Ultrasonic Testing Tips for Steam Traps and Valves

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ABSTRACT

Steam can exist anywhere in a system. Steam may be escaping through external or internal leaks in fittings, valves or controls, from oversized steam traps, or traps that are blowing, leaking or plugged with dirt.

Steam may be lost through uninsulated valves, flanges, sections of steam pipe, or through high back pressure in condensate lines caused by blowing traps. A control valve unable to close because of "wiredrawing" or undersized steam and condensate lines with no provision for utilizing flash steam could all be sources of wasted energy.

Testing Tips for Common Problem Areas

It is essential to know how each steam trap or valve works under specific conditions in order to be able to diagnose a problem correctly. To determine leakage or blockage, touch the ultrasonic instrument upstream of the valve or trap and reduce the sensitivity of the detector until the meter reads about 50. If you need to hear the specific sound quality of the fluid, simply tune the frequency until the sound you would expect to hear becomes clear. Next, touch downstream of the valve or trap and compare intensity levels and, for traps, sound pattern levels. If the sound level is louder downstream, then fluid is passing through. If the sound level is low, then the valve or trap is closed.

Check Valves

When check valves are placed closer than three feet downstream of blast action traps (such as inverted bucket or thermodynamic types) flappers may loosen or even break free. Damaged check valves will usually become noisy. When control valves are grossly oversized they are forced to work close to their seats. High velocity wet steam acts almost as sandpaper, cutting the seat when a mixture of steam and water is forced through the tiny crevice. With an ultrasonic instrument you can distinguish between normal machine noises and sounds that spell trouble. To verify data, use the instrument to test nearby units and compare.

Control Valves / Pressure-Reducing Valves

Air operated control valves may be leaking at or around their diaphragms. Scan the exterior sections listening for the turbulent sounds created by a leak. Test ultrasonically for internal leakage as you would for any other valve. It will be necessary to momentarily close the valve to perform definitive testing. For those valves with diaphragms, listen for leakage at the small bleed hole. This is a dead giveaway that a rupture has taken place.

Solenoids

Listen for leakage through solenoids that are in a closed position. You will be able to detect which valve is leaking even when it is part of a large bank of valves. If you are in doubt about a judgment call, compare with similar valves.

Relief Valve

In a steam system, relief valves that have opened by excess pressure may not reseat properly. Some with softer seats may be chattering or may suffer microscopic steam and water cuffing. Ultrasonic testing will detect the turbulent passage of steam or vapor as it moves through the leak site. Touch the instrument's stethoscope at the point on the valve closest to the orifice and then touch the downstream piping. Leaking and blowing valves are easily identified. Augment your test with a hand-held infrared thermometer for temperature differentials.

Condensate Return Pumps

Listen for the static noise indicating a vaporization bubble collapsing around the impeller. If in doubt, test similar pumps and compare. Remember to test volute pump casing temperatures with an infrared thermometer.

Pressure Powered Pump Needle Valves

The needle valves on steam or air powered condensate movers, like any other mechanism, will deteriorate over time. Listen for seepage of steam through worn valves, usually indicated by a high pitched whistling sound. When more then one pump exists, comparisons can be useful.

Valve, Piping and Gland Leakage

Use the ultrasonic instrument to scan all parts of the steam system for the sounds of turbulence. It will be a reality check to find out how many areas are actually leaking.

CONCLUSION

A maintenance program is critical in using steam efficiently. Implementing these simple steps can help any facility realize as much as a 34 percent saving on steam energy costs alone. Not many investments pay such high dividends. To establish an effective program, determine the optimum maintenance schedule for each trap and follow it. It would be difficult to find a less time-consuming program that is as cost effective.

Warnings of possible steam trap failure:

- An abnormally warm boiler room.
- A condensate receiver is venting excessive steam.
- A condensate pump water seal is failing prematurely.
- The conditioned space is overheating or under-heating.
- Boiler operating pressure is difficult to maintain.
- Vacuum in return lines is difficult to maintain.
- Water hammer.

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