Part 21 (PAR) Event # 47488

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Region: 1		**Docket #:**	
City: LYNCHBURG		**Agreement State:** Yes	
County:		**License #:**	
State: VA			
NRC Notified by: JEFF McCONKEY		**Notifications:** WAYNE SCHMIDT	R1DO
HQ Ops Officer: BILL HUFFMAN		BINOY DESAI	R2DO
Emergency Class: NON EMERGENCY		KENNETH RIEMER	R3DO
10 CFR Section:		THOMAS FARNHOLTZ	R4DO
21.21 UNSPECIFIED PARAGRAPH		PT 21 GRP (E-MAIL)	

PART 21 NOTIFICATION ON LIMITORQUE SMB-5T ACTUATOR CLUTCH LUG FAILURE

The following is a summary of information was received from Limitorque via facsimile:

"On August 2, 2011, Flowserve-Limitorque was notified by Browns Ferry Nuclear (BFN) Generating Station that a Limitorque SMB-5T valve actuator (1-MVOP-074-052) had failed to run open automatically during the performance of a stroke test. Electrical maintenance personnel working at the valve reported an abnormal mechanical noise. Upon disassembly, it was found that the driving lugs on both the sliding clutch gear and the flexible clutch were seriously worn with a significant amount of deformation. Further investigation by BFN showed that the declutch mechanism would not allow full engagement of the drive lugs on the sliding clutch and flexible clutch. These lugs must be engaged for motor operation to take place. The declutch mechanism required adjustment to allow full drive lug engagement.

"Following reassembly of the SMB-5T on 1-MVOP-074-052, an inspection was performed of the SMB-5T on valve 1-MVOP-074-066 which was manufactured and supplied to TVA at the same time. This actuator was functioning normally at the time of the inspection. Disassembly of the clutch compartment revealed evidence of deformation of the clutch drive lugs. To better evaluate the operation of the clutch components, the grease was cleaned out of the compartment and a boroscope used so that the action of the clutch could be seen. Boroscope examination of several declutching and re-clutching tests showed that the clutch lugs would not engage fully. The major contributing factor in this issue was found to be the external declutch lever stop screw adjustment. Adjustment of the lever stop screw significantly improved the lug engagement. Subsequently, BFN personnel inspected four additional SMB-5T actuators. The declutch components were found to be adjusted correctly and no indications of abnormal clutch lug wear were found.

"The potential for this issue is limited to SMB-5 and SMB-5T actuators only. Other sizes of SMB/SB/SBD actuators

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are not affected. This issue, when it occurs can affect the safety related function of the actuator by preventing proper motorized operation. Indications of the issue can include failure to complete valve stroke, failure to remain in motorized operation, intermittent motorized operation resulting in longer than expected stroke time, and/or abnormal noise in the clutch compartment.

"Limitorque performed an investigation per the guidelines of 10 CFR Part 21. The failure of 1-MVOP-074-052 to operate was due to damage to the drive lug interface between the sliding clutch and the flexible clutch which resulted in the actuator disengaging from electric motor operation in mid-stroke of the valve. This lug damage occurred over time during normal operation of the actuator and is directly attributable to an assembly set-up error resulting in partial lug engagement. The actuators which were investigated at BFN Unit 1 were of relatively recent manufacture, having been shipped from the Limitorque factory in 2004. Limitorque's review of existing SMB-5/5T assembly procedures followed by interviews with assembly personnel led to the conclusion that the root cause of this event was that the Limitorque factory assembly procedure documents for the SMB-5/5T lack adequate detail to ensure reliable long term functionality of the clutching mechanism.

"Limitorque's review of previous industry operating experience did not show any history of problems related to drive lug engagement and/or declutch components in SMB-5/5T actuators. However to address the potential issue of insufficient drive lug engagement, Limitorque will issue a Maintenance Update to the MOV Users Group for distribution to the utilities (on or before January 15, 2012) containing recommendations for site inspection of the SMB-5/5T clutch mechanism as well as detailed instructions for set-up, adjustment and verification of proper clutch operation. As part of our internal corrective action, Limitorque will develop enhanced assembly and service procedures for the SMB-5/5T to include sufficient detail to ensure the proper set-up and function of the clutching mechanism. Limitorque assembly, field service, and QC personnel will be trained in the enhanced procedures."

