



Boiler Success Stories

There are multiple ways to successfully implement pollution prevention applications in boiler, furnace and/or kiln operations. Below you will find a few examples of ways to improve energy efficiency, reduce air emissions and annual operating costs by \$1,000 - \$60,000.

Combustion Efficiency:

The Spokane Regional Clean Air Agency recommends that businesses with boilers, furnaces or kilns keep their machines well-tuned, regularly-maintained, and perform a combustion analysis test each year. Keeping a 400,000 British thermal units (btu)/hour boiler (running 24 hours/day, 365 days/year), tuned with a \$1,500 combustion analyzer can save up to \$897 - \$6,709 in reduced natural gas costs annually. That could pay for the cost of the combustion analyzer in the first year.

For this example the cost of \$5.12/400,000 btu of natural gas, for annual total of \$44,728.32 per year. According to the U.S. Dept. of Energy, the percent of fuel efficiency improvement with testing and tuning boiler combustion varies from 2-15%. That would be a \$897 - 6,709 annual savings, depending on the efficiency improvement with the boiler.

Boiler Blowdown:

The boiler blowdown process involves the periodic or continuous removal of water from a boiler to remove accumulated dissolved solids and/or sludges. During the process, water is discharged from the boiler to avoid the negative impacts of dissolved solids or impurities on boiler efficiency and maintenance. However, boiler blowdown wastes energy because the blown down liquid is at about the same temperature as the steam produced. Much of this heat can be recovered by routing the blown down liquid through a heat exchanger that preheats the boiler's makeup water.

A boiler blowdown heat recovery project at the Augusta Newsprint Company mill in Georgia will preheat the boiler feedwater by 17° F to save almost \$31,000 in annual fuel costs. The calculations are based on a normal feedwater

flow of 220 gallons per minute, a temperature differential of 17° F, and a fuel cost of \$2.33 per 1,000 pounds of steam. The total cost of the project is \$15,000; the payback period is about 6 months. Nearly 14,000 million btu's in annual energy savings are expected. *Success story courtesy of U.S Dept. of Energy*

Upgrade & Modernize:

The Rozell Heating Plant at Eastern Washington University upgraded and modernized the boilers that are used to provide heat and hot water to the campus. A new 99.7 MMBtu/hr boiler was installed. In addition, new burners were installed in the four existing boilers at the plant (boilers installed in 1960s & 1970s). The new burners allow the existing boilers to burn fuel oil #2 as a back up fuel, a cleaner burning fuel than fuel oil #6. The five boilers all run on natural gas.

Boilers emit products of combustion, primarily oxides of nitrogen and carbon monoxide (CO). To minimize emissions, the new boiler was equipped with a low NOx burner and flue gas recirculation system, resulting in lower NOx emission concentrations from the new boiler when burning natural gas. The use of a low NOx burner with staged combustion partially delays the combustion process, which results in a cooler flame and less NOx formation. The flue gas recirculation system reduces combustion temperatures and dilutes the concentration of oxygen in the flame by recirculating a portion of the exhaust flue gases back into the flame, again reducing NOx emissions.

NOx emissions from the new boiler are 75% lower than expected emissions from the older boilers. CO emissions are 56% lower. This equates to NOx emissions reduction of 15 tons and CO emissions reduction of 9 tons.