Day Centre Energy Consultation

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WPI

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1. Introduction

The purpose of this energy consultation was to discover potential areas of energy reduction and savings within the Day Centre in Leatherhead. This consultation was conducted using a questionnaire and check list during a walk-through, with supplementary data on past gas and electric usage. The Day Centre is an older building home to a small staff and daily events held for elderly visitors above the age of sixty. Due to its age there are many areas where energy savings can be found.

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accurate, it should be taken into consideration that some of the information may be incomplete, inaccurate, or become out of date.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	Behavioral Changes	-	-	-	Minimal	Immediate
2	LED Lighting	200	1390	2,540	2,860	14.5
3	Envelope and Door Insulation	310	3190	5850	390	1.3
Total		510	4580	8390	3250	6.4

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3. Current Use and Potential Savings

This is a breakdown of your current costs and what your expected cost may be with these recommendations.

Utility	Energy Consumption		Costs		CO_2 Emissions	
	kWh/year	**%**	**£/year**	**%**	**CO_2 (Kg)**	**%**
Electricity	31,655.00	23.43	4,263.34	55.87	17,258.94	47.39
Gas	103,430.00	76.57	3,366.85	44.13	19,158.34	52.61
Total	135,085.00	100	7,630.19	100	36,417.28	100
	Projected Energy Consumption	**% Savings**	**Projected Savings(£/year)**	**% Savings**	**Projected CO_2 Emissions (Kg)**	**% Savings**
	126,695	6	7,120	7	31,838	13

4. Energy Savings

a. Priority 1: Behavioral Changes, No Cost Solutions

Make sure that all radiators are unobstructed and kept on appropriate settings. Obstructed radiators are forced to work harder to heat a room resulting in higher energy usage. Also a radiator that is left on its maximum setting will never turn off and over heat a room. Keeping radiators unobstructed and at a setting of 3 to 4 you will save energy and money.

Site Specific Examples:

- Many of the radiators in the building were obstructed by furniture or other items and should be moved accordingly if at all possible. See Figure 1 and Figure 2 below for some examples.

Figure 1: Desk in front of a radiator

Figure 2: Chair in front of a radiator

- When TRV's are put in maintain them at a level of 3-4 unless otherwise needed.
    - In the unused office put the TRV on the lowest setting so that it remains off.
    - In the corridor towards the kitchen the radiators should be on the lowest setting as the kitchen staff will most likely not need the area to be heated.

- In the hair dressers the settings can be kept lower (1-3) as the hair dryers and other equipment will likely supply extra heat.

Turn off lighting and electrical equipment when it is unnecessary. Lights and equipment that are left on when they are not in use consume unnecessary energy. Putting signs up reminding people to turn lights and equipment off when leaving a room will help to save energy. See attached examples on signs to turn off lights.

Site Specific Examples:

- Be sure that the lights in unoccupied rooms are always switched off.
- Try to use more natural light, whenever possible
- Create maintenance schedule for cleaning skylights, to maximize their use.
- Turn off switches on electrical outlets or unplug all items when they are not being used, to avoid using power for items that are not on.
- Motion sensors should be installed in toilets that don't already have them, and the kitchen 'store' room. The lights in the store room are left on all day for the convenience of the kitchen staff, since the switch is located behind the door when it is opened, and they are often in the room for short periods of time.
- Higher traffic rooms, in which the lights are often left on when no one is occupying them, should have motion sensors installed to help decrease energy usage.

b. Priority 2: Envelope and Door Insulation

Doors that protect rooms from different temperature air should close properly and have rubber seals and skirts. Doors that are not insulated or do not close will cause drafts in a building, resulting in the heating and cooling systems to work harder to maintain the buildings temperature.

