

## 'Steam saver' enhances comfort, cuts energy costs for school district

The two most commonly encountered steam traps used today are the inverted bucket trap and the float and thermostatic (F&T) trap.

But these mechanical traps are not necessarily the most effective, according to an ongoing study by the Tyrone, Pa. School District.

In 1985, traps in the heating system at Lincoln Elementary School in the Tyrone district were leaking badly. As a result, excessive live steam was returning with condensate to the condensate receiver in the boiler room.

This created high humidity and extensive rusting of metal surfaces. Worse yet, a lot of steam and energy dollars were being wasted.

Students and teachers alike felt the effects of the steam heating problem, especially in those classrooms farthest from the boiler room.

There were days when some classrooms were still cold midway through the morning sessions. Teachers, students, and parents complained about the cold room temperatures.

To offset this problem, students and teachers were advised to dress warmer — not much of a solution. Temperatures in the rooms were also raised by increasing the steam pressure.

This partially solved the problem, but again was not an optimum solution.

### Solution sought

At the height of the problem, an administrative assistant for the school district heard about a device called the "Hall Steam Saver" that appeared promising.

What impressed him initially was that the product was made of machined stainless steel and had no

moving parts.

From experience, it was known that the biggest problem with mechanical traps is that they operate cyclically, opening and closing and sometimes sticking in the open position. If they stay partially open, which they often do, live steam continually escapes, losing valuable steam energy.

Further exploring this concept revealed that the steam saver removes condensate continually at a rate approximately equal to the rate of condensate formation in the heat exchanger or steam distribution system.

The stainless steel nozzle has a varying capacity to remove condensate, depending on the fluid pressure at the nozzle.

Its capacity for condensate removal actually works in concert with the control valve controlling steam flow to the heating unit. It operates on the physics of two-phase flow, taking advantage of the widely divergent densities of steam and condensate.

The Hall Steam Saver is machined from 300 Series stainless steel, which means it will not corrode, erode, or wear out in the steam heating system.

The steam saver nozzle is part of a three-component system: the nozzle, Y-strainer, and quarter-turn blow-off valve. The nozzle operates on the same principle as a two-phase flow-through nozzle.

Once installed, the unit is guaranteed for 10 years.

### Drip legs tested

A test installation was made at Lincoln Elementary School. Because maintenance funds were limited, the HydroProducts sales

engineer recommended replacing only the drip leg traps on the steam distribution system, since this is where most steam loss occurs.

This meant replacing only 12 traps out of a total of approximately 125 in the entire heating system.

After the 12 steam savers were installed, the steam pressure was brought to operating temperature. It was immediately noticed that the cloud of steam usually forming in the boiler room had disappeared. So did the leaks from those traps where the steam saver was installed.

Where heat had been a problem with classrooms farthest from the boilers, they now had the same amount of heat as those classrooms closest to the boiler room.

Seeing success at Lincoln Elementary, it was decided that the next energy management program would be at the senior high school, where a similar problem existed.

In 1990, the school district applied for a DOE grant to convert all 70 traps on drip legs to the steam savers. DOE initially rejected the grant application, stating that steam traps are normally considered a maintenance item, therefore not eligible for grants.

Try again: The district responded by stating that this was not simply a maintenance replacement, but a conversion to a more-efficient, maintenance-free system which will be a permanent solution to a steam-loss problem.

Based on this information, DOE granted the request.

In the summer of 1991, a contractor installed the steam saver in the 70 drip legs. Results:

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**1. Comfortable classrooms.**

Cold classrooms are now history. There is now adequate steam heat to all the rooms.

Also, there is a shorter fire-up time with the steam saver. The boiler is set to start 45 min later than with the mechanical steam traps.

**2. Steam energy savings.**

Since 45 min was saved every day on start-up, this automatically translated into dollars saved. The heating system requires less energy to heat the building.

**3. Less maintenance.**

The workhours required to repair or replace failed mechanical traps were virtually eliminated. Continued inspection of the steam system found those traps equipped with the steam saver to be maintenance-free.

It should be pointed out that to install or replace either a mechanical trap or a steam saver requires approximately 30 min to an hour. Failure rate on mechanical traps was estimated at 25% to 50%.

**4. Noise eliminated.**

Disturbing noises created in the heating system by condensate went down to a whisper — not the loud banging sounds which previously disturbed students and teachers in the classrooms.

The steam saver also corrected a steam-heating problem with a 150,000-gal Olympic-size swimming pool.

Heating was inadequate due to condensate back-up. Once the

steam saver was installed on the pool's heat exchanger, the heating problem disappeared.

As with most school districts, this one has a comprehensive energy management program. The steam-saving concept is an integral part of the planning.

In the future, the district intends to upgrade or replace all of its elementary schools. As part of this planning, the steam saver will be written into all specifications.

Comprehensive Design, Inc., State College, Pa., a consulting engineer firm, prepared specifications for the Tyrone School District's steam-heating projects.

It also performed technical assistance work to secure the grant through the Pennsylvania Energy office.

The Tyrone Area School District has implemented an effective energy conservation program, saving \$1,040,000 over the past 16 years.

The school district has won several awards in the field of energy, including: Award of Energy Responsibility from Pennsylvania Electric Company; School Construction Award from Peoples Natural Gas Company; Governor's Energy Council Award from the Commonwealth of Pennsylvania; and National Award for Energy Innovation from the United States Department of Energy.

*For more information, contact HydroProducts Co., 120 S. Whitfield St., Pittsburgh, Pa. 15206; 412-362-6540.*