

Energy Conservation at a Tire Manufacturing Facility

The Project.

At a tire manufacturing plant, thousands of tons of tires are produced each year, requiring the use of vast amounts of energy and creating sizeable expenditures for the facility. Conversion Technology, Inc. (CTI) was contracted by the plant to perform an energy conservation audit, investigating methods for reducing energy consumption in order to cut facility expenses. Through analysis, design, and implementation of energy-saving systems, CTI was able to offer the manufacturer a solution that significantly decreased both the overall energy consumption at the facility and the costs associated with energy use.

The Analysis.

CTI's engineers performed a complete analysis of the plant's manufacturing process, determining all energy and material flows. Through this investigation, CTI determined that:

- The plant manufactures 33,000 metric tons of tires per year.
- The total power demand of the plant is 22,474,000 kWh/year.
- No. 6 fuel is the primary fuel source at the facility, using 7,540 tons of fuel each year to generate 103,140 tons of steam.
- In the existing system, significant amounts of heat were discharged to the atmosphere via stacks at the facility.
- The steam and hot water valves and pipes at the facility were not insulated, leading to noteworthy losses in heat energy.

The Solution.

After completing the energy analysis, CTI proposed and implemented several action items intended to reduce facility energy consumption. The improvements made by CTI were:

- Designing a system to use the excess heat from the boiler to heat the boiler feedwater, rather than discharging the heat into the atmosphere. Through the addition of a heat exchanger with a thermal efficiency of 80%, the feedwater is heated from 110° C to 142° C, reducing the expense of heating the water by the combustion of fuel oil (see Figure 1 below).
- Adding a steam turbine the system, providing energy to run the feedwater pump at the facility. Excess steam from the boiler itself is used to run the turbine (see Figure 2 below).
- Adding insulation on all pipes and valves in the system, reducing heat loss throughout the manufacturing processes.
- Implementing a computerized power control system for the steam system.

The Results.

The alterations to facility energy use implemented by CTI have led to noteworthy improvements in energy consumption at the manufacturer:

- The addition of the heat exchanger to heat the boiler feedwater led to a 500-ton decrease in annual No. 6 fuel oil consumption, creating an annual cost savings of approximately \$150,000 for the facility.
- The new 50-HP steam turbine providing energy to the feedwater pump produced an annual energy savings of nearly \$15,000 for the facility.
- Fitting the steam and hot water pipes at the facility with proper insulation brought about nearly \$90,000 in annual savings for the facility by significantly reducing heat loss.

- The investment cost of these improvements was recovered through energy savings at the facility in 3 years.

The Final Word.

CTI’s work at this tire manufacturer makes evident the diversity of methods that can be employed at industrial facilities to create energy savings. Even well-engineered manufacturing processes can often be improved to make them more energy-efficient and cost-effective. Every industry presents unique challenges, but a comprehensive energy conservation audit can examine any facility’s energy consumption and offer innovative solutions to considerably reduce energy costs.

