Venturi Orifice Steam Traps Reduce Energy Costs and CO_2 Emissions

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Steam traps and steam systems can represent a large proportion of a manufacturing plant's total operating costs. As business managers look for additional ways to cut costs and make operations leaner, many focus on increasing energy efficiency and incorporating cleaner energy options. This approach not only underlines a company's corporate responsibility in decreasing CO_2 emissions but also substantially reduces a company's energy costs, which is a great way to improve the bottom line when growth is difficult. Steam is used extensively in many industries accounting for as much as 40% of a company's fuel bill. Finding ways of reducing these costs is now of major importance to energy, facility and plant managers the world over.

In addition to steam being used to heat raw material and semi-finished products, it is also used to evaporate, distil, boil, brew, react, agitate, clean and sterilise for a wide range of equipment in a diverse range of industries from petroleum and chemical processing, pharmaceutical manufacturing to food production, breweries and laundries. However, steam is not free and as fuel costs increase, so does the cost of producing steam. Ensuring that a steam system is working at maximum capacity and efficiency is becoming increasingly necessary. Therefore it is essential to:

- Determine how efficiently your steam generation is operating based on steam output versus fuel input
- Determine how much steam is being used and how much it is costing to generate this steam
- Determine the effectiveness of your steam traps and whether they are working efficiently

For a steam system to operate effectively it requires the efficient use of steam traps. The job of a steam trap is to get rid of condensate, air and non-condensables as quickly as they accumulate. In addition, for overall efficiency and economy the trap must also provide:

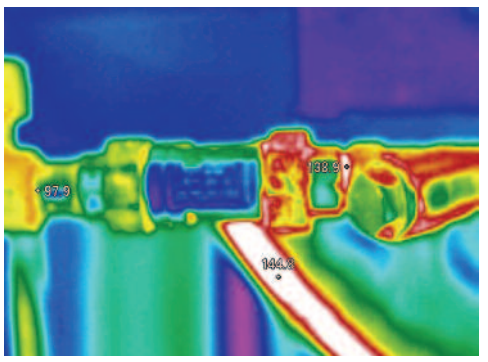
- Minimal steam loss
- Long and dependable service
- Corrosion resistance
- Air and Non-condensable gas venting
- Operation against back pressure
- Freedom from dirt problems

A trap delivering anything other than these desirable features will reduce the efficiency of the system and increase costs. A steam trap is the most important link in the condensate loop, because it connects steam usage with the condensate return.

Malfunctioning steam traps represent a significant source of wasted energy and condensate losses in addition to replacement and maintenance costs. Depending upon an individual maintenance routine, around 15% to 25% of steam traps can be leaking within any factory or site at any one time resulting in hundreds of thousands of pounds of energy being lost annually. This not only represents a major cost in expensive lost steam but also means additional expenditure in maintaining, stocking, checking and replacing mechanical steam traps.

Why Do Steam Traps Fail

Needless to say, anything that is mechanical can and will malfunction and mechanical steam traps are no exception to this rule. Pressure surges due to sudden steam valve openings and improper piping or trap misapplication, which in addition to malfunction can result in water hammer, are some of the main reasons for failure resulting in either it leaking or the trap failing closed. Additionally, when such steam traps fail open, and discharge into condensate return systems, they cause pressurisation of the condensate lines, which inhibits trap drainage and often reduces heat output and production.



Steam traps also need to be working at optimum efficiency so that they minimise the impact on the environment. For example, for each litre of heavy fuel oil burned unnecessarily to compensate for a steam leak, approximately 3kg of CO_2 is emitted to the atmosphere. This size of leak over 1 year in CO_2 is equivalent to the emission from 25 cars.

The Venturi Orifice Design

According to research carried out by Queen's University, Belfast, the venturi orifice designed steam traps, like those produced by Thermal Energy International, have been proven to be the most efficiently designed steam traps on the market providing an average reduction of 11.5% in the portion of the boiler fuel bill that is used to generate trapped steam.

While the venturi orifice design retains its initial efficiency indefinitely, the mechanical trap, with its moving parts, begins to gradually deteriorate. With mechanical steam traps, when heat from steam is lost, vapour condenses to the bottom of the pipe and finally makes its way to the mechanical trap. With the venturi orifice trap, the difference in density between steam and condensate and the continuous flow preferentially discharges the higher density condensate resulting in significantly less condensed water on the heat transfer side of the equipment. This also maintains the steam on the heat transferring side of the equipment resulting in better thermal efficiency.

Unlike a mechanical trap, as the venturi orifice steam trap enables continuous condensate discharge, the trap is equipped with an orifice, sized to the application. Therefore the live steam loss through a venturi orifice trap is significantly lower than the loss through a conventional mechanical trap, even when new.

Through the correct application of venturi throat design and orifice size, the capacity of the venturi orifice design can be self-regulated, dependant on load, and operated from the maximum running conditions to zero. This provides greatly increased capacity during start up.

Now becoming the steam trap of choice for industrial and commercial applications, the venturi orifice steam trap effectively drains condensate from the steam system. As it has no moving parts to wedge open or fail, it provides the ultimate in reliability necessitating only minimal maintenance and requiring no spares, testing or monitoring equipment. Since the trap can handle variable loads and accommodate wide load changes it is suitable for a large range of applications. Venturi orifice steam traps, like those produced by Thermal Energy International, are usually manufactured from high-grade corrosion resistant stainless steel as standard and are performance guaranteed for 10 years, obviating the need for repair or replacement.

Many companies carry out a steam trap inspection only once or twice a year, by which time at least 10% of their steam traps will have failed open, shut or partly open. Losses can include not only wasted energy but also replacement of damaged equipment and misuse of man-hours. Fortunately, installing the low maintenance venturi orifice steam traps can avert many of these potential losses.