Feeling The Heat?

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Improving steam trap maintenance and operation can help improve energy savings.

The now bygone era of inexpensive energy has been replaced by a new reality – steady, steep and continued rises in fuel prices. This has sent plant managers on a frantic search to find new ways of cutting costs in virtually every phase of the manufacturing process, but one area they may have been overlooking is steam generation.

To gauge the high cost of steam trap leakage, consider this example of the potential loss of energy dollars:

- In just one hour, an unchecked blowing steam trap at 300 PSI with an orifice diameter of 3/16” will waste 267 lbs. of steam.
- Using an average cost of steam at $12 per 1,000 lbs., one blowing steam trap will expend $77.02 per day, or an astounding $28,110.82 per year.

Take A Look Around

The first step in determining what your plant might be wasting as a result of faulty traps is to conduct a steam trap survey. Part of this process should involve a review of the system itself. Has yours been logically designed—and then been subject to haphazard additions? If this is the case, you can assume there are problems. Here are a few examples of system neglect:

- Oversized and misapplied steam traps that can cause blowing, leaking and plugging from dirt that, as a result of these improper applications, has amassed in the system.
- Control valves that have been wire-drawn: The valves may be unable to close, due to a wet steam.
- High back pressure in condensate lines due to blowing traps. Not only is this wasteful, but its also hazardous.
- Low steam temperatures from traps that are discharging into flooded condensate lines.
- Uninsulated valves, strainers, flanges and even whole sections of steam system piping, which can be a major cause of energy waste.
- A low percentage of condensate return, a condition that could escalate the costs of boiler fuel, chemicals and water.

Exercise Caution

Some systems incorporate bypasses around steam traps to temporarily drain systems of condensate while trap replacements are made. While this is a useful practice, there are several downsides to consider:

- What if the bypasses are opened by operators who believe condensate is not being purged quickly enough?
- What if they have been inadvertently left open (possibly through operator error)?
- What if they have not been shut-off tightly?
- What if they are leaking as a result of carbonic acid corrosion?
- What happens if they are not checked regularly for leakage?

A vacuum breaker is one of the preventative tools that can put the plant manager’s mind at ease. Vacuum breakers allow condensate to gradually drop out of the system. They also help to prevent water-hammer, frozen HVAC coils and equipment, as well as the damaging effects of carbonic acid erosion. However, to be effective a vacuum breaker needs to be installed properly.

One of the most simple and overlooked components in a steam system is a strainer with a blow-down valve upstream. Strainers should be installed upstream of traps and other steam components, as these systems contain iron oxides that can leech out and cause blockage of the strainer. That’s why they should be checked and cleaned frequently by specially trained and authorized personnel that understand the prescribed safety procedures for opening these or any other steam valves. Additionally, an increase in flash steam spewing from condensate vent-stacks can underscore the need for an ultrasound condition-based maintenance program, as faulty steam traps can be easily detected with this type of equipment.

Steam Trap Testing

Online trap inspection usually includes visual, thermal and acoustic means:

- Visual inspection relies on eyeballing a release valve situated downstream of traps, a sight glass, or a three-way test valve. With a test tee or three-way valve, an inspector can open these valves and look to see if the trap is discharging condensate or steam.
- Thermal inspection involves examination of upstream/downstream temperature variations. It can encompass the use of pyrometry, infrared tools, heat bands (which wrap around a trap and change color as temperatures increase) and heat sticks (which melt at various temperatures). As a steam trap begins to leak steam into the condensate system, the temperature on the discharge side of the trap increases. If only one failed open trap discharged steam into a sufficiently vented and appropriately sized return system, there would not be an appreciable difference in condensate system temperatures. However, if the failed open trap raised the pressure in the return line, higher temperatures would result. The temperature method depends on identification of this temperature variance. The downside is that this method does not always work because multiple traps usually feed into a common return. When those traps fail, they pressurize the common return header, and since the failed open traps dump into the common return, pressure will equalize in the condensate system. As a result, the same temperature will be read on the discharge of traps in all sections of that return system and produce inconsistent results.
- Acoustic techniques require an inspector to listen to and detect steam trap operations and malfunction. This method utilizes various listening devices, such as mechanics' stethoscopes, screwdrivers and ultrasonic detection instruments. The most advantageous listening device will allow users to listen to the sounds of steam trap operations while isolating most ambient system sounds. The ultrasonic leak detector is the easiest and most accurate, as they are sensitive to high frequency (short wave) signals and tend to ignore most stray signals.

Knowledge Base

When utilizing the ultrasound method, the tester must have knowledge of the steam system application and trap type being used. Ultrasonic instruments should also be used in conjunction with an infrared detector so that partially or fully blocked traps can be easily identified. Infrared temperature instruments will also identify increased back pressure in condensate systems. Escalations in condensate temperatures not only adversely affect the performance of otherwise properly functioning traps, but they can create an assortment of detrimental effects to the overall steam system.

As energy prices continue to escalate, user efficiency will become more and more critical in helping to keep operations as efficient and profitable as possible. That's why, in many cases, it is imperative that a steam system be regularly monitored for loss, and, if necessary, re-designed or replaced.

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