

An Oil & Gas Tool Goes Nuclear

The MIDAS Meter® valve leak detection system was introduced to the commercial nuclear power industry in January 2011 at the annual AOV-MOV conference in San Antonio. Since then the tool has evolved into an indispensable tool for nuclear plant maintenance and engineering personnel and is used during troubleshooting and testing of valves and systems where valve leakage is a concern. Appendix J engineers in particular find the tool to be very effective for quickly locating leaking valves during system leak rate testing.

By Robert Greenlees - Manager, Nuclear Operations - Score Atlanta

MIDAS Meter® was developed by Score Group PLC, a global valve services company based in the UK. Initially a North Sea oil & gas oriented service company, Score has added expertise and capability and now handles all aspects of valve supply, valve service and valve asset management, including valve diagnostic testing for customers worldwide.

Thirty plus years of valve experience has also enabled Score Group companies to cross over into other industries such as military and commercial nuclear power. When Score Atlanta Inc. was established in 2009, it opened a conduit to facilitate transfer of nuclear in-

dustry valve diagnostic experience and requirements back into Score Diagnostic's Ltd product development process while simultaneously transferring Score's developed and emerging diagnostic capabilities for oil & gas to commercial nuclear power.

Score Atlanta key personnel have over 100 man-years of experience supporting valve engineering, testing and maintenance activities at nuclear plants worldwide. The Atlanta location supports MIDAS Meter as well as Score Diagnostic's current on line data acquisition and monitoring installations (see V-MAP™ article - Valve World Magazine, Volume 16, Issue 8).



When Midas Meter® was introduced in 2011 it was quickly adopted by the nuclear industry because of its ability to identify *very small leaks at low pressures*.

The valve leak detection system consists of the hand set which includes a Score designed AE sensor, on board computer and electronics, rechargeable battery pack, and digital (dB) display screen.

The second and equally important part of the system is a ruggedized PDA, complete with Score proprietary leak estimation software. The handset transmits the readings to the PDA via Bluetooth and the PDA software converts this dB reading to a leak rate using user defined valve and process information.

Additionally, the PDA can be connected to a PC and information input via PC keyboard and mouse.

Even though the leakage results are in standard units of mass or volumetric flow the tool was not intended to replace the LLRT cart used to quantify valve leaks in nuclear applications. It does however provide consistent qualitative results, so a valve can be trended over time, worked "just in time", or compared to similar valves in order to prioritize maintenance.

The third component of the system is the PC based Communicator™ software. This tracks license and calibration files, facilitates the import and export of PDA data, prepares reports and exports data.

Acoustic, ultrasonic and higher frequency acoustic emission tools are not new to the nuclear industry and some products have been used with limited success over the past 30 years. The primary difference between the tool and a general purpose ultrasonic tool is MIDAS Meter® is a low level *leak detection tool only*. General purpose ultrasonic tools, some of which are advertised for leak detection, cover a specific range of lower frequencies. While these tools perform many tasks adequately, they typically do not *conclusively* identify low level gas or fluid leaks. The challenge for the ultrasonic in-



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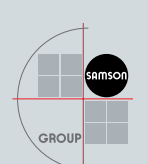
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This was a long sought after solution for Appendix J testing since the normal process includes isolating sections of plant piping by closing many valves to create a test boundary. As long as the test pressure within the boundary is maintained the test is successful and nuclear plant outage activities proceed as planned. However, when the test pressure cannot be maintained, the process of eliminating each valve one at a time begins while progress toward plant restart slows or stops. The tool identifies the culprit valve quickly thus enabling maintenance activities to be refocused on exactly what needs to be corrected now.

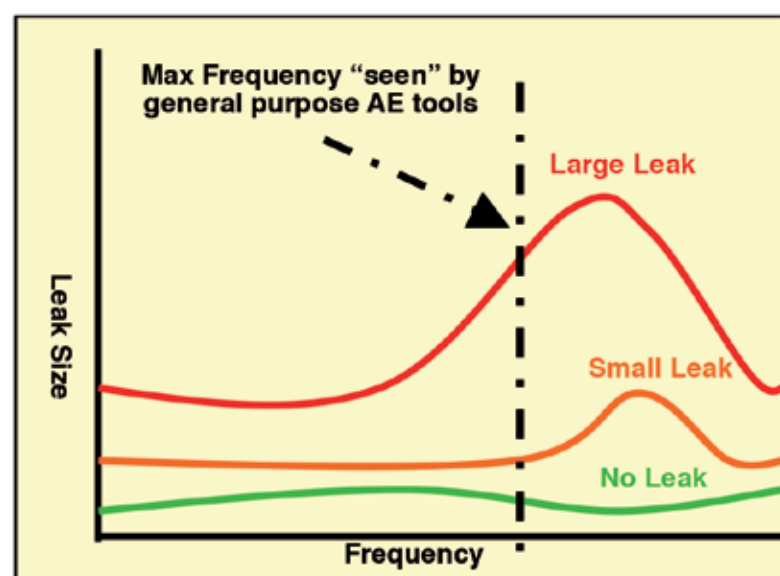


FIGURE 4 . Leakage frequencies

strument is the leak signal is lower and thus overwhelmed by lower frequency mechanical interference.

Over time as small high frequency leaks grow, the leak noise broadens as shown in FIGURE 4 and shifts to a lower frequency indicative of flow where the general purpose tool may find the leak.

The tool has been broadly adopted in the nuclear industry to support ILRT/LLRT activities, for post maintenance testing, to set up butterfly valves, adjust bench set and seat load on control valves (AOVs), troubleshoot steam traps, identify leaking MOV isolation valves, assess check valves, identify the source

of losses through cross ties and by mechanics as a means of testing the quality of their work. Some utilities have also "chased megawatts" with the meter, where it quickly pays for itself.

In 2012, Score Diagnostic's released the new on-line MIDAS® Sensor that can be permanently installed on a valve to detect leakage. The Sensor includes the same sensor and on board data processing as MIDAS Meter® but can be connected to Score on line systems as part of a comprehensive valve monitoring solution or directly to customer systems to provide an indication of valve leakage.



Because of growing nuclear power adoption, Score Atlanta has begun the process of validating the leakage estimation algorithm under a 10CFR50 Appendix B QA program. A flow loop was constructed in Atlanta during 2012 and testing activities will continue through 2013. The test program includes an extensive evaluation of acoustic emission signatures from a wide range of manufactured leak path geometries, laboratory valve testing followed by field verification. Current nuclear plant MIDAS Meter® owners have volunteered to participate in the field test-

ing. The tool will be the first acoustic based leak detection system to be

validated for nuclear safety-related use.

Did you know... that the Industrial Revolution brought on the modern history of the valve. Thomas Newcomen invented the first steam machine in 1705 that used valves to regulate the steam at high pressure. Valve designs further improved as new inventors such as James Watt created new machines, but it would be many years before valve production was done independently of projects that required their use.



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