INL/CON-11-21863
PREPRINT

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Eleventh NRC/ASME Symposium on Valves, Pumps, & Inservice Testing for Operating & New Reactors

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August 2011

The INL is a
U.S. Department of Energy
National Laboratory
operated by
Battelle Energy Alliance

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OM Code Requirements for MOVs – OMN-1 and Appendix III

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Abstract

The purpose or scope of the American Society of Mechanical Engineers (ASME) Code for Operations and Maintenance of Nuclear Power Plants (OM Code) is to establish the requirements for pre-service and in-service testing of nuclear power plant components to assess their operational readiness. For Motor-operated valves (MOVs) this includes those that perform a specific function in shutting down a reactor to the safe shutdown condition, maintaining the safe shutdown condition, and mitigating the consequences of an accident. This paper will present a brief history of industry and regulatory activities related to MOVs and the development of Code requirements to address weaknesses in earlier versions of the OM Code. The paper will discuss the MOV requirements contained in the 2009 version of ASME OM Code, specifically Mandatory Appendix III and OMN-1, Revision 1.

Introduction

The requirements for pre-service and in-service testing of nuclear power plant components to assess their operational readiness, are found in the ASME OM Code. It identifies the components that are subject to test and Owner's responsibilities under the OM Code. The OM Code addresses test methods and intervals, defines the parameters to be measured, and provides criteria for evaluating the results. It also provides requirements for corrective actions. Its jurisdiction covers components that have met the requirements of the construction codes and commences as soon as those requirements have been met. The MOVs covered include those required to perform a specific function in shutting down a reactor to the safe shutdown condition, maintaining the safe shutdown condition, and mitigating the consequences of an accident.

There are several approaches that can be used for component operation, testing, and maintenance. One is to simply operate the component until its performance degrades

to unacceptable levels or it fails and then fix or repair the component. This run-to-failure approach has never been acceptable for safety-related components. Another method is to take a deterministic approach where components are placed in categories based upon design and function. Specific test requirements are defined for each category. Newer operations and maintenance strategies include risk-informed and performance-based testing, where tests and intervals are based on the impact to plant safety and the performance characteristics of the component.

The ASME OM Code was developed in the 1970's and early 1980's, and prior to the development of diagnostic testing. At that time, deterministic based testing and maintenance was considered to be the best available approach. This deterministic approach was implemented in the ASME OM Code, Subsection ISTC, "Inservice Testing of Valves in Light-Water Reactor Nuclear Power Plants." Stroke-time testing was the best the industry had at the time and was considered adequate for assessing MOV operational readiness. ISTC included requirements for position verification, quarterly exercising, stroke-time criteria for the quarterly testing, and leak rate testing (if required).

Industry Experience and Regulatory Actions

In the early 1980's, the nuclear industry began to develop an awareness of problems with MOVs. The United States Nuclear Regulatory Commission (NRC) issued numerous concerns and cautions, and issued a series of documents that resulted in utilities developing MOV programs.

Inspection & Enforcement Bulletin 85-03, Motor-Operated Valve Common Mode Failures During Plant Transients Due to Improper Switch Settings. In response to MOV events the US nuclear utilities were directed to reevaluate the control switch setting on selected safety-related MOVs. The torque switch settings were to be high enough to ensure valve operation at design-basis differential pressure conditions. This introduced the use of MOV diagnostic testing.

Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance. This Generic Letter (GL) expanded the scope of Bulletin 85-03 to all safety-related MOVs and led to utility MOV program development. These programs included:

- Review of design-basis conditions
- Development of switch setting calculations
- Use of static testing to set torque switches
- Performance of dynamic testing to demonstrate MOV operability
- Establishment of methods to maintain proper settings for the life of the plant
- Proper post-maintenance activities

Generic Letter 96-05, Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves. Recommendation "d" of GL 89-10 requested that licensees prepare procedures to ensure that correct MOV switch settings are maintained throughout the life of the plant. GL 96-05 provided more complete guidance regarding

periodic verification of safety-related MOVs and superseded GL 89-10 and its supplements with regard to MOV periodic verification.

