

ENCLOSURE 4

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) 1.d
(MOV Performance Indicator Report for Cycle 19)

NET 13-0064

October 21, 2013

To: Greg Kremer
Victor Thomas

From: Mike Brenner

Re: **MOV Testing Program**

The attached 18 Month MOV Performance Indicator Report for Cycle 19 was prepared in accordance with the provisions of EDP-ZZ-01114, Motor Operated Valve Program Guide.

Key Accomplishments:

- All of Callaway's safety-related Motor Operated Valves (MOV) are properly set up and are in good working condition. There are no signs of adverse trends. Nominal operating parameters are documented in Attachment 2.
 - a) All rising stem MOVs with active safety related functions using a torque switch in their closing stroke are setup to exceed the 25% target margin. Having 25% margin allows a 4-cycle/6 year static testing (rather than DP testing) interval for periodic verification of operability.
 - b) All rising stem MOVs with active safety function using a limit switch to open and or close have positive margin.
 - c) All butterfly MOVs have had their torque switches jumpered or removed. These MOVs must have positive margin for opening and closing stroke with an active safety-related function. All butterfly MOVs meet the parameters required to: 1) eliminate the need for periodic differential pressure testing, and 2) utilize the 4 cycle/6 year interval for periodic verification of operability.
- The results of testing performed on rising stem valves during cycle 19 confirms that there is no lubrication degradation of the stem-to-stem nut interface over the 18-month interval between maintenance.



Planned Enhancements

- Continued utilization of the CRANE Easy Torque/Thrust Sensor (ETT). The ETT is a permanently mounted stem strain gauge used for direct measurement of torque and thrust. It is planned to use ETTs on MOV butterfly valves in preparation for testing MOVs at the Motor Control Center (MCC).
- Revise calculation ZZ-536 or create a new calculation to calculate capability and margin for MOVs utilizing EPRI PPM .
- If resources are available, continue work on the development of testing MOVs at their Motor Control Center (MCC).


Michael E. Brenner
MOV Engineer

Attachment 1: 18 Month MOV Performance Indicator Report for Cycle 19
Attachment 2: Database for Cycle 19 with Margins and Limits

cc: file: A160.0446
Greg Kremer
Victor Thomas
Mike Brenner
Darrel Heckel
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Attachment 1

18 Month MOV Performance Indicator Report For Cycle 19

This report provides an overview of the performance and condition of all safety related motor-operated valves (MOV) in the GL 89-10 Program at the Callaway plant and recaps MOV Program activities over Cycle 19 and Refuel 19 (11/25/11 to 5/28/13), in accordance with the provisions of EDP-ZZ-01114, Motor Operated Valve Program Guide.

The 18 Month MOV Performance Indicator Report is broken down into seven main sections:

1. Summary of Diagnostic Testing Performed to Date and a Recap of Testing Performed during the past 18 Months
2. Description of the Current Set-Up of all Safety-Related MOVs
3. Description of Major Work Completed on Safety-Related MOVs
4. Summary of Adverse Condition CARs issued on Safety-Related MOVs
5. Summary of Trends Identified from Test Results
6. Actions to Improve Margin and Reduced Voltage Performance
7. Planned Actions to Enhance the Callaway MOV Program.

Attachment 1

18 Month MOV Performance Indicator Report For Cycle 19

1. Summary of Diagnostic Testing Performed to Date and a Recap of Testing Performed during the Past 18 Months:

There are currently 144 valves in the Motor-Operated Valve (MOV) program. All 144 MOVs have been Baseline tested and 99 have been Differential Pressure (DP) tested.

For Cycle 19, Periodic Verification Tests were performed on 45 MOVs. The MOV component ID and test date are listed below.

