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SUSTAINABLE DRYING CABINETS

REPLACEMENT PROJECT, UNIVERSITY OF OXFORD

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INTRODUCTION

Drying cabinets are an essential item of equipment across the chemical and life sciences. However, what was overlooked until recently was the design of these units and how much energy they consume.

This report will highlight the savings that can be made by replacing the older design drying cabinets with a more energy efficient, modern unit.

THE TRADITIONAL DRYING CABINET

The design of the drying cabinet commonly used over the last 30 years hasn't really changed. Units tend to consist of a metal box, a hinged or sliding glass door, a heating element and dial to set the temperature from 1 to 10. With zero insulation these units become very hot and consume a lot of energy. The energy consumed by a drying cabinet is remarkably high. In fact 'pound for pound' or to be more precise 'litre for litre' a drying cabinet at 70C will use up to ten times the energy of an Ultra Low Temperature (ULT) freezer set at -80C! The University of Oxford had 159 of traditional unit types.

Figure 1. The traditional design of drying cabinet.

REPLACING OLD WITH NEW

The University of Oxford carried out the largest drying cabinet replacement project in the UK. The traditional type units were replaced with the next generation of drying cabinets. The differences between these two model types are shown in figure 2.

Design Feature	'Old' Design Drying Cabinets	'New' E3 Drying Cabinets
Insulation	**None** – Surfaces become very hot, unsafe to tough. High energy consumption. Higher HVAC costs.	**Insulated** – Both the control panel and chamber are insulated with natural materials. The doors of the larger units are also double glazed. Safe to touch and energy efficient. Lower HVAC costs
Temperature Setting	**Dial** – Numerical dial 1-10 made setting the exact temperature challenging, internal conditions could be too hot for contents (plasticware and tips).	**Digital** – Temperature can be precisely set to 0.1C to suit the contents being dried.
Temperature Control System	**Simmerstat** – Basic controller with poor temperature accuracy and variability at set point.	**Microprocessor** – Heating element is finely controlled, temperature is held accurately. Improves energy efficiency
Temperature Display	**None** – External monitoring is required to know what tm	**L.E.D.** – Temperature is clearly displayed.
Programmability	**None** - Units must be switched off manually or an external timer must be used.	**7 Day Timer** – Unit will only be on when it's required.

Figure 2. Old drying cabinet design features versus the new E3 models.

The 159 traditional units were replaced with 154 E3 models. The improvements in energy efficiency and programming the replacement units to operate from 7am to 7pm Monday resulted in a **72%** reduction in energy consumption (figure 3).

% Reduction in kWh	72.19
kWh/Yr Saved	501109.16
kWh/Yr Saved (£)	£50,110.92
T/CO2/Yr Saved	141.85
Payback Period (Yrs)	4.19

Figure 3. Project savings (£0.10/kWh, 283g/CO_2e/kWh)

The 72% reduction in energy consumption is a **conservative figure** as a number of the older units were being used at a 50C set point and their energy consumption has been compared to all E3 models running at 75C. Furthermore the savings calculated do not include any associated savings in air conditioning gained form the reduced heat output into the laboratory.

The replacement E3 models (figure 4) have an estimated lifespan of 15 years. This would mean that for the remaining 10+ years of their lifespan the University will save in excess of £500,000 in electricity costs and 1,400 tonnes of carbon emissions.

Figure 4. 200L E3 drying cabinet.

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