BY ENGINEERING THRU PDC 9466 REVISION
3	VALVES ADDED BY ENGINEERING THRU PDC 9466 REVISION
67	VALVES TO FIELD INSPECT FOR TORQUE SWITCH SETTINGS
36	VALVES ADDED DUE TO DISCREPANCIES IDENTIFIED IN THE VALIDATION OF THE MAINTENANCE FIELD DATA
103	VALVES TO DATE TO FIELD INSPECT FOR TORQUE SWITCH SETTINGS

LIMIT SWITCH BYPASS FIELD INSPECTION

42	VALVES TO PERFORM FIELD INSPECTION
26	VALVES ARE IN COMBINATION WITH TORQUE SWITCH SETTINGS
16	VALVES JUST TO HAVE LIMIT SWITCH BYPASS FIELD INSPECTION

TOTAL NUMBER OF VALVES IN SAMPLE

103	TORQUE SWITCH SETTINGS
16	LIMIT SWITCH BYPASS SETTINGS
28	MOVAT TESTED DOCUMENTATION REVIEW
147	TOTAL VALVES
176	SAFETY RELATED MOV'S

AGENDA

MOTOR OPERATED VALVES (MOVs)

- ENGINEERING INVOLVEMENT - HISTORICAL BACKGROUND
- VALIDATION PROGRAM
- SHORT TERM PROGRAM
- LONG TERM PROGRAM

MOV - HISTORICAL BACKGROUND

- SPECIFICATION OF VALVES AND ACTUATOR
  - MASTER VALVE LIST
- INTERFACE ENGINEERING AND SUPPLIER