A significant concern to the ASME OM committee was the fact that MOVs successfully passed the OM Code requirements, yet required additional testing, analysis, and upgrades to function at design basis. The ASME OM Code requirements for MOVs were inadequate and lagged well behind industry and regulatory activities. NRC expressed their concerns in the September 1999 Federal Register, 10CFR50, Section 2.3.2.5

> *"…since 1989, it has been recognized that the quarterly stroke-time testing requirements for MOVs in the Code are not sufficient to provide assurance of MOV operability under design-basis conditions."*

Development of OMN-1

The ASME OM Subgroup on MOVs (formerly the OM-8 Working Group on MOVs) effort to update the Code requirements for MOV testing began in 1989. The goal was to create consensus-based in-service test requirements that would assess operational readiness and eliminate the need for regulatory-based MOV programs. The new requirements would eventually replace the MOV related requirements in ISTC. The ISTC leakage rate testing would not be affected. In the early 1990's, the Subgroup on MOVs developed new test requirements and selected the ASME Code Case format for initial use. The Code Case format provided the quickest path for producing a consensus document. Code Cases are voluntary alternatives to Code requirements but they allow requirements to use and feedback obtained prior to becoming mandatory Code requirements. Code Case OMN-1, Alternative Rules for Preservice and Inservice Testing of Active Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants, was published with the 1999 Addenda to the OM Code.

OMN-1 is performance based, where testing requirements and frequencies are determined using MOV classification (similar to ISTC), design and capabilities, operational use and environment, and maintenance programs. It provides test requirements for the design basis verification test, preservice test, inservice test, and post-maintenance test. OMN-1 encourages the use of engineering evaluations when determining the testing strategy and frequency for each MOV or for groupings of MOVs. Testing frequency is based on MOV design, capability margin, and what the Owner knows about MOV degradation rates (history). OMN-1 replaces the ISTC requirements for quarterly stroke-time testing, position verification, and provides exercising requirements in lieu of the ISTC requirements. It is also the first ASME Code document to allow risk-informed techniques.

Prior to the approval of OMN-1, utilities had to maintain dual test programs, one to meet the requirements of the ASME Code and one to meet NRC concerns (GL 89-10, GL 96-05). OMN-1 programs satisfy the concerns and requirements in both. GL 96-05 identified the OMN-1 Code Case as one approach for meeting the requirement of that

GL. Based on the 2000 modification to 10 CFR 50.55a and later in Regulatory Guide 1.192, OMN-1 was approved for use.

Code Case OMN-11 – Risk Informed Testing

As the ASME risk informed initiatives progressed in the 1990's, the Subgroup on MOVs submitted another Code Case to expand the existing risk initiative section of OMN-1. This became known as Code Case OMN-11, Risk-Informed Testing for Motor-Operated Valves. In order to apply OMN-11 the Owner must first be using OMN-1. OMN-11 allows the Owner to relax the grouping criteria found in OMN-1, Section 3.5 for Low Safety Significant Component (LSSC) MOVs. Existing groups of MOVs can have LSSC MOVs associated with them for the purpose of reducing the overall test burden.

ASME OM-2009 and OMN-1, Revision 1

While the development of Code Case OMN-1 was a significant accomplishment, it was only the first step toward updating the OM Code. The Subgroup on MOVs has continued to address industry feedback to improve OMN-1 and develop a change to the mandatory requirements in the OM Code. The goal has recently been completed in the latest edition of the OM Code. The 2009 OM Code no longer includes the stroke time and exercising requirements for MOVs in Subsection ISTC. Instead, ISTC refers MOVs to Mandatory Appendix III, Preservice and Inservice Testing of Active Electric Motor Operated Valve Assemblies in Light-Water Reactor Power Plants. The 2009 OM Code also includes Code Case OMN-1, Revision 1, Alternative Rules For Preservice and Inservice Testing of Active Electric Motor Operated Valve Assemblies in Light-Water Reactor Power Plants.

