

Cypress EnviroSystems Application Note Steam Trap Energy Savings August 2008

Energy Savings Opportunity: Detecting Steam Trap Failures and Avoiding Expensive Leaks

Many facilities produce steam for heating or manufacturing processes. The steam is typically piped from a central boiler(s) to various locations on site where the steam is used.

“Steam traps” are mechanical devices installed on the pipes to remove condensate from the steam flow; they are needed to maintain the proper operation of the steam distribution system. A typical industrial plant or university site may have several hundred or even thousands of steam traps.

Unfortunately, steam traps have a tendency to leak, which can add up to thousands of dollars per year of wasted steam for a single steam trap. This was probably less important when the original steam system was built years ago, but with today’s energy prices, it is critical to detect and correct failures quickly. On average 15-25%¹ of steam traps are leaking at existing installations, which means hundreds of thousands of dollars of wasted energy per year per site.

Figure 1 – Signs of a leaking steam trap



Figure 2 – Typical steam trap installation



¹ US Department of Energy, Federal Energy Management Program – March 2001

The Challenge:

Most facilities perform a steam trap audit once a year, which usually involves sending two technicians to a steam trap (many in relatively inaccessible locations), and manually inspecting it with hand-held devices i.e. Infrared Thermography detectors. Defective steam traps are fixed when identified by the audit.

The audits are very time-consuming, averaging 15-30 minutes per steam trap, and take many weeks for an entire site. For this reason, audits are usually performed only once per year, or even less frequently. Given the typical failure rate of steam traps, this means that many start leaking during the course of a year and are not detected for many months (till the next audit).

In between audits, leaks would occur without intervention, and would waste over a hundred thousand dollars even for a smaller site with a few hundred steam traps.

The Cypress Envirosystems Solution:

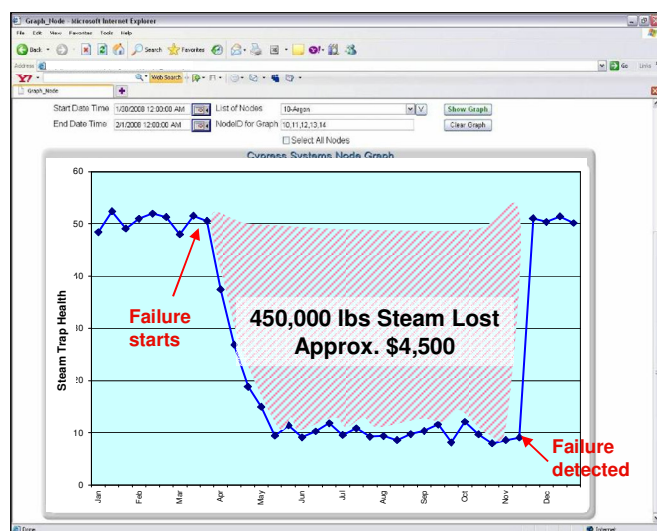
Instead of performing manual audits just described, facility managers can now use the new Cypress Systems Wireless Steam Trap Monitor (WSTM) to detect steam trap failures within a day, and to repair or replace the defective units. The amount of steam wasted in this case would be a small fraction of an undetected leak.

This technology non-invasively clamps on top of steam traps, performs monitoring and diagnostics and transmits health status wirelessly to a central receiver and server for monitoring, trending, graphing, alarming and historization. Each WSTM installs in less than an hour, and does not involve breaking seals, leak checks, or production downtime.

The WSTM data can be shared with existing Building Management Systems (BMS) so that no new software or operator training to implement this solution.

Figure 3 – Earlier failure detection avoids costly leaks (1/8" orifice steam trap example)