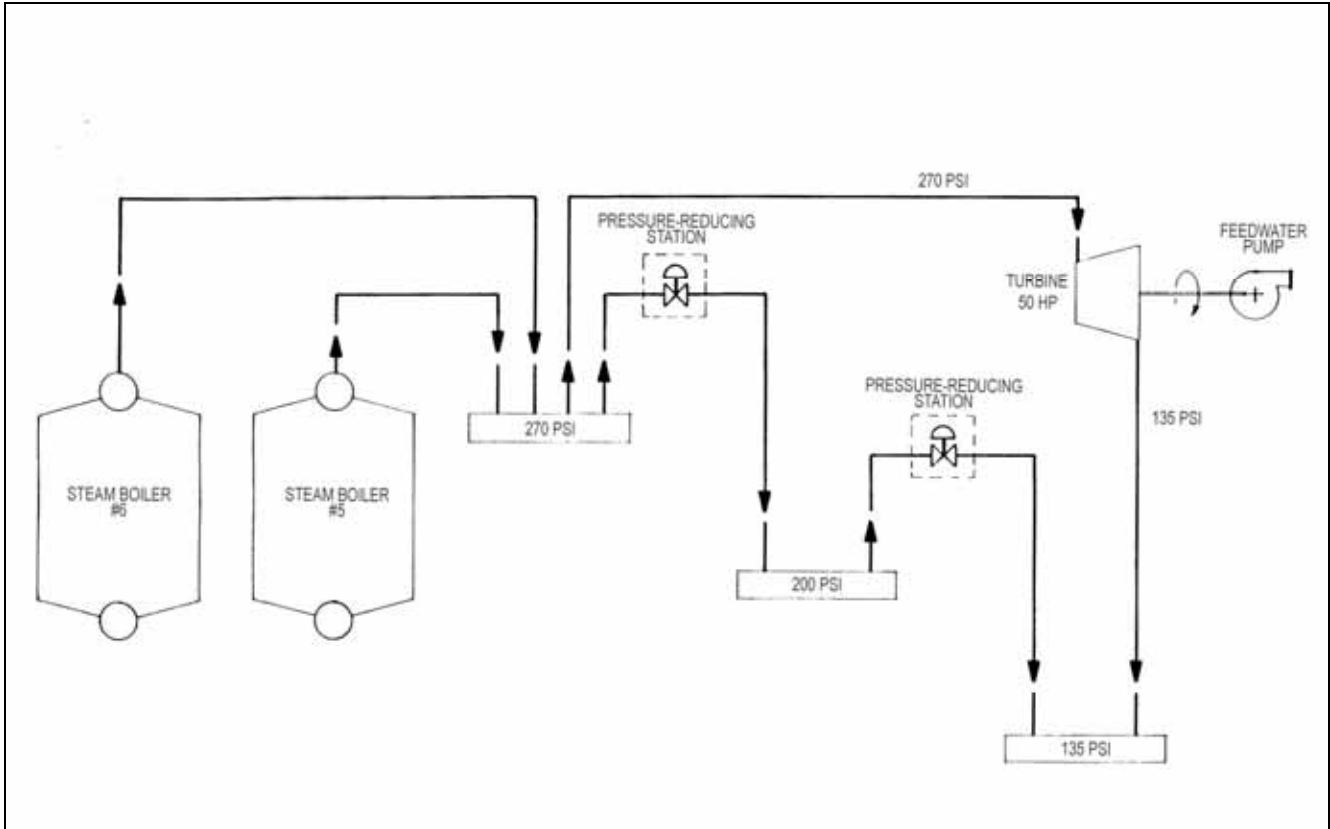


Figure 1: Schematic showing the addition of the 50-HP steam turbine, which uses steam generated by the boilers in order to operate the feedwater pump.

CASE STUDY

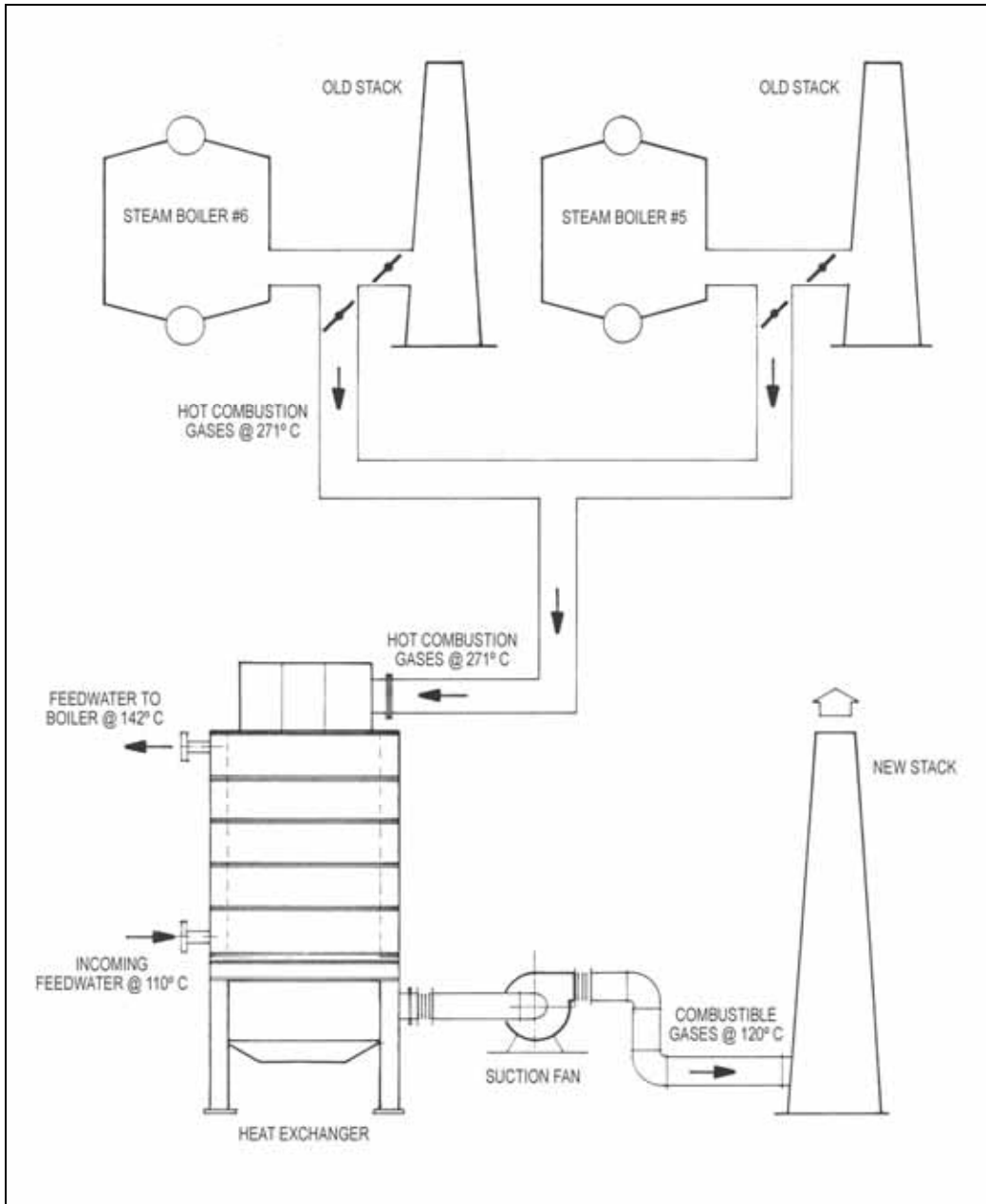


Figure 2: New system design, including the heat exchanger which heats the boiler feedwater, leading to a decrease in fuel oil consumption.