ENERGY SAVINGS FOR A STEEL CASTING PLANT

Background

This plant specializes in producing steel castings. The facility had an annual electrical energy consumption of over 17,500,000 kilowatt-hours (kWh) per year and an annual natural gas consumption of over 1 million therms per year. The total energy costs were estimated to be approximately $3.2 million each year.

Potential Energy Savings

The energy efficiency opportunities recommended could potentially save an estimated 2,056,194 kWh of electrical energy each year, or 12% of the plant's total electrical energy usage. The recommendations could reduce the facility's electrical demand by about 647 kW. The recommended measures may reduce the plant's natural gas energy by 157,428 therms per year, or approximately 14% of the plant's total natural gas usage. The potential total annual cost savings due to implementing all of the recommended measures was estimated to be approximately $301,728 per year, which represents about 9% of the plant's total energy costs. Total estimated implementation cost was about $524,206 giving an average simple payback of 1.7 years.

SUMMARY OF ENERGY EFFICIENCY OPPORTUNITIES SAVINGS AND COSTS

Description	Potential Energy Conserved	Demand Savings (kW)	Potential Savings ($/yr)	Implem. Cost ($)	Simple Payback (years)
1 Turn Off Shakeout Dust Collector When Not in Use	120,559 kWh/yr	32.20	14,092	0	Immed.
2 Repair Compressed Air Leaks	141,362 kWh/yr	25.18	15,303	0	Immed.
3 Turn Off Melting Furnace Cooling Tower Fans and Pumps After Furnaces are Cooled	131,629 kWh/yr	18.60	14,492	0	Immed.
4 Turn Off Suction Blower on Air Boxes When Not In Use	36,186 kWh/yr	16.37	4,809	0	Immed.
5 Replace Standard Efficiency Metal Halide Lighting with High Efficiency Metal Halide Lighting as They Burn Out	2,065 kWh/yr	0.57	284	485	1.7
6 Control Quench Tank Mixers with Operation of Lift Motor	113,953 kWh/yr	15.22	12,006	950	0.1
7 Control Quench Tank Pump and Cooling Tower Fan with On/Off Control Based on Tank Water Temperature	120,957 kWh/yr	11.24	12,319	1,182	0.1

SUMMARY OF ENERGY EFFICIENCY OPPORTUNITIES SAVINGS AND COSTS (CONTINUED)						
Description		**Potential Energy Conserved**	**Demand Savings** (kW)	**Potential Savings** ($/yr)	**Implem. Cost** ($)	**Simple Payback** (years)
8 Interlock Auger Drive and Bead Distribution Motors with Table Blaster Operation		10,775 kWh/yr	2.45	1,223	1,560	1.3
9 Replace Standard V-Belts with Cog-Type Belts		16,805 kWh/yr	4.39	2,118	2,011	0.9
10 Install an Adjustable Speed Drive on Dust Collector Serving Grinding Department		43,222 kWh/yr	9.24	4,762	10,735	2.3
11 Install an Adjustable Speed Drive on Dust Collector Serving Mold Department		33,617 kWh/yr	7.18	3,703	11,000	3.0
12 Duct Exhaust Gas from Heat Treating Ovens to Heat Tempering Ovens		157,428 therms/yr	N/A	58,988	54,453	0.9
13 Preheat Scrap Metal with Exhaust from Heat Treating Oven		507,560 kWh/yr	205.49	58,854	182,390	3.1
14 Preheat Scrap Metal with Exhaust from Cleaning and Finishing Oven		777,504 kWh/yr	299.04	98,775	259,440	2.6
Totals	**(Electricity)**	**2,056,194 kWh/yr**	**647 kW**	**$301,728/yr**	**$524,206**	**1.7 years**
	(Natural Gas)	**157,428 therms/yr**				

Major Opportunities for Energy Efficiency

Summaries of some of the major energy efficiency measures are briefly described as follows.

Measure 12 – Duct Exhaust Gas from Heat Treating Ovens to Heat Tempering Ovens

The plant utilizes three natural gas-fired, high temperature heat treating ovens for relieving stresses from the cast products and two tempering ovens for heat treating products. The high-temperature heating ovens operate at a temperature ranging from 1270°F to 1350°F. The tempering ovens were operating at a temperature ranging from 1080°F to 1230°F. It was recommended that the exhaust from the three heat treating ovens be introduced directly into the two tempering ovens. This will reduce the gas consumption of the tempering ovens by approximately 157,428 therms per year.

Measure 14 – Preheat Scrap Metal with Exhaust from Cleaning and Finishing Oven

The plant utilizes a natural gas-fired cleaning and finishing oven for relieving stresses from the cast products. The typical operating temperature of this oven ranges from 1250ºF to 1800ºF. It was recommended that a chamber be built near the electric arc furnace to contain the scrap metal and the hot exhaust gas be introduced directly into the chamber to preheat the scrap material before it is fed into the electric arc melting furnace. Using this exhaust heat to preheat the scrap metal prior to feeding into the electric arc melting furnace will reduce the energy used by the electric furnace to heat the scrap metal to a temperature of 3200 ºF, resulting in an estimated electrical energy savings of 777,504 kWh per year, with a potential demand reduction of 299 kW.