Without Steam Trap Monitoring



With Steam Trap Monitoring

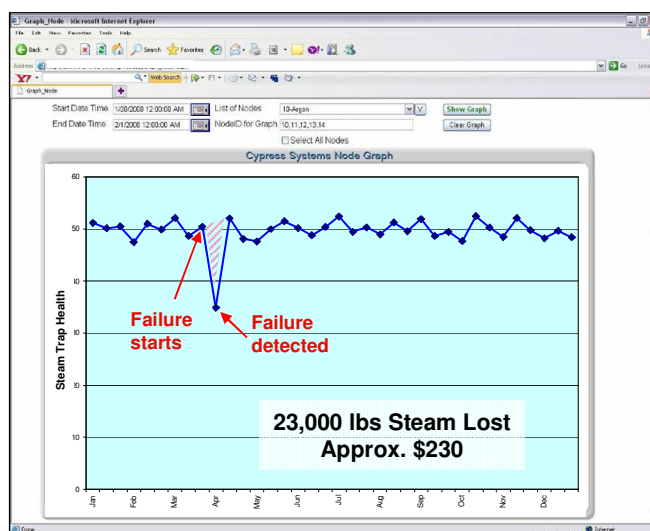
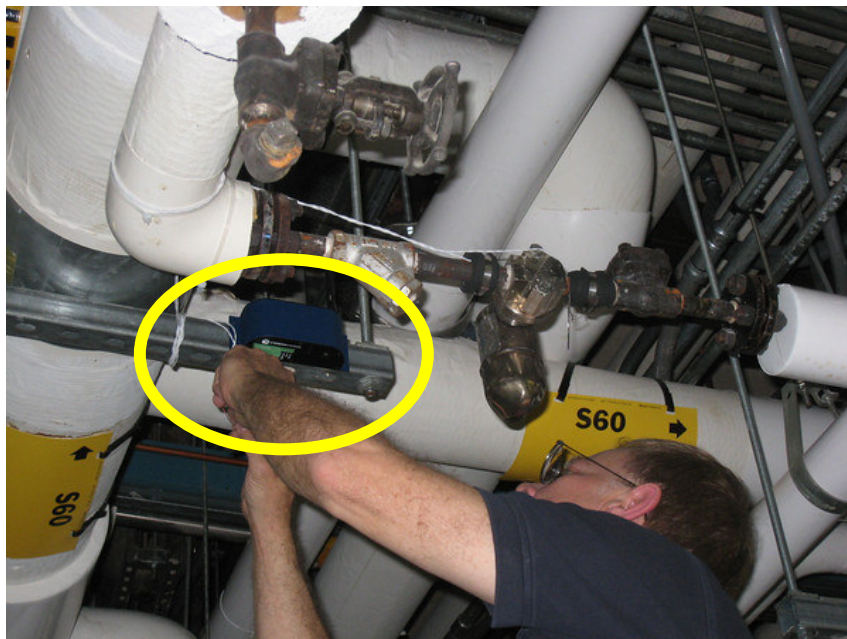


Figure 4 – Non-invasive Wireless Steam Trap Monitor installation



Application Example:

A plant in New England was constructed in 1964 and has 400 steam traps with 1/8" orifice, and 150 larger traps with 1/4" orifice, operating at 105 psi steam pressure. They perform an annual audit of the traps at a cost of approximately 140 man-hours or \$20,000 each time, requiring about calendar month to complete.

All failed steam traps uncovered during an audit are replaced, but during the course of a year, approximately 15% of the steam traps fail and start to leak. On average, it takes six months before the leaks are detected at the next audit. Assuming steam cost at \$10/thousand lbs, the leakage would waste \$375,000 per year.

To reduce the leakage costs, the plant manager decided to install the WSTM on all steam traps. The installation would require one month at a total cost of approximately \$650 per steam trap. The WSTM system would detect and thereby reduce steam leakage by 95%, and reduce audit labor by 70%. The overall project would deliver a payback of 12 months.

Figure 5 – Cost of Steam Leakage due to Failed Steam Traps

	1/8" orifice	1/4" orifice	
Total number of steam traps with 1/8" orifice	400	150	units
% of traps failed/leaking	15%	15%	
Avg number of months leaking before detection	6	6	assuming one year audit interval
Amount of steam leaked per year	15,000,000	22,500,000	lbs
Cost of leaked steam for all 1/8" orifice units	\$150,000	\$225,000	@ \$10/thousand lbs of steam
Total Cost of Leaks per year => \$375,000			

Figure 6 – Payback period calculation

Total cost to install WSTM on 550 steam traps	\$357,500
Savings Total	\$371,650
Energy savings (avoided 95% of steam leak)	\$356,250
Labor savings (reduced time by 70%)	\$15,400
Payback Period (months)	11.5

About Cypress Envirosystems:

Cypress Envirosystems is a subsidiary of Cypress Semiconductor (NYSE: CY). Its mission is to save energy and improve productivity in older plants and buildings, using state-of-the-art non-invasive and wireless technologies to minimize disruption and cost, delivering payback of 12 months or less. More information is available at: www.cypress.com/systems or call (408) 943-2800.