UQ Sustainability
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The University Of Queensland
AUSTRALIA

CREATE CHANGE

GREEN LABS

BEST PRACTICE GUIDE

UQ GREEN LABS BEST PRACTICE GUIDE

Laboratory operation has many significant environmental impacts ranging from energy and resource consumption to chemical and equipment use and disposal. This Green Labs Best Practice Guide serves as a reference outlining sustainable practices for UQ lab personnel.

CONTENTS

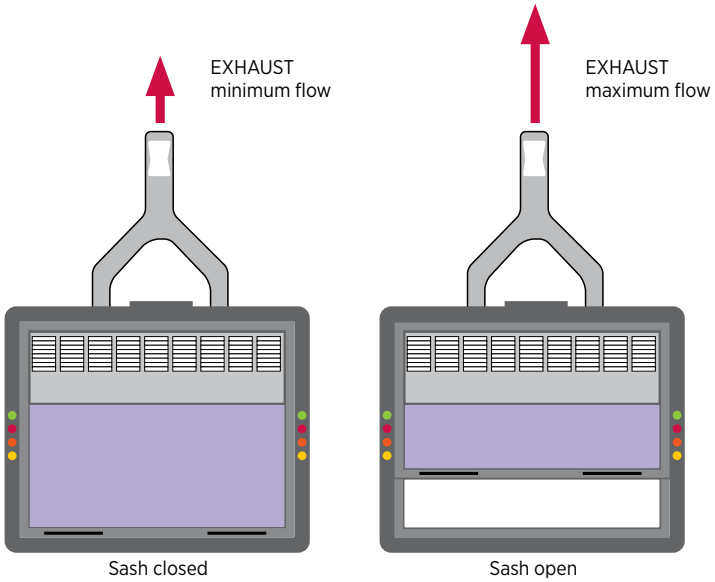
ENERGY USE

Fume cupboards

Fume cupboards are significant energy users in the lab. Air is constantly drawn through the fume cupboard and discharged through the ducts outside.

To save energy:

- The sash should be kept as low as possible during operation and only raised to the highest level during set up of the experiment. In general the sash should be shut.
- Use the sash ruler sticker. To request stickers email **greenlabs@pf.uq.edu.au**.
- To discuss whether the installation of automatic sash closers would be beneficial in your lab, email **sustainability@uq.edu.au**.



Closing the sash instead of leaving it open will save up to $2000 per year in heating/cooling energy costs. An open sash wastes energy and increases the risk to lab users from fumes.

A regular cleaning and maintenance schedule will help maintain freezer efficiency.

One ULT freezer uses the same amount of energy as an average Australian household every single day! And if that freezer is more than 15 years old, it's an even bigger energy drain, using almost double the energy of a newer model.

Biological Safety and Laminar Flow Cabinets

Laminar flow and biological safety cabinets both use significant amounts of energy and affect the operation of the lab air-conditioning system as it works to balance air flows.

To save energy:

- Ensure cabinets are turned off when not in use.
- Ensure UV lights are not left on for extended periods after use.

Freezers

ULT (-80°C) freezers are the most energy intensive type of "plug load" equipment in a laboratory. Take the following steps to decrease energy usage, reduce operating and maintenance costs and reduce risk of sample loss:

- Implement a cleaning and defrost roster. More information on maintenance activities can be found in the **Freezer Maintenance Guide**.
- Optimise cold storage space, and conduct an annual cleanout of old unwanted samples.
- Avoid purchasing a new freezer if possible. Instead clean out space in your existing freezer to accommodate new samples, or share freezer space with a neighbouring lab.
- If you need to buy a new freezer, look for an efficient model by comparing **Energy Star Certified Lab Grade Refrigerators and Freezers**.
- Set up an inventory – enter your samples on a searchable database to keep samples organised and minimise the amount of time needed to find a sample.
- Chill up – consider raising freezer temperatures by 5 to 10 degrees. Raising freezer temperatures from -80 to -70 degrees significantly reduces energy consumption and research shows that many samples keep just as well at -70. For more information contact Green Labs at **greenlabs@pf.uq.edu.au**.

Appliance Efficiency

Lab equipment can be very energy intensive. Here are some tips to conserve energy where you can:

- Turn off laboratory equipment when not in use, especially anything with a heating function e.g. heating blocks, microscopes, PCR machines, water baths, autoclaves and incubators.
- "Switch Off & Save" stickers can be placed near switches to act as a reminder.
- Evaluate the amount of time it takes for this equipment to get up to temperature and place a "Warm Up Time" sticker with this information on the unit. Users will then be informed about how long it will take to reach temperature and can plan accordingly.
- Use properly sized appliances e.g. using an oversized autoclave may consume ten times the energy of a sufficient countertop version.
- Install timers on equipment that is often left on but could be turned off at night and on the weekends e.g. heating blocks, centrifuges and PCR machines.
- Measure energy use of laboratory equipment to monitor its efficiency. Contact Green Labs for access to energy metering equipment at **greenlabs@pf.uq.edu.au**.