MOV Component ID	Description	Test Date
ALHV0007	MDAFP TO S/G B HV	10/18/2012
ALHV0030	ESW TO MD AFP B HV	10/18/2012
ALHV0036	CST TO TD AFP HV	05/18/2013
BBHV0013	RCP A THRM BAR COOL COIL COOL WTR OUT HV	05/05/2013
BBHV0014	RCP B THRM BAR COOL COIL COOL WTR OUT HV	05/05/2013
BBHV0015	RCP C THRM BAR COOL COIL COOL WTR OUT HV	05/05/2013
BBHV0016	RCP D THRM BAR COOL COIL COOL WTR OUT HV	05/05/2013
BBHV8000B	RCS PZR OUT PWR OPER RLF HV	04/27/2013
BBHV8037B	RCS PRT OUT TO CTMT NORM SMP ISO HV	04/20/2013
BBPV8702A	RCS LOOP 1 HOT LEG TO RHR PMPS PCV ISO	05/05/2013
BBPV8702B	RCS LOOP 4 HOT LEG TO RHR PMPS PCV ISO	04/20/2013
BGHV8100	SEAL WTR RTN OUTER CTMT ISO	04/17/2013
BGHV8106	CVCS CHARGING HDR TO REGEN HX OUTER CTMT ISO VLV	04/28/2013
BGHV8110	A CCP DISCH MINIFLOW TO SEAL WTR HX ISO	04/17/2012
BNHV0003	RWST TO CTMT SPRY PMP B HV	03/06/2013

Attachment 1

18 Month MOV Performance Indicator Report
For Cycle 19

ECHV0012	FUEL POOL HX B SHELL SIDE CCW OUT ISO	07/23/2012
EFHV0024	SERV WTR TO ESW TRN B UPSTRM HV	04/02/2013
EFHV0025	SERV WTR TO ESW TRN A DNSTRM HV	01/15/2013
EFHV0039	ESW TRN A TO SERV WTR UPSTRM HV	01/16/2013
EFHV0040	ESW TRN B TO SERV WTR UPSTRM HV	11/20/2012
EFHV0066	ESW UHS COOL TOWER TRN B BYP HAND CTRL VLV	04/24/2013
EFPDV0019	ESW S-C STR A DRN DP CTRL VLV	05/04/2013
EGHV0015	CCW TRN A SPLY/RTN ISO HV	05/06/2013
EGHV0053	CCW TRN A SPLY ISO HV	05/16/2013
EGHV0058	CCW TO RCS CTMT OUTER ISO HV	04/27/2013
EGHV0062	CCW FROM RCS IN CTMT ISO HV	04/17/2013
EGHV0127	CCW TO CTMT BYP ISO HV	04/19/2013
EGHV0133	CCW FROM RCS CTMT EG-HV-0061 BYP ISO HAND CTRL VLV	04/25/2013
EJHV8701A	RHR PUMP A SUCT ISO	05/01/2013
EJHV8701B	RHR PUMP B SUCT ISO	04/16/2013
EJHV8804B	RHR TRN B SI PUMPS SPLY ISO	05/22/2013
EMHV8801B	BORON INJ HDR OUT ISO HAND CTRL VLV B	04/26/2013
EMHV8802A	SI PMP A DISCH TO HOT LEG INJ ISO (3.0.3)	04/30/2013
EMHV8803A	BORON INJ HDR SPLY FROM CCP A ISO	04/26/2013
EMHV8803B	BORON INJ HDR SPLY FROM CCP B ISO	04/26/2013
EMHV8807A	RHR HX A TO SI PMPS SUCT DNSTRM ISO VLV A	05/06/2013
EMHV8821B	SI PMP B DISCH TO COLD LEG INJ ISO	04/19/2019
EMHV8923B	RWST TO SI PMP B SUCT ISO HV	04/19/2019
ENHV0001	CTMT RECIRC SMP TO CTMT SPRY PMP A HV	04/29/2013
ENHV0012	CTMT SPRY PMP B DISCH HV	04/17/2013
EPHV8808D	SI ACC TK C OUT ISO	04/21/2013

Attachment 1

18 Month MOV Performance Indicator Report For Cycle 19

FCHV0312	AFP TURB MECH TRIP/THROT HAND CTRL VLV	05/09/2013
GSHV0021	H2 PURGE OUTER CTMT ISO HV	05/09/2013
KCHV0253	F-PROT LOOP TO RX BLD OUTER CTMT DNSTRM ISO	05/09/2013
LFHV0105	CTMT NORM SMP PMPS DISCH HDR CTMT FV	01/18/2013

Test Descriptions:

- A Periodic Verification Test (PVT) is performed to monitor performance parameter changes from the Baseline Test. PVTs are performed to verify the condition of the MOV and to validate that preventive maintenance between tests is adequate. Periodic Verification Tests are performed every four cycles or four refuels. This testing satisfies commitments in answering Generic Letters (GL) 89-10 and GL 96-05.