Technical contacts:
John Thilking 434-522-9862
Jeff McConkey 434-845-9738

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Flowserve

To:	NRC Operations Center	**Fax: (301) 816-5151**	
From:	Jeff McConkey	**Date:**	11/29/2011
Re:		**Pages:**	3

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Notes: Subject: Limitorque Part 21Notification SMB-5T Actuator Clutch Lug Failure

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Flow Control Division
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November 23, 2011

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

To: NRC Operations Center, Fax # 301-816-5151
Attn: Document Control Desk

Subject: Limitorque Part 21 Notification
SMB-5T Actuator Clutch Lug Failure

References: Browns Ferry Unit 1, OE34247
Limitorque Internal Part 21 File # 72

This report relates to a Limitorque SMB-5T valve actuator (1-MVOP-074-052) which failed to operate during surveillance testing at Browns Ferry Nuclear (BFN) Generating Station. This actuator was supplied to TVA under Limitorque Order Number 33365.010.

Background

On August 2, 2011, Flowserve-Limitorque was notified by BFN that a Limitorque SMB-5T valve actuator had failed to run open automatically during the performance of a stroke test. Electrical maintenance personnel working at the valve reported an abnormal mechanical noise. Upon disassembly, it was found that the driving lugs on both the sliding clutch gear and the flexible clutch were seriously worn with a significant amount of deformation. Further investigation by BFN showed that the declutch mechanism would not allow full engagement of the drive lugs on the sliding clutch and flexible clutch. These lugs must be engaged for motor operation to take place. The declutch mechanism required adjustment to allow full drive lug engagement.

Following reassembly of the SMB-5T on 1-MVOP-074-052, an inspection was performed of the SMB-5T on valve 1-MVOP-074-066 which was manufactured and supplied to TVA at the same time. This actuator was functioning normally at the time of the inspection. Disassembly of the clutch compartment revealed evidence of deformation of the clutch drive lugs. To better evaluate the operation of the clutch components, the grease was cleaned out of the compartment and a boroscope used so that the action of the clutch could be seen. Boroscope examination of several declutching and re-clutching tests showed that the clutch lugs would not engage fully. The major contributing factor in this issue was found to be the external declutch lever stop screw adjustment. Adjustment of the lever stop screw significantly improved the lug engagement. Subsequently, BFN personnel inspected four additional SMB-5T actuators. The declutch components were found to be adjusted correctly and no indications of abnormal clutch lug wear were found.

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Identification of the affected components:

The potential for this issue is limited to SMB-5 and SMB-5T actuators only. Other sizes of SMB/SB/SBD actuators are not affected. This issue, when it occurs can affect the safety related function of the actuator by preventing proper motorized operation. Indications of the issue can include failure to complete valve stroke, failure to remain in motorized operation, intermittent motorized operation resulting in longer than expected stroke time, and/or abnormal noise in the clutch compartment.

Root Cause and Corrective Action

Limitorque performed an investigation per the guidelines of 10 CFR Part 21. The failure of 1-MVOP-074-052 to operate was due to damage to the drive lug interface between the sliding clutch and the flexible clutch which resulted in the actuator disengaging from electric motor operation in mid-stroke of the valve. This lug damage occurred over time during normal operation of the actuator and is directly attributable to an assembly set-up error resulting in partial lug engagement. The actuators which were investigated at BFN Unit 1 were of relatively recent manufacture, having been shipped from the Limitorque factory in 2004. Limitorque's review of existing SMB-5/5T assembly procedures followed by interviews with assembly personnel led to the conclusion that the root cause of this event was that the Limitorque factory assembly procedure documents for the SMB-5/5T lack adequate detail to ensure reliable long term functionality of the clutching mechanism.

Limitorque's review of previous industry OE (supplied by BFN) did not show any history of problems related to drive lug engagement and/or declutch components in SMB-5/5T actuators. However to address the potential issue of insufficient drive lug engagement, Limitorque will issue a Maintenance Update to the MOV Users Group for distribution to the utilities (on or before January 15, 2012) containing recommendations for site inspection of the SMB-5/5T clutch mechanism as well as detailed instructions for set-up, adjustment and verification of proper clutch operation. As part of our internal corrective action, Limitorque will develop enhanced assembly and service procedures for the SMB-5/5T to include sufficient detail to ensure the proper set-up and function of the clutching mechanism. Limitorque assembly, field service, and QC personnel will be trained in the enhanced procedures.

The technical contact at Flowserve -Limitorque for this issue is John Thilking, (jthilking@flowserve.com).

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