ENERGY SAVINGS FOR A CHEESE MANUFACTURING PLANT

Background

This was a brand new plant that specializes in producing a special cheese. At the time of the audit (not in full production), the plant had equivalent to an annual electrical energy consumption of over 36,000,000 kilowatt-hours (kWh) per year and an annual natural gas consumption of over 600,000 therms per year. The total energy costs were estimated to be approximately $4.1 million each year.

Potential Energy Savings

The energy efficiency opportunities recommended could potentially save an estimated 11,466,677 kWh of electrical energy each year and reduce the plant's electrical demand by about 1,328 kW. The potential total annual cost savings due to implementing all of the recommended measures was estimated to be approximately $1,317,872 per year. Total estimated implementation cost was about $984,183 giving an average simple payback of 0.7 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 Setback the Temperature in Office Areas When Unoccupied	41,629 kWh/yr	0.00	3,852	400	0.2
2 Sequence the Steam Boilers	515,918 kWh/yr 146,880 therms/yr	58.89	145,357	1,600	Immediate
3 Install Occupancy Sensors	79,758 kWh/yr	9.10	7,830	2,040	0.3
4 Reduce the Air Compressor Discharge Pressure	92,865 kWh/yr	10.60	9,117	5,045	0.6
5 Turn Off the Lighting in the Interstitial Space	526,141 kWh/yr	60.06	51,652	6,144	0.1
6 Install VFDs on the Hot Water Pumps	304,400 kWh/yr	34.75	29,884	38,870	0.3
7 Install VFDs on the Indirect Cooling Tower Pumps	698,706 kWh/yr	79.76	68,593	40,020	0.6
8 Reduce the Head Pressure of the Refrigeration System	3,391,236 kWh/yr	408.45	333,980	46,325	0.1
9 Install VFDs on the Boiler Combustion Blowers	505,600 kWh/yr	57.72	49,636	60,030	1.2
10 Install VFDs on the HVAC Chilled Water Pumps	602,484 kWh/yr	68.78	59,147	74,750	1.3

SUMMARY OF ENERGY EFFICIENCY OPPORTUNITIES SAVINGS AND COSTS (CONTINUED)						
Energy Efficiency Measure		**Potential Energy Conserved**	**Demand Savings** (kW)	**Potential Savings** ($/yr)	**Implem. Cost** ($)	**Simple Payback** (years)
11 Reduce the Lighting Levels in the Over-lit Areas of the Plant		740,879 kWh/yr	84.58	72,733	78,039	1.1
12 Install VFDs on the Process Chilled Water Pumps		2,409,936 kWh/yr	275.10	236,588	90,620	0.4
13 Preheat Tempered Water with Superheated Ammonia		76,666 kWh/yr 148,920 therms/yr	0.00	103,593	102,350	1.0
14 Convert the -20 °F Suction Refrigeration into a Two-Stage System		505,160 kWh/yr	69.20	50,163	163,875	3.3
15 Install Bi-Level Lighting Control on the HID Lights		975,299 kWh/yr	111.34	95,747	274,075	2.9
Totals	**(Electricity)**	**11,466,677 kWh/yr**	**1328.3 kW**	**$1,317,872/ yr**	**$984,183**	**0.7 years**
	(Natural Gas)	**295,800 therms/yr**				

Implemented Measures

In following up with the plant half a year after submitting the report, the plant had already implemented a few of the measures and were evaluating the implementation of several other energy efficiency measures. Some of the implemented measures are included as follows.

Measure 5 – Turn Off the Lighting in the Interstitial Space

It was recommended to turn-off the lighting in the interstitial space (utility areas under the main production floor) to save electricity. Currently the utility area is accessed only when equipment requires maintenance (estimated to be 10% of the time), thus unoccupied most of the time. Turning off the lighting for a major part of the time will result in an electrical energy savings of over 526,000 kWh per year and potentially reduce the demand by approximately 60 kW.

Measure 8 – Reduce Head Pressure of the Refrigeration System

It was recommended to reduce the head pressure of the ammonia refrigeration system by running more of the fans and pumps of the existing evaporative condensers more frequently. Increasing the heat rejection rate of the plant's evaporative condensers will lower the system head pressure, which will reduce the power consumption of the ammonia compressors. Increasing the number of evaporative condensers operating in order to reduce the system discharge pressure would result in an estimated total electrical energy savings of over 3,391,000 kWh per year and a potential demand savings of over 400 kW for the ammonia compressors.

Measure 10 – Install VFDs on the HVAC Chilled Water Pumps

Based on the average chilled water refrigeration load (both process and HVAC) at the plant, it was estimated that on average the HVAC chilled water pumps operate at 50% refrigeration capacity. By utilizing VFDs to control each of the 150 hp HVAC chilled water pumps, energy savings of over 600,000 kWh per year, with a demand reduction of almost 69 kW can be obtained due to the fact that the pumps will not be running at 100% load for their entire operating hours. The VFD controllers would be set up to respond to the return chilled water temperature by increasing or decreasing the speed of chilled water pump.