

MOTOR-OPERATED VALVES

Computer-Based Training Module



ABSTRACT

This CBT is a detailed, comprehensive, generic overview of the design attributes, maintenance and testing protocols, and historical regulatory issues related to motor-operated valves (MOVs). To provide a solid introduction to MOV technical and regulatory issues, both general valve issues and motor-actuator items are covered. MOV diagnostic testing and refurbishment are also addressed in this module. The module relies on input from various EPRI reports and Limatorque technical documents, regarding the SMB/SB actuator design, along with a thorough coverage of the applicable NRC documents that address MOV issues. There are no prerequisite CBTs that need to be completed prior to taking this CBT.



INTENDED AUDIENCE

Experienced site engineering SMEs in development, who require an in-depth understanding of motor-operated valves



DURATION

- 3.75 hours
- An additional 8-10 hours for reading materials provided within the CBT

TERMINAL LEARNING OBJECTIVES

1. Recognize the valve and motor-actuator types, with emphasis on the most common types found in nuclear power plants.
2. Identify valve and actuator subcomponents and their functions for the electrical, mechanical, and control components.
3. Explain the basic operation of the various valve and actuator designs used in typical MOV service.
4. Demonstrate awareness of the chronological history of nuclear industry regulatory requirements associated with MOVs and the operating experiences that were the initial drivers.
5. Identify applicable codes, standards, and industry design guidance applicable to MOVs.
6. Identify applicable industry users' groups and their charters that are associated with MOVs.
7. Identify the principles, technical parameters, and techniques used in selecting and sizing appropriate actuators.
8. Describe typical MOV electrical issues (circuitry, alternating vs. direct current motors, degraded voltage, etc.).
9. Identify the requirements for stress calculations including weak-link analysis, seismic analysis, and actuator capability calculations.
10. Identify Environmental Qualification (EQ) requirements per 10 CFR 50.49 and applicable vendor requirements and their impact on valve components and lubricants.
11. Identify industry accepted preventive/predictive maintenance regimens and frequencies, including the underlying bases of the MOV maintenance program at nuclear power plants.
12. Diagnose the cause of the issue that requires troubleshooting by using some examples of MOV operational problems or issues.
13. Explain the different methods for measuring the operational performance of MOVs through diagnostic testing.
14. Identify points required to meet the MOV acceptance criteria by using typical diagnostic traces.
15. Explain any observed degradations or anomalies from a typical diagnostic trace or series of traces.
16. Recall industry operating experience with respect to MOV failures and the resulting corrective actions put in place to prevent recurrence.
17. Explain the need for valve/actuator replacement.
18. Identify common MOV modifications required for the plant MOV program.
19. Explain the requirements for post-modification testing of the valve/actuator combination after refurbishment or replacement.

KEY INDUSTRY DOCUMENTS

Publicly Available Documents

1. EPRI Report TR-105852, "Valve Application, Maintenance, and Repair Guide (Volume 1)"
2. EPRI Report 3002008045, "NMAC: Application Guide for Motor-Operated Valves – Revision 3 [Volume 1 - Rising Stem Valves]"
3. EPRI Report TR-106563-V1, "Application Guide for Motor-Operated Valves in Nuclear Power Plants (Volume 1, Revision 1: Gate & Globe Valves)"
4. NRC IE Bulletin 85-03 "Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings"
5. NRC Generic Letter 89-10 "Safety-Related (1) Motor-Operated Valve Testing and Surveillance Results of the Public Workshops"
6. NRC IN 96-48 "Motor-Operated Valve Performance Issues"
7. NRC GL 96-05 "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves"
8. NRC Regulatory Guide 1.192 "Operation and Maintenance Code Case Acceptability, ASME OM Code"
9. Limitorque Technical Update 98-01
10. Commonwealth Edison White Paper 125
11. NRC Regulatory Guide 1.106, Revision 1
12. EPRI Report 3002012918, "Using Motor-Operated Valve (MOV) Static Diagnostic Testing to Diagnose Valve Degradation"
13. EPRI NP-6229, "Technical Repair Guidelines for Limitorque Model SMB-000 Valve Actuators"
14. Limitorque Maintenance Update 92-1, Multiple Technical Issues, Involving Different Actuator Subcomponents