RND Pharma Saves Energy Using Wireless Steam Trap Monitors

Wireless devices automate steam trap fault detection, avoid exposing workers to hazardous areas, and pay back in less than one year

The Challenge

- RND Pharma's Technology Center Headquarters site uses over 2,400 steam traps in their campus wide steam distribution system.
- Undetected leaks from steam traps waste significant energy throughout the system.
- Frequent monitoring is required to detect leaks in a timely manner.
- Manual audit of traps are problematic because many are inaccessible or in potentially hazardous locations i.e. subterranean location, at temperatures up to 500° F.
- The situation created a dilemma between meeting RND's energy saving goals, and maximizing safety for personnel.

The Solution

- RND Pharma selected Cypress Envirosystems' cost-effective turnkey solution for Wireless Steam Trap Monitoring that can automate monitoring in difficult locations.
- The installation was non-invasive – no need to shut off steam lines, and no disruption to production operations in any way.
- Pilot project for 12 Wireless Steam Trap Monitors (WSTM) cost less than $10,000.

The Results

- Automating steam trap monitoring has significantly reduced the time to detect a steam trap failure, saving thousands of dollars for each leaking trap. The system also reduced the labor and potential safety hazards associated with manual audits.
- Expected payback period for the system is about 12 months.
- "The Wireless Steam Trap Monitor installation has provided us with a solution that cost-effectively addresses our need to save energy and increase safety and reliability across our entire complex," said John Smith, Manager of Utility Steam Plant Operations, RND Pharma Technology Center Headquarters.

Situation/Background

Located in the heart of Maintown, USA, RND Pharma is one of the city's largest employers. With an enviable Technology Center Headquarters, RND has always been at the forefront of leading edge technology to apply to their manufacturing processes for many of the world's prominent pharmaceutical products. With a comprehensive sustainability program focused on improving energy efficiency, the Utility Plant distributes steam, chilled water, compressed air, etc. to the various buildings comprising the complex. Each building is then responsible for its own energy consumption and associated carbon footprint, being billed by the Utility Plant for usage. With this being the case, the Utility Plant sought a continuous steam trap monitoring system to save energy, plus increase safety and reliability. This would provide transparent accountability for billing users for steam that may just be leaking to air from the steam traps, hence closing the loop on the overall energy reduction goals for RND Pharma Corp.

Figure I
RND Pharma's Technology Center headquarters spans two city blocks in Maintown, USA.

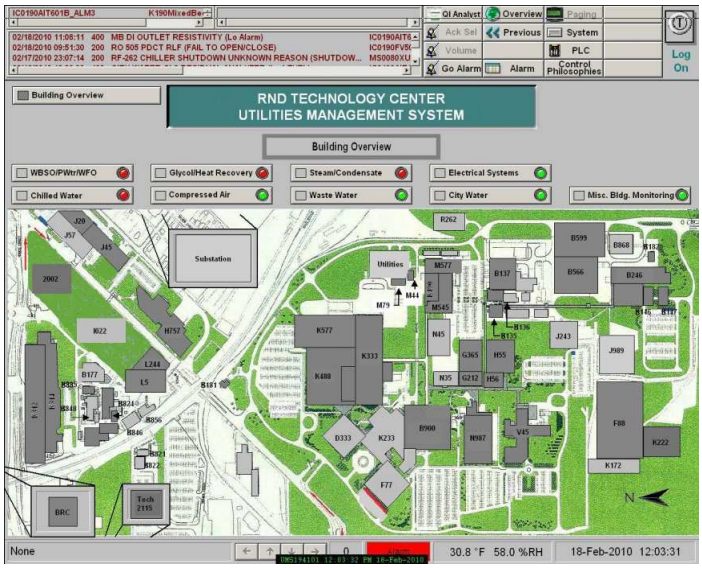

Figure II
Cypress Envirosystems' robust wireless network traverses the large Tech Center complex to connect WSTM and other Cypress wireless devices.

The Cypress Envirosystems Solution

Instead of performing manual audits, facility managers can now use the Cypress Envirosystems Wireless Steam Trap Monitor (WSTM) to detect steam trap failures within a day, and to repair or replace the defective units.

