ENERGY SAVINGS FOR A COMMERCIAL BUILDING

Background

The facility studied in this audit is a 7-story building and has approximately 200,000 ft² of rentable floor area (an estimated 17% of which is vacant) of which the majority is office type space. The facility had an annual electrical energy consumption of over 4,000,000 kilowatt-hours (kWh) per year and an annual natural gas consumption of over 54,000 therms per year. The total energy costs were estimated to be approximately $661,000 each year.

Potential Energy Savings

The energy efficiency opportunities recommended could potentially save an estimated 390,704 kWh of electrical energy each year, or about 10% of the facility's total electrical energy usage. The recommendations could reduce the facility's electrical demand by about 73 kW. The potential total annual cost savings due to implementing all of the recommended measures was estimated to be approximately $58,165 per year, which represents about 9% of the facility's total energy costs. Total estimated implementation cost was about $80,690 giving an average simple payback of 1.4 years.

SUMMARY OF ENERGY EFFICIENCY OPPORTUNITIES SAVINGS AND COSTS

Energy Efficiency Opportunity	Potential Energy Conserved	Demand Savings (kW)	Potential Savings ($/yr)	Implem. Cost* ($)	Simple Payback* (years)
1 Replace Standard V-Belts with Cog-Type Belts	4,076 kWh/yr	0.46	538	476	0.9
2 Install Higher Efficiency Motors*	8,179 kWh/yr	1.44	1,281	542	0.4
3 Delamp Overlit Areas	95,553 kWh/yr	22.54	14,539	1,665	0.1
4 Replace Conventional Incandescent, Halogen, and Mercury Vapor Lamps in Building with Compact Fluorescents	11,198 kWh/yr	4.10	3,726	2,019	0.5
5 Install Adjustable Speed Drives on Hot Water Pumps	18,357 kWh/yr	0.0	2,087	5,204	2.5
6 Install Adjustable Speed Drives on Condenser Water Pumps	58,285 kWh/yr	0.0	6,627	6,498	1.0
7 Install Occupancy Sensors Throughout the Building	24,420 kWh/yr	8.95	4,235	7,584	1.8
8 Install an Adjustable Speed Drive on Cooling Tower Fan Motors	88,955 kWh/yr	10.16	11,770	9,252	0.8
9 Install High Efficiency T8 Fluorescent Lighting	28,538 kWh/yr	3.25	3,773	15,320	4.1
10 Install Window Film on South Side Windows	53,143 kWh/yr	21.77	9,589	32,130	3.4
Total Energy Savings	**390,704 kWh/yr**	**72.67 kW**	**$58,165/yr**	**$80,690**	**1.4 years**

* Based on two year figure.

Implemented Measures

In following up with the plant half a year after submitting the report, the plant had already implemented or are in the planning stages of implementing all of the recommended energy efficiency measures. Some of the implemented measures are included as follows.

Measure 3 – Delamp Overlit Area

During the audit of the facility, it was observed that many areas in the building were considerably overlit. Light intensity measurements were taken and compared to standards shown in the IESNA Lighting Handbook. It was determined that the recommended areas can reduce the light levels from 26% up to 82%, resulting in an electrical energy savings of approximately 95,000 kWh per year and a demand reduction of 22 kW. The facility started implementing this measure immediately after our recommendation.

Measure 8 – Install and Adjustable Speed Drive on Cooling Tower Fan Motors

Cooling water for the building is produced by a 440-ton cooling tower. Cooling tower water is used to maintain building temperature (space cooling). The cooling tower currently has no fan control, and consequently the fan runs continuously at full load. By controlling the cooling tower fan to reduce its rotational speed when the necessary cooling capacity has been reached, an electrical energy savings of approximately 89,000 kWh per year and a demand reduction of 10 kW can be realized. This measure was being planned for implementation shortly after our recommendation.

Measure 16 – Install Window Film on South Side Windows

During the audit, the audit team noted that a high percentage of windows had the blinds fully closed during the late afternoon. Window film blocks most solar heat gain while transmitting most visible light. It was recommended that window film be installed on the south side windows to block solar gain and improve tenants' satisfaction. eQuest, a DOE-2 based building simulation software, was used to develop a model of the office building to determine the potential energy savings for installing window film on the south side windows. The total electrical energy savings due to installing window film on the south side windows was estimated to be over 53,000 kWh/yr, with a demand reduction of almost 22 kW. This measure was being budgeted and planned for implementation in the near future.