The text of Appendix III and OMN-1, Revision 1, is identical. Appendix III becomes the required IST for MOVs for users under the jurisdiction of the 2009 OM Code. OMN-1, Revision 1, allows voluntary use of Appendix III requirements for users under the jurisdiction of earlier versions of the OM Code. The scope of Appendix III/OMN-1, Revision 1, is an IST scope which differs from the scope of MOVs mandated by the NRC in GL 89-10 and GL 96-05. The scope impact has been minimized by being applicable to Active MOVs required for safe shutdown of the plant. The revision continues to stress the importance of engineering evaluations and justifications in the determination of testing methods and frequencies. Some prescriptive elements found in the earlier OMN-1, including confusing diagrams, have been removed. The use of torque versus thrust for determining margin has been clarified and Code Case OMN-11 addressing risk-based initiatives has been fully incorporated. Considerations for new testing strategies, such as Motor Control Center (MCC) diagnostic testing, have been added. Finally, quarter-turn plug and ball valves have been specifically addressed.

The 2009 OM Code was published in March 2010 and is now being reviewed by NRC for endorsement. The endorsement process is expected to take approximately 2 years.

Ongoing Efforts

Code Case OMN-1 is being implemented at numerous sites across the US. Other sites have stated a desire to implement Appendix III when it is endorsed by NRC. Table 1 provides a list of these sites and is based on our best feedback to date. The OM Subgroup on MOVs continues to address questions presented by industry and regulators. Feedback from users is appreciated and used in the effort to continuously improve Codes and Standards. Recent questions received by the Subgroup and status of these efforts include the following:

Implementation Guide. The Subgroup on MOVs has considered the need for an Implementation Guide for Appendix III and Code Case OMN-1. The Subgroup is not currently working on this guide since other industry groups are actively working to provide this. The IST Owners Group has a draft implementation guide which the Subgroup on MOVs will review and provide comments.

Scheduling Allowance (Grace Period). The ASME OM Code establishes the IST frequency for all components within the scope of the Code. The frequencies (e.g., quarterly) have always been interpreted as "nominal" frequencies and Owners have routinely applied the surveillance extension time period (grace period) contained in the plant Technical Specifications. However, instances have occurred where regulatory issues have been raised as to the applicability of the Technical Specification "Grace Period" to OM Code required IST frequencies. A Code Case and Code revision is being developed to address scheduling allowance. Current thoughts include a ≤ 25% extension for test frequencies of ≤ 2 years, with a maximum 6 month extension for test frequencies > 2 years. The allowance cannot be cumulative.

Missed Inservice Test. The ASME OM Code provides corrective actions for IST where the acceptance criteria are not satisfied. However, the Code does not consider the scenario where an Owner fails to perform an IST. The plant Technical Specifications typically contain required actions for a missed surveillance; however, instances have occurred where regulatory issues have been raised as to the applicability of the Technical Specification for a Code required IST that is not performed. A Code Case was suggested to resolve these issues and incorporate requirements when an Owner identified that a Code required IST has not been performed. The OM Committee is not pursuing this Code Case. The general opinion is that the Code provides requirements and should not provide an "out" for those who break the requirements.

Technical Inquiries. The ASME OM Committees meet regularly to conduct standards development business. This includes consideration of written requests for interpretations, Code Cases, and revisions to the code. ASME OM meetings are open to the public and we encourage feedback, questions, and suggestions for improvements to the Code. Instructions for the preparation of technical inquiries are contained in the front pages of the OM Code.

Conclusion

The ASME OM Code, Mandatory Appendix III and Code Case OMN-1, Revision 1 provide the requirements for design-basis verification, pre-service, and in-service testing of MOVs to assess their operational readiness, These requirements have evolved from industry experience and regulatory actions that have produced significant improvement in the state of the art in MOV technology and diagnostic testing. Implementation of the OM Code and Code Cases should improve the reliability of MOVs, assure their performance at design basis, and eliminate the need to regulatory-based MOV programs.

Table 1. Implementation of OMN-1 and Appendix III

Sites using or implementing OMN-1	Sites planning to implement Appendix III
Beaver Valley	Exelon (9 sites)
Calvert Cliffs	Southern Nuclear (6 units)
Clinton	Duke Power (3 sites, 7 units)
Comanche Peak	TVA (3 sites, 7 units)
DC Cook	
Diablo Canyon	
Ginna	
LaSalle	
Nine Mile	
Palo Verde	
Peach Bottom	
Perry	
Salem	
San Onofre	
South Texas	
Wolf Creek	