Biwater Energy Consultation

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WPI

Mole Valley District Council

1. Introduction

The purpose of this energy consultation was to discover potential areas of energy reduction and savings within the Biwater office building in Dorking. This consultation was conducted using a questionnaire and check list during a walk-through, with supplementary data on past gas and electric usage. Biwater is an international company, whose Dorking office building is attached to the Dorking train station, and houses an additional tenant company. The Biwater staff is very energy conscious and already making many efforts towards carbon reduction.

The energy consultation, analysis, and report were completed by four American university students, for a project requirement for Worcester Polytechnic Institute. These students are working with the Mole Valley District Council to help reduce the carbon emissions of small and medium enterprises in the Mole Valley.

Notice: While there has been an effort made to ensure that the information contained in this report is accurate, it should be taken into consideration that some of the information may be incomplete, inaccurate, or become out of date. Therefore, Mole Valley District Council, Worcester Polytechnic Institute, and all associated persons do not provide any guarantees on the information provided in the following report.

2. Action Plan

The recommendations listed below are prioritized by payback period and estimated costs. Further explanations of each recommendation are provided.

Priority	Recommendations	Estimated Annual Savings			Estimated Costs (£)	Payback Periods (years)
		(£)	CO_2 (Kg)	(kWh)		
1	Lighting Control	375	3,656	6,699	---	---
2	Additions to Building Management System	---	---	---	---	---
3	LED Lighting	520	2,940	5,390	2,494	4.8
4	Envelope and Door Insulation	3	16	30	---	---
Total		898	6,612	12,119	2,494	4.8

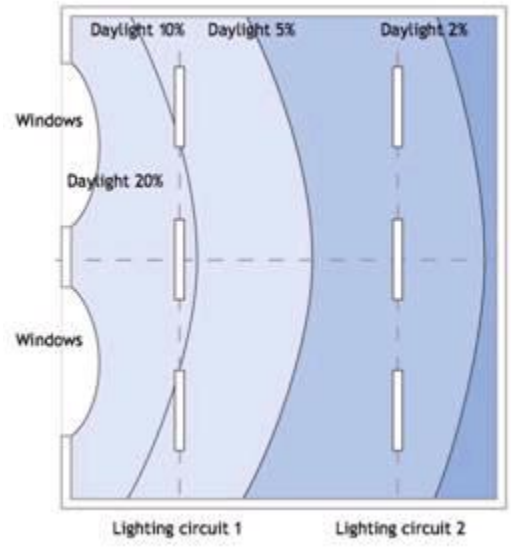
3. Energy Savings

a. Priority 1: Lighting Control

Lights that are on when they are not needed consume extra energy. There are different situations which can result in lights being on, though they not needed. Timed lights, lights in often though not continuously used areas, or incorrectly zoned lights are some examples of why more lights may be in use than are needed.

Site Specific Examples:

- The lights outside of the main entrance to the building are set on a timer to be turned on throughout the day, when the office is open. Installing a light sensor for these lights that would turn them off when it is a sunny day would save energy, since they are currently turned on all day, no matter how bright it is outside.
- The lights in the open office areas of the building are zoned in square sections. These lights should be zoned such that the line of lights closest to the windows are one zone with subsequent zones moving further from the windows. If they are zoned in this manner, the lights closest to the windows can be turned off when the sun provides sufficient lighting, therefore saving energy. This means, with sufficient sunlight, approximately one eight to one quarter of a large room's energy consumption can be cut, and one half of a small office can be cut.



Total Number of Bulbs in Zoning Area	Total Current kWh per Year	New kWh if 1/4-1/8 of Lights are Turned Off	Money Saved per Year (£)	CO_2 Savings (kg of CO_2)
298	21,890	19,150-20,520	270-130	1,500-750

*This is if the lights are off for half a day on average throughout the year

- Toilettes are frequently used areas, where the lights are left on when no one is in the room. All the toilettes in the building should have motion sensors installed on the lights. This will save energy by turning off the lights when the room is not being used, while adding the convenience of having the lights turn on when someone enters the area. For added employee convenience with motion sensors, check to see if it has a timer.