- DOCUMENTATION PROCESS
- RECORDS

VALIDATION PROGRAM

TORQUE SWITCHES

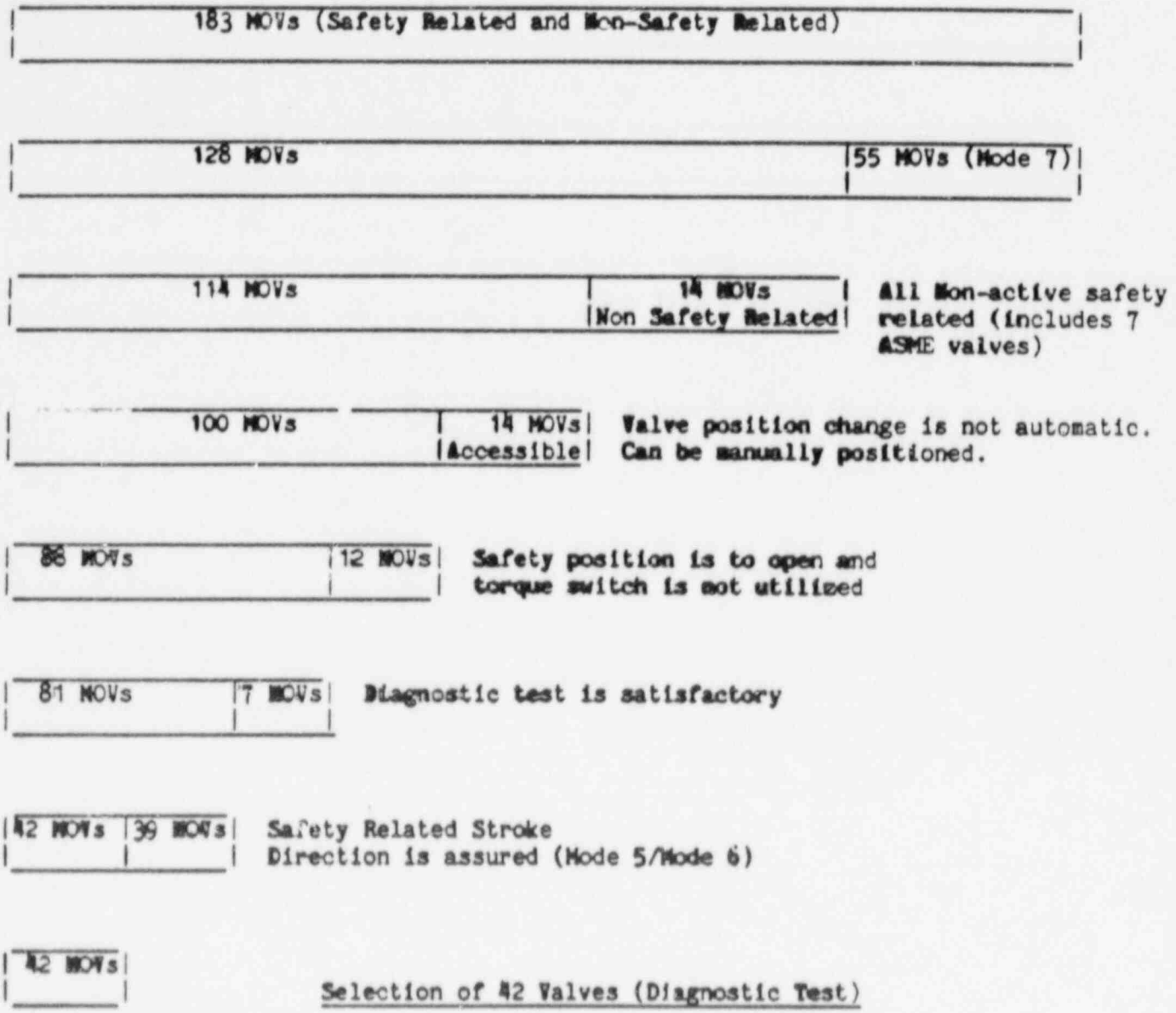
- SCOPE - QA/1 SAFETY RELATED VALVES (176)
- VALIDATION PROCESS
  - MASTER VALVE LIST
  - ENGINEERING MEMORANDUM
  - TEST SHEETS
  - ENGINEERING DESIGN PACKAGE REVIEW
- ENGINEERING LIST (1983) COMPARED TO MAINTENANCE LIST
- DESIGN DOCUMENTS ISSUED SINCE JUNE 1984 REVIEWED
- 76 DEVIATIONS IDENTIFIED AND CORRECTIONS IMPLEMENTED
- 34 VALVES REQUIRED MAINTENANCE LIST REVISION FOR MIN/MAX SETTINGS
  - NO CHANGE TO VALVE ACTUATOR REQUIRED SETTING.
- 42 VALVES REQUIRE SETTING CHANGE OR FIELD VERIFICATION THAT ACTUAL SETTING WITHIN REQUIRED.
- IMPLEMENTATION OF REQUIRED TORQUE SWITCH SETTINGS AFFECTED 1983 ENGINEERING LIST.
  - FIVE DEVIATIONS FOUND IN ADDITION TO CHANGES MADE DURING EQ.
- REVIEW SCOPE EXPANDED TO INCLUDE CHANGE PAPER SINCE PROCESS INITIATED (APPROX. 1980).
- PROCESS IN PROGRESS.