This technology non-invasively clamps on top of steam traps, performs monitoring and diagnostics and transmits health status wirelessly to the Blue Box 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.

When a steam trap fails "open", the early detection provided by the WSTM significantly reduces the steam wasted compared with less frequent manual monitoring.

Without Steam Trap Monitoring

With Steam Trap Monitoring

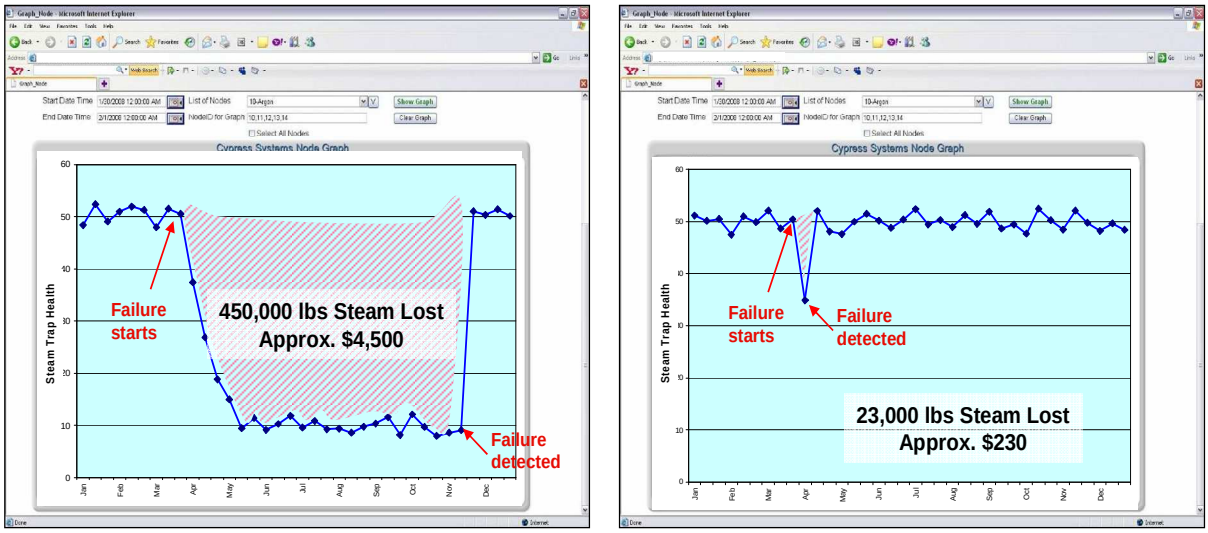

Figure III – Early failure detection avoids costly leaks (1/8" orifice steam trap example)

When a steam trap fails "closed", it destabilizes the efficiency of the steam distribution system, which in turn wastes energy. This also causes damaging water hammer that may lead to broken piping costing hundreds of thousands of dollars to repair, not including the lost production impact during the repair downtime. The seriousness of piping breakage also heightens the safety issues to those that may be present at the failure point.

Whether failing open or closed, the WSTM provides alarm notification, enabling timely maintenance to increase safety and reliability in addition to saving energy.

The WSTM has a built-in "zero footprint" web-based user interface which provides any user on the company Intranet visibility for history trending, graphs, and alarming/notification. It also provides comprehensive reports with an energy summary which shows steam loss and the cost associated with the loss for analysis and auditing – no new software or operator training is required to implement this solution.