Location	**Total Number of Bulbs in Zoning Area**	**Watt of Bulb**	**Total Current kWh per Year**	**New Consumption with Technology**	**Money Saved per Year (£)**	**CO2 Savings (kg of CO2)**	**Cost of Appropriate Sensor (£)**	**Payback Period (Years)**
Outside	14	26	786	393	38	214	50	1.3
Toilette	14	50	1,512	378	37	618	50	1.4
Toilette	74	26	4,156	1,039	100	1699	50	0.5

b. Priority 2: Additions to Building Management System

Adding controls or sensors to a BMS will allow it to work less and, therefore save energy. Controlling the air flow and temperature in a building, especially a larger one, can be stressful and time-consuming for the facilities staff. The BMS is an automatic control that handles most of the managing load with timers and electronic thermostat settings. When the BMS has more information, it can work in a more efficient manner and help cut costs. Some devices can be added to the BMS to help it work in a smarter manner.

Site Specific Examples:

- Oxygen sensors measure the amount of oxygen extracted from a room, with these linked to a BMS, it could make way for a closed loop ventilation system. When the system senses a low-level of oxygen in the air, the outside air vent will open allowing for fresh air to mix in. When the vent is closed, old air is reused to make the system work less hard.

c. Priority 3: LED Lighting

Replace existing lights in the facility with newer lights. Many old lighting elements have become inefficient over the years. Replacing the existing elements with LED equivalents allows you to save significant amounts of money on your energy bill. If LED bulbs are not a viable option at the current time then CFL and fluorescent tubes can be used but make sure that the most efficient ones are in use i.e. T8 or T5's for fluorescent tubes and bulbs with high energy ratings of A or B should be used. The table below breaks down the recommended areas where lighting should be replaced with all the correlating information about payback periods and costs.

Site Specific Examples:

- All halogen spotlights can be replaced with lower wattage LED lighting where possible.

Old Light Bulb Wattage (W)	New Bulb Type	New Light Bulb Wattage (W)*	Price per New Bulb (£)*	Number of Bulbs Replacing	Price of Electricity (£)**	Total Bulb Costs	Savings per Year (£)	kWh Saved per Year (kWh)	Payback Period (years)	CO_2 Savings per Year (kg CO_2)
50	LED	7	43	58	0.09669	2,494	520	5,390	4.80	2,940

*All calculations are based off pricing and wattage from Halers Lighting 2011 Catalogue

**This is based off your current rates

d. Priority 4: Building Envelope

Instead of purchasing new windows, make the old ones work in a more efficient manner.

Site Specific Examples:

- The windows that surround the building can be more efficient with the aid of window insulation film. Specifically convection control film which cuts down the amount of heat lost from the inside of the building. It can also prevent window condensation, another reason for heat lost.
- Consider using platinum polystyrene beads to fill in the cavities in the window frame. The thermal conductivity of this substance is 0.033 w/m^2. This may or may not increase window insulation, a free quote and estimate can be obtained from various companies, ask for energy saving qualities.

Estimated Values

Number of Windows	kWh Saved per Window per Year	Total kWh Saved per year	Total Savings (£)
306	0.1	30.6	3

4. Additional Considerations

These are items that should be considered to help increase energy savings.

Site Specific Examples:

- The tube lights in the lift may be able to be replaced with LEDs. The lights in the lift are on all of the time, unless power to the lift is shut off. The large T-12 and T-8s in the lift can be replaced by 22-W LED lights. This would result in approximately a 1.5 year payback period, not factoring in the labor of such an exchange. Consult the elevator company about this.
- Consider changing the 28 Watt butterfly compact fluorescent one to the smaller 14 Watt bulb to consume half as much electricity. However, exchanging power consumption also means exchanging brightness; ensure that this does not violate any safety regulations.

5. Brief Summary

In summary it can be seen that while this building is already doing very well in energy efficiency, there are still areas which can be improved to help reduce energy usage. Many of these steps are of a higher cost or more difficulty, but will be worth the change due to the amount saved on energy bills.