Site Specific Examples:

- All exterior doors should be insulated with a new rubber seal and skirt, to protect against the loss of heat in the building.
- The inner door of the main entrance vestibule is an automatic door that does not work correctly. The door is stuck open all day, allowing for cold air to enter the building continuously, and should be fixed.
- The exterior door in the dining room does not close properly. The door should be fixed so that the door properly latches when closed.
- The exterior door in the tea room also does not latch closed, leaving much space for cold outside air to enter the building.
- Insulate doors from main corridor to kitchen corridor and check to be sure they stay closed when exterior door of kitchen corridor is opened, to keep heat in main area of the building.

Holes in the envelope of a building result in drafts causing the heating system to overwork. Sealing holes in the envelope of the building will reduce energy bills, because the heating and ventilation systems won't have to work as hard to maintain the temperature of the building.

Site Specific Examples:

- The ceiling vents in the building tend to be forced open by the wind, resulting in cold air flowing into the building. This causes the need for the extract fans to be turned on. The heating also has to work harder when this occurs. Finding a way of keeping the vents closed during the winter will increase the efficiency of the buildings heating system.
    - A recommendation to fix this problem is to install removable covers over the vents.
- Some windows were found to be drafty and in some cases warped to the point that they were partially open on one side. See Figure 3 below.

Figure 3: Warped window

c. Priority 4: 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 fluorescent and incandescent lights should be replaced with lower wattage LED light tubes.

Old Light Bulb Wattage (W)	New Bulb Type	New Light Bulb Wattage (W)*	Hours worked per year	Additional Hours per Week	Number of Bulbs Replacing	Price of Electricity (£)	Total Bulb Costs	Total Costs Including Labour**	Savings per Year (£)	kWh Saved per Year (kWh)	Payback Period (years)	Payback Period Including Labour Costs (years)**	CO2 Savings per Year (Kg of CO2)
65	LED Tube	30	1920	8	10	0.07748	746	786	62	806	12	12.6	440
58	LED Tube	30	1920	8	25	0.07748	1866	1966	125	1613	15	15.7	879
60	LED Bulb	5	1920		1	0.07748	12	16	8	106	1.5	2	58
60	LED Bulb	5	60		6	0.07748	72	96	2	20	46.9	62.5	11
				Totals	42	---	2696	2864	197	2545	13.7	14.5	1388

*All calculations are based off of pricing and wattage from NET LED

**Based off an estimated £4 instillation cost per bulb. Professional quotation should be acquired.

5. Additional Considerations

These are items that should be considered to help increase energy savings. These changes are difficult to quantify due to their vague and varying nature.

Site Specific Examples:

- There should be a maintenance plan set in place for the sky lights to be cleaned so that they are more effective.
- The insulation in the roof is falling out and should be fixed and maintained so that they can keep the building insulated. This will result in savings on the gas bill as the heating will not have to go on as much as possible. The Figure 4 below shows the falling insulation.

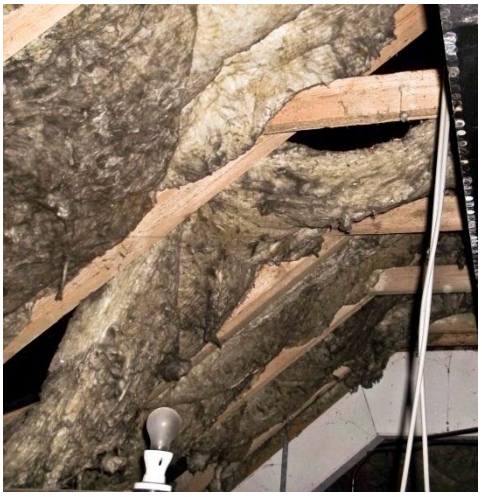

Figure 4: Insulation falling off the roof

6. Brief Summary

In summary it can be seen that there are a number of ways to save energy for this building. Many of these savings will come from the general maintenance of the building, such as ensuring that doors close and are sealed properly, as well as covering vents which bring cold air into the building. Other changes may require more capital outlay, but can result in great savings such as the LED lighting, which can save £200/year. Taking these steps and more will help to reduce your energy bill and save you money.