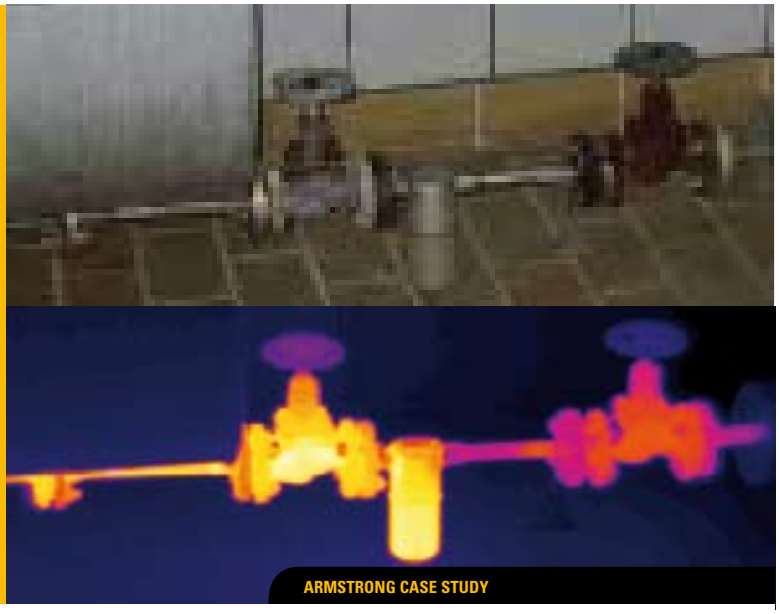
PHARMA

Case study

Efficient management of steam trap systems



Case summary

Energy savings		Operational optimizations
Criterion	2005	2005 - 2007
Steam savings	845 tons/year (7% of the total)	Improved thermal exchange (greater productivity)
CO_2	112 tons/year	Reduced maintenance (less corrosion and water hammering)
Financial savings	€ 16,900/year	Better steam quality
Investment	3,100 €	Reduction of back pressure (condensate return pressure)
Payback time	2 months	

The cost of inactivity

Increasing energy costs, the Kyoto protocol and continued efforts for higher competitiveness have incited many companies to focus greater attention on the efficiency of their steam systems. They found that more efficient management of their steam trap systems leads to relatively significant and easily attainable savings. Indeed, the financial losses engendered by a leaking trap exceed the cost of replacement within just a few months! In this context, waiting several years before acting can cause huge financial losses.

Traps have an average service life of 5 to 15 years and, thus, it is normal that 10 to 15% of the traps in a homogenous population breakdown each year. Therefore, an annual control and repair/replacement plan is a best practice for steam traps.

One of our pharmaceutical customers has understood the importance of regular upgrades of its steam systems. For 3 years now, Armstrong has been responsible for annual survey of an increasing portion of the trap population and the control in 2007 even covered 80% of all traps installed.

The calculation of steam leaks and data storage is performed using Armstrong SteamStar - an internet steam trap management platform that contains data on 6000 trap models from all world manufacturers and that uses a UN-approved formula for calculation.

In this pharmaceutical factory, one of the units equipped with 84 traps was included in the first survey. An in-depth analysis of the results revealed 3-year trends for this unit, thus providing a good idea of the benefits of regular control of steam traps.

Piping error: missing drip leg upstream of the trap

Case study

EFFICIENT MANAGEMENT OF STEAM TRAP SYSTEMS

Criterion	2005	2006	2007	Savings (3 years)
Failure rate	22.9%	17.5%	11.3%	- 11.6%
"Leaking"	18.8%	14.0%	9.4%	- 9.4%
"Blocked closed"	4.1%	3.5%	1.9%	- 2.2%
Steam loss	845 tons/year	241 tons/year	99 tons/year	- 746 tons/year
CO_2 emissions due to the leaks	112 tons/year	32 tons/year	13 tons/year	- 99 tons/year
Financial savings (cost of steam: € 20/ton)	€ 16,900/year	€ 4,800/year	€ 2,000/year	- € 14,900/year
Equipment investments	2,200 €	2,000 €	€ 1,200/year	- € 1,000/year
Survey cost	900 €	900 €	900 €	

The relatively high losses during the first year were partly due to a trap that, on its own, was generating a leak of over 600 tons/year, which equals losses of € 12,000/year. Erosion due to the passage of leaking steam had caused separation of the seat from the trap body, leaving a 7 mm-wide opening. This was enough to cause an annual leak equal to 60 times the cost of replacement of this trap!

In 3 years, the rate of traps failure was cut in half to reach a "normal" level of 11%, which can only be improved by increasing the frequency of surveys. Another solution considered is installation of a permanent monitoring equipment on certain critical traps. Armstrong recently launched SteamEye - a wireless steam trap monitoring equipment. SteamEye is easy to install on a clamp equipment around the pipe upstream of the trap, regardless of its brand or technology. Armstrong SteamEye is the ideal solution to immediately detect failure of a critical trap which could lead to big steam losses or significant disturbances in the installation.

Of course, in the event of discontinuance of regular trap maintenance, the rate of traps failure increases very rapidly. If no intervention is made for 3 years, it is normal for 30 to 40% of the traps to breakdown during that period.

Test the traps... and even more

Armstrong technicians don't stop at just testing the traps, they also analyze the entire trap station to detect various anomalies. Indeed, an error in sizing, technological choice or installation can have a negative impact on the service life of the trap.

During the initial diagnosis, the following errors were detected:

- one trap installed backwards and another positioned at a wrong inclination versus the pipes;
- two traps installed in series;
- incorrect piping and several missing drip legs;
- open by-pass valves;
- one trap with a mechanism not adapted to the operating pressure (blocked by the differential pressure);
- traps with technology inadapted to the application for which they were installed.

This in-depth analysis revealed several possibilities for improvement of the trap stations. We were able to make the installation more reliable and increase the service life of the traps. Isn't the best solution to a problem actually the one which makes it possible to avoid the problem in the future?

Steam traps: "customs officers" with a crucial role

Steam traps act as "customs officers" in a steam installation. On one hand, they must prevent the leak of steam to the condensate return and, thus, to the atmosphere. On the other, they must evacuate the condensate to avoid phenomena such as corrosion, water hammers and poor thermal exchange. This distinction between the steam and the condensate is made by mechanisms that operate based on differences in density, temperature or velocity.

Steam traps are pieces of mechanical equipment and, thus, their service life generally varies between 5 and 15 years depending on the conditions of use. When the trap fails, it loses its ability to make the distinction between the steam and the condensate. The first possibility is for it to remain permanently open ("leaking"), allowing not only the condensate but also the steam to pass. In such cases, this could lead to losses of up to 3% of the annual "steam" budget on the site, not to mention CO_2 emissions. The second possibility is for the trap to remain "blocked closed", not only preventing the flow of steam, but also the evacuation of condensate. This reduces the productivity of the heat exchangers located upstream of the traps and the temperature variations may also seriously damage the heated product. Moreover, the accumulation of condensate in the exchangers causes corrosion and water hammering, which leads to mechanical breakdown of the exchangers. Even though the financial impact of traps which are "blocked closed" on the company's operational budget is more difficult to evaluate, it is certainly greater than that from energy losses!

Armstrong
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