A Baseline Test is performed during or immediately after Design Basis Verification DP testing. This testing ensures that the MOV is setup to perform its safety-related functions under design basis conditions. A Calibration/Correlation between traces such as the Torque Thrust Cell (TTC) to the Optical Displacement Measurement Transducer (ODMT) is performed during the Baseline Test.

- Packing Load Tests are utilized as the retest following packing replacements or adjustments. The Packing Load Test is performed to verify that the installed packing load is less than the bounding value used in the Motor-Operated Valve Capability and Margin Calculation.

2. Description of the Current Set-Up of all Safety-Related MOVs:

Attachment 2 provides a synopsis of the current set-up of 89-10 Program MOVs. Callaway's commitment is to maintain a 25% torque/thrust field margin for MOVs using a torque switch to control the closing stroke and a positive field margin for MOVs using a limit switch to control the opening and closing strokes. The commitment on these MOVs is to maintain positive field margin. These commitments apply only to GL 89-10 MOVs with strokes that have a safety-related function to open, close or both.

At the end of Cycle 19:

Attachment 1

18 Month MOV Performance Indicator Report For Cycle 19

- All rising-stem torque-controlled MOVs in the GL 89-10 Program with a safety function to close have a 25% or greater field margin to close and positive field margin to open
- All rising-stem limit-controlled MOVs in the GL 89-10 Program have positive field margin for both the opening and closing strokes.
- All butterfly valve MOVs in the GL 89-10 Program meet the requirements for design basis safety-related operation having positive margin to perform their safety-related functions.

3. Description of Major Work Completed on Safety-Related, GL 89-10 Program MOVs:

Periodic Verification Tests (PVT):

45 Periodic Verification Tests were performed during Cycle 19 as listed above.

Differential Pressure Tests (DPT):

1 Differential Pressure Test was performed on FCHV0312.

Packing Replace or Re-torques:

46 GL 89-10 Program MOVs had packing replaced or re-torqued due to packing leaks.

Motor Pinion Inspections:

One motor pinion inspection was performed.

CAR 200302661 and ADCN 200303845 were resolved in response to OE15680. The issue was improper staking of the key on the motor pinion gear. 129 jobs were initiated to inspect these MOVs during their scheduled Periodic Verification Test. Inspections began in RF13 and have been completed in RF19.

Attachment 1

18 Month MOV Performance Indicator Report For Cycle 19

Overall Gear Ratio (OAR) Verifications:

ADCN 200605957 documents finding an incorrect motor pinion and worm shaft gear set in EFHV0040. This results in a slight change in stroke time and very slight accelerated gear wear. Inspection jobs have been written on all GL 89-10 Program MOVs. 9 inspections were performed during Cycle 19. The EFHV0042 inspection found an incorrect gear set. This was corrected and is documented in CAR 201200073.

Actuator Grease Change Outs:

3 Grease Change Outs or Actuator Rebuilds on GL 89-10 Program valves were performed during Cycle 19. Due to their work duration, these grease change outs were performed during Refuel 19. During previous Tech Spec Outages (TSO) the actuator was swapped out with a rebuilt actuator. This should be considered again.

Service and Inspects:

37 Service and Inspect PMs were performed on GL 89-10 Program MOVs. If properly aligned with Periodic Verification Tests, there should have been 45. This is a scheduling issue.

