

ENERGY SAVINGS FOR A HIGH TECH FACILITY

Background

The facility studied in this audit develops and manufactures drug delivery products. The facility had an annual electrical energy consumption of over 16,000,000 kilowatt-hours (kWh) per year and an annual natural gas consumption of over 877,000 therms per year. The total energy costs were estimated to be approximately \$2.7 million each year.

Potential Energy Savings

The energy efficiency opportunities recommended could potentially save an estimated 1,205,853 kWh of electrical energy each year, or about 7% of the facility's total electrical energy usage. The recommendations could reduce the facility's electrical demand by about 82 kW. The recommendations could save an estimated 22,352 therms of natural gas each year, or 3% of the plant's total natural gas energy usage. The potential total annual cost savings due to implementing all of the recommended measures was estimated to be approximately \$134,669 per year, which represents about 5% of the facility's total energy costs. Total estimated implementation cost was about \$135,012 giving an average simple payback of 1 year.

SUMMARY OF ENERGY EFFICIENCY OPPORTUNITIES SAVINGS AND COSTS					
Description	Potential Energy Conserved	Demand Savings (kW)	Potential Savings (\$/yr)	Implem. Cost (\$)	Simple Payback (years)
1. Tune Steam Boilers	4,842 therms/yr	N / A	2,406	0	Immediate
2. Install Programmable Thermostats for the HVAC Units in the Office Areas	597,067 kWh/yr	0.00	54,154	0*	0.0
3. Install Adjustable Speed Drives on Air Handler Fans	195,824 kWh/yr	0.00	17,761	0*	0.0
4. Insulate the Dearator Tank	3,649 therms/yr	N / A	3,019	2,341	0.8
5. Install Daylight Sensors in Daylit Areas	53,671 kWh/yr	20.48	8,119	3,090	0.4
6. Install Adjustable Speed Drives on Secondary Chilled Water Pumps	16,168 kWh/yr	1.85	1,760	5,836	3.3
7. Install Lighting Occupancy Sensors in Low Occupancy Areas	54,391 kWh/yr	11.22	6,715	7,564	1.1
8. Sequence the Hot Water Boilers	8,561 therms/yr	N / A	7,083	11,295	1.6
9. Sequence the Steam Boilers	5,300 therms/yr	N / A	4,385	12,043	2.7
10. Replace the High Intensity Discharge (HID) Lighting with High Efficiency T8 Fluorescent Lighting	64,605 kWh/yr	22.59	9,446	22,068	2.3

SUMMARY OF ENERGY EFFICIENCY OPPORTUNITIES SAVINGS AND COSTS (CONTINUED)						
Description	Potential Energy Conserved	Demand Savings (kW)	Potential Savings (\$/yr)	Implem. Cost (\$)	Simple Payback (years)	
11. Replace Electric Steam Humidifiers with More Efficient Ultrasonic Humidifiers	123,219 kWh/yr	14.05	8,988	34,320	3.8	
12. Install Adjustable Speed Drives on the Deionized Water Pumps	100,908 kWh/yr	11.52	10,833	36,455	3.4	
Totals	(Electricity)	1,205,853 kWh/yr	81.7 kW	\$134,669/yr	\$135,012	1.0 year
	(Natural Gas)	22,352 therms/yr				

* The implementation costs for these recommendations are included in the DRO No. 1 “Turn Off Portion of HVAC Compressors Serving Office Areas During Demand Response Events”.

Potential Demand Response Opportunities

The demand response opportunities identified in this report could reduce the total electrical demand in the facility by approximately 158.8 kW during demand response events. This demand reduction will result in an electrical energy credit of \$20,193 per year.

SUMMARY OF DEMAND RESPONSE OPPORTUNITY SAVINGS AND COSTS				
Description	Demand Reduction (kW)	Potential Savings (\$/yr)	Implem. Cost (\$)	Simple Payback (years)
1. Turn Off Some HVAC Compressors Serving the Office Areas During Demand Response Events	82.42	2,191	84,851*	
2. Turn on Only One Lamp in Each Hallway Fixture During Demand Response Events	7.95	216	0	
3. Turn Off Some Lamps in the Warehouse and Break Room During Demand Response Events	28.32	749	Included in DRO No. 1	
4. Reduce Speed of Adjustable-Speed-Drive-Controlled Air Handlers to about 50% During Demand Response Events	45.51	1,210	Included in DRO No. 1	
Totals	164.2 kW	\$4,366/yr	\$84,851	1.1*

* Based on total demand reduction cost savings and cost savings from EEOs No. 2 and 3.

Major Opportunities for Energy Efficiency

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

Measure 2 – Install Programmable Thermostats for the HVAC Units in the Office Areas

There are a total of thirty-three packaged HVAC units that serve the office areas in the facility. It was recommended that these HVAC units be controlled with 7 day programmable thermostats to turn off the units when the office areas are unoccupied during the evenings and weekends. Running the HVAC only when the office areas are occupied will reduce the electrical energy consumption of the HVAC units by approximately 597,067 kWh per year.

Measure 8 – Sequence the Steam Boilers

The facility utilizes two 150-hp steam boilers to produce high pressure steam at 435 psig for process heating. During the audit, both boilers were observed to be operating at fairly low firing rates. It was recommended that a sequencer be installed to control the two high pressure steam boilers based on the facility's steam demand. The sequencer will control one boiler to operate at a higher load and turn off the other boiler. The other boiler would turn on as needed if the first boiler is unable to meet system demand. Controlling only one boiler to operate instead of two will reduce the surface heat loss incurred by one of the boilers resulting in an estimated natural gas energy savings of 5,300 therms per year.

Measure 11 – Replace Electric Steam Humidifiers with More Efficient Ultrasonic Humidifiers

The facility utilizes a total of five electric steam humidifiers to maintain a relative humidity of approximately 40% in the production areas. It was recommended that ultrasonic humidifiers be installed in place of the existing electrically heated units. Ultrasonic humidifiers rely on an adiabatic process that generates a water mist without raising its temperature and reduces humidifier energy usage by over 90% compared to other humidifiers. Replacing the existing electric humidifiers with ultrasonic humidifiers would reduce the energy consumption of the facility by approximately 123,219 kWh per year, with a potential demand reduction of 14 kW.