SWITCH OFF & SAVE
Switch off the appliance at the end of the day or when not in use

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WARM UP TIME
This appliance takes _____hr/min to warm up. Please switch on only before it is needed

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Stickers to print can be found here.

LIGHTING AND HEATING/ COOLING ENERGY USE

Heating ventilation and cooling (HVAC) systems are the dominant energy users in most lab buildings. Some simple individual actions can be taken to make large energy savings with lighting and HVAC in labs.

HVAC

- Ensure doors and windows are kept closed in air-conditioned space, particularly doors leading to stairwells and external areas.
- Use air-conditioning during typical operational hours only. To reschedule set operational times and/or investigate installing an out-of-hours button, email **sustainability@uq.edu.au**.
- Discuss with lab colleagues what temperature and humidity requirements are necessary for your lab. If your research can permit a slight variation in temperature that will save energy, email **sustainability@uq.edu.au**.
- Remove space heaters.

Note on space heaters:

- A portable plug-in heater is one of the least efficient and most expensive ways to produce heat.
- Portable heaters interfere with the building HVAC thermostats resulting in the air-conditioning system further cooling the entire room or floor to compete with the portable heater.
- The need for a space heater is probably being caused by a fixable problem, such as drafty windows or improperly balanced air delivery. To address the problem email **sustainability@uq.edu.au**.

Lighting

- Switch off lighting during the day if there is sufficient natural light.
- Use task-level lighting to direct light to where it is needed rather than lighting large areas.
- Label light switches so that operators can isolate the switch that will operate their area rather than switching on all the lights.
- To investigate installing LED lighting or motion sensors in areas where lights are frequently left on, email **sustainability@uq.edu.au**. HVAC can also be tied into motion sensors if your building is sufficiently modern.
- Put up reminder prompts for the last person in the lab to turn off the lights on the way out.

WASTE MANAGEMENT

- Minimise the production of waste by reducing the scale of experiments and using washable or reusable labware in place of disposable items e.g. refill your old tip boxes by purchasing your pipette tips in bags or use a tip-loading system. Glass substitutions have been found effective for these single use plastic items:
  - Falcon tubes
  - Pipettes
  - Filter bottles
  - Petri dishes
  - Bijou bottles
  - Test tubes
  - Replace plastic weigh boats with watch glass
- Set up a convenient recycling facility outside your lab. Clean, uncontaminated plastic, glass, paper, cardboard and polystyrene can be recycled. For OGTR and Quarantine Approved Premises, outer packaging materials that have not entered the lab can be recycled. If you need bins, contact **recycling@pf.uq.edu.au**.
- Place the **Lab Recycling Poster** next to the recycling bins. Use newsletters, regular emails and/or staff meetings to remind staff of correct recycling practices while also providing positive reinforcement. These items can be recycled at UQ:
  - co-mingled items [plastic bottles and containers, glass bottles]
  - paper
  - cardboard
  - soft plastic
  - polystyrene
  - empty toner and inkjet cartridges
  - mobile phones
  - e-waste
  - batteries
- If you do not work within a OGTR and Quarantine Approved Premise, empty original chemical bottles can be returned to the Chemical Store for reuse (predominantly plastic and glass bottles 2.5 and 4 litre). Do not wash bottles or deface labels as it is necessary to know what is in the bottles to prevent unwanted reaction. Contact Chemical Store for more information at **uqsciencestore@uq.edu.au**.
- Refer to **UQ's Waste Operating Procedures** and the **Lab Waste Reduction** guide for further details.

More information on waste and recycling can be found **here**.

Pipette tip reloading systems reduce waste by using re-usable tip boxes.

GREEN CHEMISTRY

- Label, store and dispose of hazardous chemicals and materials according to UQ's **EMS (Environmental Management System) procedures.**
- Maintain a chemical inventory and audit the chemical supply at least yearly to ensure that unnecessary orders are not placed and that expired chemicals are disposed of properly.
- Only purchase minimum amounts required to complete the experiment or consider sharing with other groups. Unused chemical is wasted chemical.
- Don't store chemicals in the fume cupboard. Generally chemicals vaporise because the bottle seals breaks down over time and chemical leaks out. The Chemical Store has a range of different bottle tops and seals and should have one to fit the bottle.
- Eliminate hazardous chemicals or substitute less hazardous materials in your experiment. My Green Lab has developed **Green Chemistry**, a useful guide for choosing green chemical alternatives.
- Consider the development of solvent-less chemical reactions or the development of chemical reactions using alternative green solvents (see **Green Chemistry Solvent Selection Guide**).

