



Case Study

Reducing Gas Usage Saves \$1.2 Million Per Year

The Opportunity

A large chemical plant had the dubious distinction of being the largest consumer of natural gas in the company, resulting in high costs. Also, the plant powerhouses, which consumed natural gas, were threatened by new environmental limits on the furnace exit temperature. These limits could only be met by reducing steam output, which would curtail plant operations. An attempt to save natural gas costs had already been made by burning waste products from production to produce steam (over three million pounds per hour), purified water, electricity, and compressed air.

The Approach

A production improvement group of six people was formed consisting of operators, technicians, and other personnel. A QualPro consultant served as an advisor.

The Test

The project participants used QualPro's 12-Step MVT Process[®]. They decided to run an experiment at one of the powerhouse boilers. The goal was to produce a pound of steam with the least amount of natural gas. Project participants measured the ratio of total natural gas consumed to total steam, various environmental emissions measures (i.e., nitrous oxide, carbon monoxide, and opacity), measures designed to reduce mechanical boiler difficulties (furnace differential pressure and furnace exit temperature), and steam reliability measures (i.e., boiler ratio, system ratio, steam flow, and megawatt to steam ratio). They brainstormed 80 ideas and eliminated those ideas which were not easy, quick, and inexpensive to implement.

<i>Idea</i>	<i>Old</i>	<i>New</i>
Stage Heater	Off	On
Burner Tip Supplier	Old	New
Minimum Fire	55°C	65°C
Atomizing Steam	160 psi	180 psi
Differential Pressure		
Waste Liquid X	4 mpph*	8 mpph
Waste Gas A Flow	300 mscfh**	600 mscfh
Waste Gas B Flow	Off	On
Waste Gas C Flow	150 mscfh	250 mscfh
Waste Gas D Flow	40 mscfh	70 mscfh
Waste Gas E Flow	25 mscfh	35 mscfh
Waste Gas F Flow	Off	On
Pilot Gas Flow	50 mscfh	65 mscfh
Natural Gas/Off-Gas Ratio*	0.20	0.30
Excess O ₂	5%	4%

* Thousand pounds per hour

** Thousand standard cubic feet per hour

The Results

After experimentation, the ratio of total natural gas consumed to total steam produced declined, resulting in a savings of \$1.2 million per year. The ideas that helped were increasing waste gas C flow, increasing waste gas D flow, reducing the pilot gas flow, reducing waste gas E flow, turning on waste gas F flow, lowering the waste liquid X flow, and using the new burner tip supplier. The new burner tip supplier also positively affected other key measures such as exit gas temperature, furnace differential pressure, and nitrous oxide. The company was then able to use more by-product fuels, get the steam rate up, and still comply with environmental furnace exit temperature limits.