Green Labs - Cold Storage 2018

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Sustainable Labs Co-ordinator, Environment & Energy

Wednesday 18th July 2018 – Addenbrooke’s Site
Thursday 19th July 2018 – Downing Site (Central Cambridge)

Environment & Energy

Agenda

• Introduce Green Labs
• Equipment Replacement Programme 2 Year Review
• ULT freezers – performance
• Ryan Bentley - The Good, The Bad and The Better Practice
• 20°C and fridges
• Factors affecting performance
• Conclusion and Feedback
Green Labs

- To assist lab-related staff and students to improve lab performance, particularly in relation to environmental impact, energy usage and carbon emissions.
- Supersedes the dormant Cold Storage Best Practice Group with a broader scope.
- Information, contacts, surveys, funding, investigation
- Future workshops on a range of topics

Useful approved information, advice and case studies of environmentally sound options. Updated periodically.
Outreach across University, encouraging evaluation and improvement of lab processes, behaviour, facilities and set-up.
Workshops are about hearing and sharing our various experiences on these topics. Helps gear Green Labs to be of most relevance to you.

https://www.environment.admin.cam.ac.uk/green-labs
https://www.environment.admin.cam.ac.uk/green-labs-guidance
https://www.environment.admin.cam.ac.uk/green-labs/green-labs-surveys-awards
Slide 4

**Cold Storage – the case for improvement**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tbody>
<tr>
<td>Est. number of ULT freezers at University of Cambridge</td>
<td>700 (+~60)</td>
</tr>
<tr>
<td>Est. Annual University spend on ULT freezer electricity:</td>
<td>£730,000 (4.5%)</td>
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<tr>
<td>Est. Annual Carbon Emissions from University ULT freezer electricity usage</td>
<td>&gt;2,000 tonnes CO₂e</td>
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Plus fridges, -20°C freezers, cold rooms, cryogenic storage…

Slide 5

**Equipment Replacement Programme – 2 year review**

<table>
<thead>
<tr>
<th>Form of Support</th>
<th>Description</th>
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<tbody>
<tr>
<td>Replacement (1-for-1)</td>
<td>-80°C Freezers 10 years or more in age.</td>
</tr>
<tr>
<td>Reduction (2-for-1)</td>
<td>100% of the approved new freezer ‘in exchange’ for 2 units.</td>
</tr>
<tr>
<td>Addition* (no old unit(s) disposed of)</td>
<td>Up to £1,000 per new energy efficient freezer.</td>
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</tbody>
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Number of Successful Applications

<table>
<thead>
<tr>
<th>Number</th>
<th>Category</th>
<th>£120,000</th>
<th>£148,322</th>
<th>£184,505</th>
<th>£22,893</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Biological Sciences</td>
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<td>Clinical Medicine</td>
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<td>Physical Sciences</td>
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<tr>
<td></td>
<td>Technology</td>
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Equipment Replacement Programme Funding Allocated (as of July 2018)
ULT Freezers – Monitored Performance

Average electricity usage reduction: 72%
Annual electricity usage saving: £765 /freezer
Carbon emissions avoided annually: 2.2 tonnes CO₂e /freezer

Monitoring is an important part of the Equipment Replacement Programme, to make sure there is payback on investment.
Both before-and-after replacement monitoring, and monitoring of new freezers only (when the old freezer is already gone, or broken) are valuable.

New generation freezers are a step-improvement. They perform at or below 10kWh/day, when set to -80°C.
-20°C Freezers and Fridges

- Use a fraction of the energy of ULT freezers, but there are more...
- Spark-free and ATEX certified
- Gathering information on which makes and models are the most efficient and the best quality.

A recent underbench fridge replacement in Plant Sciences reduced usage from 0.51 kWh/day to 0.21 kWh/day (58% reduction). £13 a year saving.

- There is not a financial case for helping funding of replacements in the same format as ULT freezers on the Equipment Replacement Programme – Bespoke projects welcome.

John Hulme, Chemical Safety Officer:
It is most unlikely laboratories will need ATEX rated fridges or freezers as almost all labs are not subject to DSEAR zoning. Therefore regular ‘spark-free’ will be sufficient. In reality there is a tiny spark risk with these.
Factors affecting performance

- Inductions, in-lab intros and training
- Guidance documents and outreach
- Sample trackers, allocated space
- Temperature monitoring and data usage: T-Scan; Britannia/Eltek; built in to new units. Useful for more than fault-finding (CIMR)?
- Set temperature. -80°C to -70°C
- International freezer challenge: https://www.freezerchallenge.org/

At CIMR, on days when the freezer was opened, freezers used 8-24% more electricity on those days.

MRC Epidemiology and others have chilled up, based on the type of sample (-70°C for non-tissue/DNA samples). Remains contentious, but the energy efficiency improvements are significant and worthwhile, if sample integrity can be assured. https://www.freezerchallenge.org/temperature-tuning.html

https://www.freezerchallenge.org
Conclusion and Feedback

- Improvements are being made with cold storage across the University, in a variety of ways
- Commonalities in the challenges, but maybe also in solutions. Experiences shared and learned from.
- How can Green Labs best help you on this topic and others? Feedback appreciated.

How can Green Labs best help you on this topic and others?
Assistance with monitoring and benchmarking?
Ideas for repeat and different events/outreach?
Surveys?
Thank you for coming

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Environment & Energy welcome enquiries.
A more sustainable research space is a safe space, a more efficiently used space and a more pleasant place to work.
Safe, Successful, Sustainable.

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