LIMIT SWITCHES

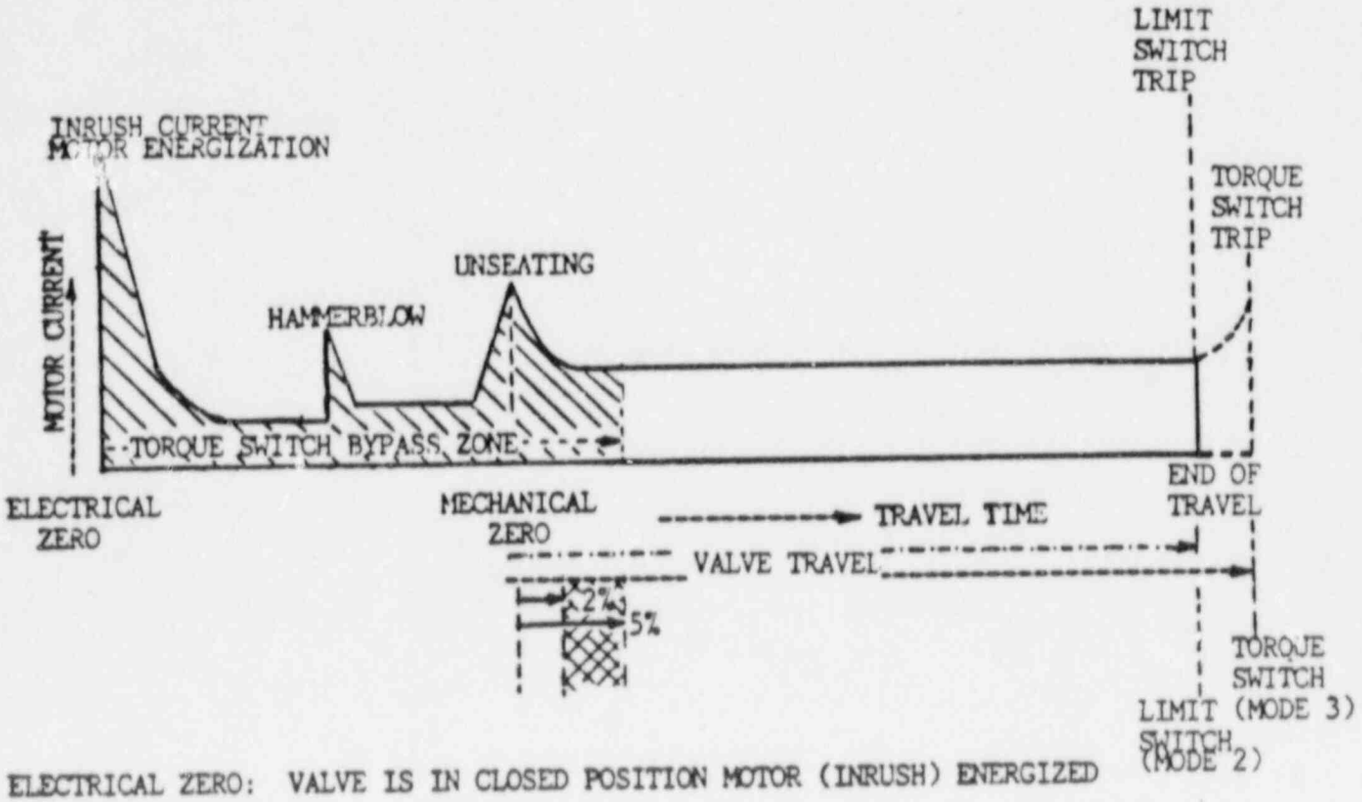
- SCOPE - QA 1 SAFETY-RELATED VALVES (176)
- VERIFY REQUIREMENTS FOR LIMIT SWITCH TO BYPASS TORQUE SWITCH
- SYSTEMS REVIEW

RESULTS OF REVIEW

- FORTY-TWO (42) VALVES REQUIRE FIELD VERIFICATION OF 2% TO 5% BYPASS


183 MOVs (Safety Related and Non-Safety Related)
128 MOVs
55 MOVs (Mode 7)
114 MOVs
14 MOVs
Non Safety Related
All Non-active safety related (includes 7 ASME valves)
100 MOVs
14 MOVs
Accessible
Valve position change is not automatic. Can be manually positioned.
86 MOVs
12 MOVs
Safety position is to open and torque switch is not utilized
81 MOVs
7 MOVs
Diagnostic test is satisfactory
42 MOVs
39 MOVs
Safety Related Stroke Direction is assured (Mode 5/Mode 6)
42 MOVs
Selection of 42 Valves (Diagnostic Test)

VALVE CLOSE-TO-OPEN CYCLE
DIAGRAM



ELECTRICAL ZERO: VALVE IS IN CLOSED POSITION MOTOR (INRUSH) ENERGIZED

HAMMERBLOW: DOGS ON THE WORM WHEEL CONTACT THE DRIVE KEYS IN THE CLUTCH RING WITH CONSIDERABLE IMPACT.

Note: Hammerblow could cause spring-pack deflection and vibrate the torque switch contact open momentarily.

MECHANICAL ZERO: MECHANICAL ZERO IS THE ACTUAL POINT WHERE THE VALVE STEM STARTED MOVING.

NOTE: LOCATION AND ELEVATION OF THE PEAK ON THE "MOTOR CURRENT - TRAVEL TIME" MAY VARY WITH THE CONDITION AND SIZE OF THE VALVE

SHORT TERM PROGRAM

- CONTROL OF TORQUE SWITCH SETTINGS
  - DESIGN DOCUMENT
- CONTROL OF LIMIT SWITCH SETTINGS
  - DESIGN DOCUMENT
- RESULT - CONTROL OF Q1 VALVES IN PLANT

LONG TERM PROGRAM

- MAINTAIN CONTROL OF Q1 VALVES
  - DESIGN DOCUMENT
  - COMPUTERIZED DATA BASE
- ESTABLISH PROGRAM PLAN FOR OTHER MOTOR OPERATED VALVES - NOVEMBER 1988
  - VALIDATE TORQUE SWITCH SETTINGS
  - VERIFY LIMIT SWITCH SETTINGS - BYPASS TORQUE SWITCH AS REQUIRED
  - DESIGN DOCUMENT
  - COMPUTERIZED DATA BASE