Main Steam Safety Valve Set Pressure Test Validation

Purpose

A Main Steam Safety Valve was tested at Wyle Labs to validate the Unit 3 Assist Device Method of testing provides similar results to the standard method of testing (lifting with steam), and to ensure that the new test gauges purchased to replace the older unreliable test gauges are actually suitable and provide satisfactory results by comparison to the Wyle Instrumentation. During the performance of the testing, representatives from Wyle Labs and Dresser were present to provide feedback and suggestions on how to improve the Millstone Testing technique.

Background

During the restart program for Unit 3, the acceptability of the assist device method of set pressure testing of the Main Steam Safety Valves was questioned by the NRC. The issue was: Did the assist device only provide a representation of simmering on the valve, and not actually the set pressure? To ensure our test method did represent the set pressure, it was agreed that a comparison of the assist device test and an actual steam lift test would be performed. This would validate the assist device method.

Lessons learned after RF05 testing of MSSVs, highlighted that the test gauges used for testing the safety valves were not very reliable. Of the 4 sets of gauges available at the start of testing, none remained functional by the end of the test due to failure of the transducer. It was recommended that new gauges be purchased that would provide better reliability. In order to ensure the gauges purchased were acceptable, it was planned to use these gauges on a MSSV at Wyle Labs.

Discussion

The testing performed at Wyle Labs used one Millstone MSSV stored at Wyle Labs. The testing consisted of Wyle Labs set pressure testing the valve using a limited travel steam lift method to establish the set pressure of the valve. This testing was done per Wyle labs standard test method, meeting ASME Section XI and OM-1 requirements. After this testing, the valve was set pressure tested using Millstone's Assist Device test method, (per the vendor (Dresser Valves) Tech Manual test outline). This test uses a hydraulic assist device to add force to compress the spring, reducing the force holding the disc on the seat. This is continued, until the normal system pressure under the valve seat is sufficient to cause a slight popping open of the valve disc. This is heard by the operator of the assist device, at which point the assist device operator removes the hydraulic force compressing the spring. The operator action plus the opening of the disc aids in the loss

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of hydraulic pressure in the assist device which leads to the re-closing of the valve. The assist device hydraulic pressure is corrected for the valve type/assist device calibration to represent the added pressure that must be added to the normal pressure in the valve, to provide a value for set pressure. This testing was also compared to a draft copy of Procedure SP3712G Main Steam Code Safety Valve Surveillance (IPTE), to ensure any needed improvements or lessons learned could be incorporated in the final approved procedure. After this series of tests, the Wyle labs test method was again performed to ensure the set pressure had remained consistent. The results of the test are as follows:

FIRST WYLE TEST SERIES

Test	SET PRESSURE	
1	1204	
2	1199	
3	1207	
4	1204	
5	1210	
6	1209	
Average	1205.5	Range 1199 to 1210

MILLSTONE TEST SERIES

Test	Set Pressure	
1	1198	
2	1185	
3	1195	
4	1204	
5	1199	
Average	1196.4	Range 1185 to 1204

SECOND WYLE TEST SERIES

Test	Set Pressure	
1	1211	
2	1206	
3	1195	
Average	1204	Range 1195 to 1211

Review of the results show that the Wyle Test Method overall had a range of 1195 to 1211 psig. Millstone's test method had a range of 1185 to 1204 psig. Only one reading from Millstone's test method was outside the range of the Wyle Labs test range. This one reading, 1185 psig represented a 1.6 % tolerance from Wyle's Set Pressure Average. This was only 10 psi below the lowest value recorded by Wyle Labs, or .08 %. The remaining

readings from Millstone's test method were within the Wyle range and within a 1 % tolerance on the Wyle Average.

Millstone's instrumentation used for normal pressure measurement in the valve was compared to the Wyle Labs Instrumentation monitoring normal system pressure in the valve. Normal pressure in the valve was maintained near 1005 psig. The Millstone gauge and Wyle gauge agreed within 1 psi for the 5 tests, or within .1 %.

Safety Significance

Since the valve used at Wyle for this testing was first As-Found tested, it will be refurbished after this testing and then As-Left set pressure tested. This testing has no safety significance on the valve used for testing.

The Tech Spec As-Left criteria for MSSV's is 1 %, which the testing with the assist device meets. The average test value for Assist Device and average test value for Wyle Labs were within this 1 % tolerance (1205.5 minus 1196.4 divided by 1205.5 equals .75%). This shows there is consistency in the two test methods within an acceptable value. The MSSVs installed in the plant are adjusted within an acceptable As-Left 1 % criteria for set pressure, to ensure the valves provide the proper over pressure protection. ASME Section XI and OM-1 allowance for As-Found acceptance criteria is 3 %.

References

ASME Section XI and OM-1
Dresser Valves Assist Device Tech Manual
Draft Copy of SP3712G

Conclusion:

As demonstrated by the Millstone Average Set Pressure being well within the range of values obtained for set pressure from the Wyle Labs test, and that only one value of set pressure out of five tests performed by the assist device method was outside the range of values obtained by Wyle Labs method, the Millstone Test Method is acceptable. The Tech Spec As Left criteria for MSSV's is 1 %, which the testing with the assist device meets. The average test value for Assist Device and average test value for Wyle labs were within this 1 % tolerance (1205.5 minus 1196.4 divided by 1205.5 equals .75%). The testing shows that there is consistency in the two test methods within an acceptable average value and the range of readings obtained. The Millstone procedure requires three acceptable As-Left tests.

Millstone Test Gauges are acceptable for use, based on readings consistent with Wyle Test Gauges during this testing.

Recommendations:

During the performance of the testing, representatives from Wyle Labs and Dresser were present to provide feedback and suggestions on how to improve the Millstone Testing technique. In addition, the test personnel performing the test from Millstone were also reviewing the draft procedure SP3712G for possible recommendations to improve or provide lessons learned from the testing being performed.

1. Personnel performing test should be instructed to ensure technique for applying pressure to the Assist Device produces a Popping action in the valve and precludes a Simmer effect in the valve.

2. Do not try to do multiplication on the meter (.312 correction), but record values of PSI and then use a calculator to get corrected value. Operation is complicated to record correction on meter and must be reset each operation and does not save time.

3. Move the instrumentation recording assist device pressure from the assist device to the hand pump. This was a recommendation from the Dresser Field Service Engineer and supported by the System Engineer from Northern States Power who was also at Wyle Labs.

4. Provide a second instrument at the assist device, which is used to ensure calibrated instrument is actually working properly. The second instrument is only used as sanity check on the other meter. This was a recommendation from Dresser Field Service Engineer and supported by the System Engineer from Northern States Power who was also at Wyle Labs.

5. Add a vent at the Assist device, to aid in system venting to allow filling the test rig with hydraulic fluid. This was a recommendation from the Dresser Field Service Engineer.

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