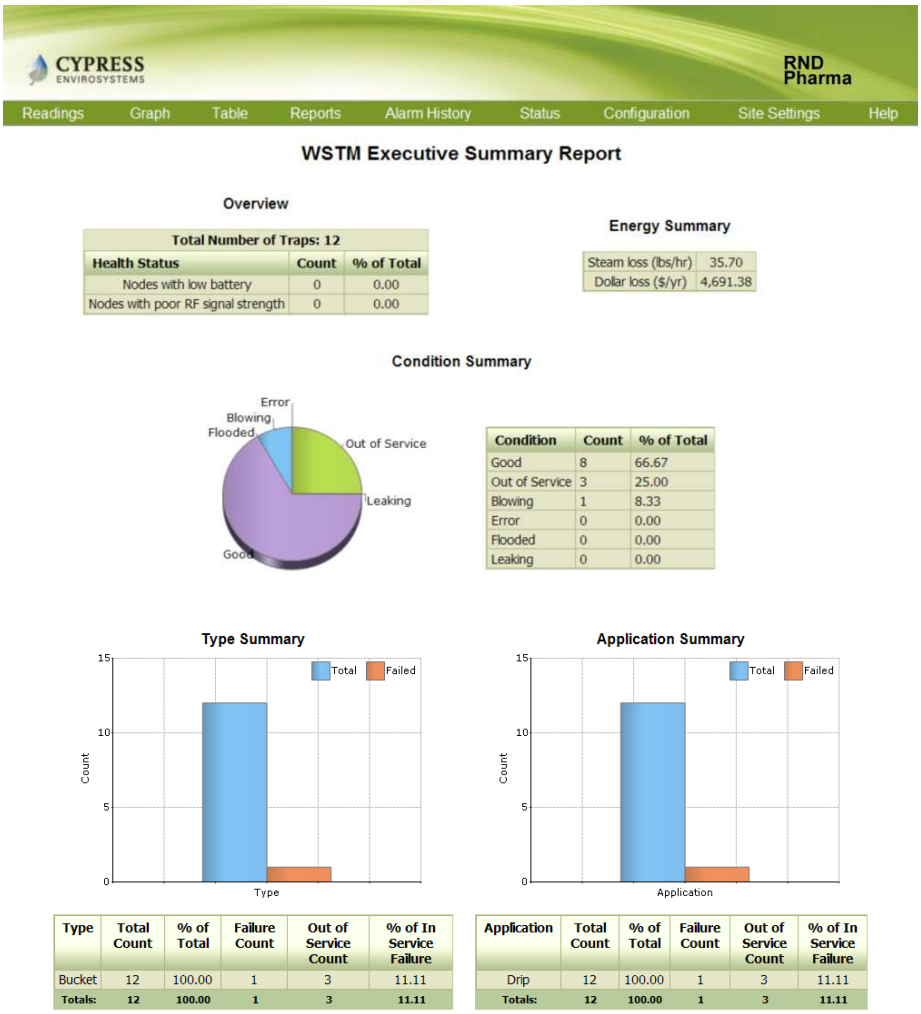

Figure IV – WSTM Executive Summary Report for comprehensive analysis of all steam traps

The WSTM data can also be easily integrated into existing automation systems via "open systems" OPC or BACnet interfaces. RND uses OPC to integrate the WSTM with their Wonderware Utilities Management System user interface as shown in Figure II.

The Cypress Envirosystems' Unmatched Solution for Difficult Environments

Although many facilities, like RND, would like to save energy and increase safety and reliability with continuous steam trap monitoring, they face the dilemma of having steam traps in hard to access places. Cypress Envirosystems now resolves this dilemma with the WSTM which can operate in demanding environments.

Figure V – CEMENT BUNKERS Over 25 ft Deep does not hinder Cypress Envirosystems "military grade" wireless signal from getting out to the Blue Box Server

Figure VI – Inaccessible "HOT VAULT" traps at temperatures up to 500℉ does not hinder getting the condition data of the steam trap back to the Blue Box Server

For RND Pharma, the WSTM solution delivered multiple benefits including energy savings[1], reduced downtime, less maintenance labor, and improved worker safety.

[1] WSTM Results Resource References:

- The US Dept of Energy has determined that steam traps have an **average failure rate of 15-20%** per year. A "failed open" steam trap (1/8" orifice) will waste about $5000 of steam per year
- US Environmental Protection Agency has documented that "Using automatic monitoring is conservatively estimated to give an **additional 5% Energy Savings** over steam trap maintenance alone, with a payback of one year"

Energy Saving 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 a 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.

Table A – 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	1,500,000	2,250,000	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***		

Table B – 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 (NASDAQ: 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 18 months or less. More information is available at: www.CypressEnvirosystems.com or call (408) 943-2800.

RND Pharma is a fictitious name to abide by customer confidentiality policy