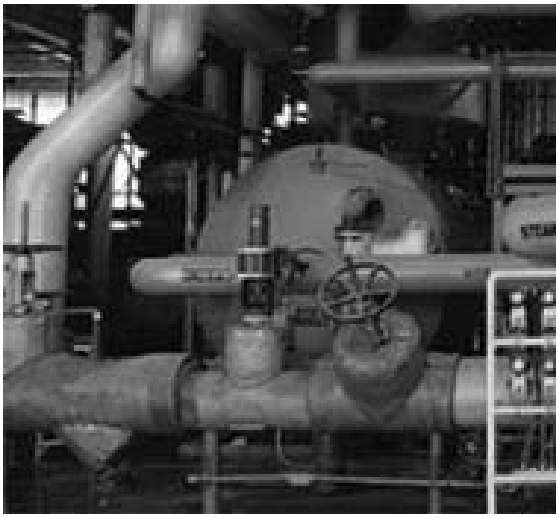
BUSINESS PROGRAMS

Steam systems

BEST PRACTICES

Steam is one of the principal forms of energy used in industrial processes. Nationwide, approximately 35 percent of the total energy used in industrial production is in the form of steam. In Wisconsin, steam boilers annually consume an estimated 800 million therms of natural gas—valued at $680 million per year at a fuel price of $0.85/therm. A typical industrial facility can save as much as 20 percent of its fuel costs through implementation of the steam system best practices presented here.



For more information, call **800.762.7077** or visit **focusonenergy.com.**

1) MAINTAIN STEAM TRAPS

Develop and implement a Steam Trap Management Program that incorporates the following activities:

- Personnel training–on entire steam systems, not just for steam traps
- Identify and inventory steam traps
- Trap inspection and testing procedure–must have a written Standard Operating Procedure (SOP)
- Trap correction processes–included in the SOP
- Trap database and reporting tool. Malfunctioning steam traps waste steam and result in higher boiler fuel consumption. Potential savings for this practice range from 5 to 10 percent of boiler fuel use. The simple payback for a steam trap maintenance program is often one year or less.

2) REDUCE SYSTEM LEAKS

Repair leaks in steam piping, condensate-return lines and fittings. Leaks cause both higher fuel use and increased make-up water consumption. The energy savings potential, especially in higher-pressure systems, increases proportionally with steam loss. Implementing a proactive steam leak management program can reduce a facility's energy usage by 1 percent.

3) ADD INSULATION TO REDUCE HEAT LOSS

Add new insulation where original insulation is damaged, where the original insulation was removed as part of an asbestos abatement program and not replaced, and to new piping and valves. Often, the original integrity of insulation on steam and condensate system piping, equipment, and tanks decreases. Lack of insulation increases heat loss, resulting in higher boiler fuel consumption. As a general rule, proper insulation on hot surfaces will reduce heat loss by 90 percent. Insulation is inexpensive and simple paybacks are within one year.

4) TUNE UP BOILERS REGULARLY

Perform boiler tune-ups at least once per year. A boiler tune-up includes reducing excess air, cleaning boiler tubes and recalibrating boiler controls. The proper combustion air-to-fuel ratio directly affects combustion efficiency. Inadequate air supply yields unburned combustibles (fuel, soot, smoke, and carbon monoxide) while excess air causes heat loss from increased flue gas flow–lowering the boiler's fuel-to-steam efficiency. Generally, boiler efficiency will increase by 1 percent for each 15 percent reduction in excess air. Implementing a routine boiler maintenance program can reduce your facility's energy use by 2 percent and quickly pay for itself.

5) ADD BOILER STACK ECONOMIZERS

Install feedwater economizers to recover stack gas wasted heat. Recovered energy may be used to heat process water, preheat boiler feed water, or preheat combustion air. Fuel requirements can be reduced by 1 percent for each 40°F reduction in stack temperature. Use sensible heat-recovery economizers (non-condensing type) to recover heat for boiler feed water where the flow is continuous. Recover both sensible heat and latent heat with condensing-type economizers. Condensing economizers pay for themselves when used for processes that require hot water with temperatures under 180°F. The typical payback for an economizer is two to three years.

6) MAXIMIZE CONDENSATE RETURN

Install piping to return condensate from the steam end-use equipment back to the boiler. Condensate is clean, treated hot water (condensed from boiler steam) that should be returned to the boiler for re-use whenever practical. Returning condensate reduces the amount of untreated, cold make-up water that would have to be replenished and heated. Facilities that require large quantities of chemical treatment will also reduce their chemical requirements and blow-down rates.

Properly size and insulate condensate piping for maximum benefit. The energy savings equals one Btu for each pound of condensate returned to the boiler for each degree (°F) of temperature difference between the condensate and makeup water. Additional benefits include lower water consumption and wastewater charges.

7) AUTOMATE BLOWDOWN AND RECOVER HEAT FROM BLOW-DOWN STREAM

Convert manual blowdown to automated blowdown to save about a half percent in typical boiler fuel usage. Continuous surface blowdown removes dissolved and suspended solids from boiler water that can cause foaming, carryover, and, in extreme circumstances, results in deposits on heat transfer surfaces.

Recover heat from blow-down stream to get additional efficiency gains. Blow-down heat recovery can reduce boiler fuel consumption by about 1 percent.

8) RECOVER FLASH STEAM HEAT

Use a vent condenser to recover vent steam heat from the condensate receiver, especially when heating processes can use hot water (typically less than 180°F). When hot condensate passes through a steam trap from the high pressure to the low pressure side, a percentage will flash to steam. This steam contains latent and sensible heat energy that can be recovered. The recovered heat can be used in different ways, often to heat make-up water or process water.

9) INSTALL LINKAGELESS AND AUTOMATIC BURNER CONTROLS

Replace mechanical linkage-type burner control actuators with linkageless controls that make adjustments more precisely. Install oxygen trim systems to automatically adjust fuel and air to the ratio curve needed for optimum combustion efficiency over the operating range of the boiler. When boilers operate at partial load, the air-to-fuel ratio may not be set for efficient operation. The O2 trim system adjusts the excess air levels to the already established fuel air ratio curve. Applying a properly designed O2 trim system can reduce boiler fuel consumption. Best candidates are boilers that produce in excess of 25,000 lb/hr of steam.