Magnesium Rotor Motor Inspection or Replacement

The Nuclear Regulatory Commission (NRC) has issued two Information Notices; IN 2006-26 and IN 2008-20 on Limitorque actuator motors with aluminum rotors. 26 GL 89-10 Program MOVs with magnesium rotors were identified. 14 have been replaced with aluminum rotors. There are 17 Non-safety MOVs at Callaway with magnesium rotors. 3 have been inspected and found to have motors with aluminum rotors in pristine condition. All other planned inspections have been put on budgetary hold. Job 13000455 has been written to inspect 4 motors that were replaced. This job is Other Maintenance (OM) and has been rescheduled numerous times. If these motor inspections find no magnesium rotor degradation, all other inspection/replacement jobs will be cancelled.

MOV MCC Test Project

The ability to perform motor operated valve testing from the motor control center in place of at the valve (MCC Test) is on hold. No progress has been made during Cycle 19. The hold is due to budget constraints. The groundwork was to be performed by

Attachment 1

18 Month MOV Performance Indicator Report For Cycle 19

Crane Nuclear. It can be performed by Plant Engineering when resources are available.

MOV Component Health

The MOV program overall health condition is white. This is due to slow resolution of actuator grease change out jobs due to budgetary constraints during refueling outages and the inability to perform grease change outs during TSOs .

4. Summary of Adverse Condition CARs issued on Safety-Related MOVs

The following ADCN CARs were issued during Cycle 19. There were a total of 24 Sig 3 to Sig 6 initiated; 22 are closed and 2 are In Process.

- 201203697: FCHV0312 motor running at approximately twice normal speed
A spare motor from the warehouse had internal damage resulting in it running at twice normal speed. The problem was discovered during a post maintenance test. This is a Sig 3 ADCN CAR.
- 201302358: ESW SW cross connect valve leakage identified during Job 06527624.904.
EFHV0024 was found to have the valve uncoupled from the actuator due to coupler bolts loose. This is being resolved through a new PM or a revision to an existing PM on all applicable MOVs. This is a Sig 3 ADCN CAR.

The following are Sig 4 ADCN CARs:

- 201201088: Update Director with Kalsi Engineering Values for Actuator Limits
- 201206217: MOVs identified with NLGI grade 3 or 4 grease with no on demand job
- 201202867: EMHV8803A discrepancy found on OAR inspection of pinion and worm gear
- 201205940: Errors identified in Calculation ZZ-536 (Rising Stem MOV Capability [These were administrative errors; not calculation errors.]
- 201204258: Discrepancy found on MOV DP testing frequency in EDP-ZZ-01114
- 201208855: ZZ-212 appears to be superseded but is shown as current
- 201305543: GAPS IDENTIFIED IN MOV dip TESTING FREQUENCY IN EDP-ZZ-01114
- Six On-line MOV tests need to be performed by RF-19
- 201302933: Wrong worm shaft gear found installed on EFHV0066 during rebuild

Attachment 1

18 Month MOV Performance Indicator Report For Cycle 19

5. Summary of Trends Identified from Predictive Performance Reports:

There were no adverse trends identified following the diagnostic tests performed during the 18-month, Cycle 19 interval. Continuing favorable trends were confirmed.

- The average measured stem-to-stem nut coefficients of friction for Cycle 19 is 0.084.
- There are no MOVs with a stem/stem nut coefficient of friction greater than the Callaway standard of 0.15. The industry bounding value for the stem/stem nut coefficient of friction is 0.20.

Cycle	Average Coefficient of Friction
19	0.084
18	0.084
15-17	0.085
14	0.090
13	0.091
12	0.094
11	0.092
10	0.094
9	0.095
8	0.100
7	0.104

6. Actions to Improve Margin and Reduced Voltage Performance:

Modification MP 01-1003 replaces the Motor Control Center breakers for MOVs. With the new breakers, there is an improvement in the reduced voltage terminal voltage which improves MOV capability and margin.

7. Planned Actions to Enhance the Callaway MOV Program:

Motor Control Center (MCC) based MOV Diagnostic Testing
The MCC based MOV diagnostic test project is stalled due to budgetary constraints. Its primary driving force was the IST Program update in 2014. MOV testing changes due to this update are now not required until 2024. A benefit for using the MCC Methodology is that at-valve testing could be extended to every 9 years vice every 6 years for most GL 89-10 MOVs.