WATER USE

- When washing lab ware, fill the sink rather than using running water, or minimise the flow.
- Make sure your dishwasher is full before running a cycle and reduce the number of rinse cycles whenever possible.
- Do not use single-pass cooling equipment, whereby the water comes from the tap, flows over the area to be cooled and straight down the sink. If you have single-pass cooling equipment within your lab, investigate the feasibility of applying a recirculating water system by emailing **sustainability@uq.edu.au**.
- When diluting chemicals, only run the taps as long as necessary to achieve the appropriate concentration, or use a measuring cylinder to get the exact volume.
- Use water timers on continuous water use devices and set them to the minimum necessary time. If it's not possible to get water timers in your lab, the next best thing is to post signs reminding people to turn the water off.
- Report leaks immediately to P&F Assist at **pfassist@pf.uq.edu.au**.
- Use the lowest grade water appropriate to the task and use RO water sparingly. RO water is easy to use; however, the stills used to filter it require a lot of energy and water. Request RO water stickers to place on your sink splashback by emailing **greenlabs@pf.uq.edu.au**.

RO water stickers are available from the Sustainability Office.

PROCUREMENT

- Buy only what you need and consolidate orders.
- Consider sharing equipment between research groups or labs.
- Try to substitute disposable products with reusable products whenever possible.
- Order products that are less hazardous. Consider accessing **My Green Lab's Green Chemistry** resources to help identify alternative chemicals and processes.
- For guidance on environmental impact of laboratory products and equipment, look out for these labels:
  - The **ACT Label** is an eco-nutrition label for laboratory products. The ACT assessment process aims to provide you with the information necessary to make smart, sustainable choices about the products you buy.
  - **Energy Rating** – This certification identifies the most energy efficient equipment for over 50 different product categories.
  - **Epeat Registry** – Evaluates the effect of a product on the environment by assessing life cycle environmental standards, and ranks products as gold, silver or bronze based on a set of environmental performance criteria.
  - **Green Lab Supplies and Lab Equipment Guide** by Labconscious assist you find eco-friendly laboratory equipment and lab consumables.
- Check out UQ's **WARPit portal** to see if another UQ staff member is giving away or loaning the item you desire.

When purchasing **lab equipment**, look out for:

- Energy efficient models. Request the manufacturer's energy consumption data and/or email **greenlabs@pf.uq.edu.au** to see if the equipment's power use has been independently metered For equipment such as lab grade refrigerators and freezers, dishwashers, washing machines and computers, compare energy efficiency and running costs using either the **Energy Rating** or **Energy Star certification**.
- Water-efficient models.
- Reduced and/or post-consumer recycled content packaging. Use end-of-life take-back programs for packaging or other materials. If no options are available, start a dialogue with suppliers encouraging them to provide such programs.
- Long-life products that can be repaired, reused and ultimately recycled.
- Non- (or reduced) polluting products with minimum use of toxic chemicals, CFCs, ozone and other pollutants.

When purchasing **lab consumables**, look out for:

- Products made of recycled materials, maximising post-consumer content.
- Recyclable products: after their intended use recyclable products can be diverted from the University's landfill waste stream.
- Non-toxic or minimally toxic products.
- Reduced and/or post-consumer recycled content packaging. Use end-of-life take-back programs for packaging or other materials. For more information refer to **Sustainable Purchasing Guide – Lab Supplies & Equipment**.

When purchasing **stationery items** refer to **Sustainable Purchasing Guide – Stationery**.

When purchasing **paper** refer to **Sustainable Purchasing Guide – Paper**.

Examples of greenlab products available include:

- **Pipette tip reloading systems that reduce waste by using re-usable tip boxes.**
- **Lab wipes made from 100% recycled cellulose and compressed packed to eliminate packaging.**
- **Petri dishes that use 35% less plastic than conventional dishes.**
- **Recycled paper towels and wipes.**
- **100% recyclable packaging.**

STAY IN THE LOOP

- Join UQ's Green Labs Program to receive newsletters with information about energy and waste reduction in labs, including new resources, upcoming events, promotions and competitions. Email **greenlabs@pf.uq.edu.au** or register **here**.
- The **Sustainability Laboratory Training** module covers UQ's environmental policies and procedures as well as workers' individual responsibilities relevant to working in labs at UQ. Make sure all staff in your area have completed this training.
- Do you have questions, new ideas or feedback? Please get in touch!

MORE INFORMATION

Green Labs

Green Labs Stickers
Green Labs Posters
Green Labs Assessment tools

Waste

Waste Disposal Guides
Waste and Recycling Poster Series
Lab Recycling Poster
Lab Waste Reduction

Energy

Renewable Energy at UQ

Procurement

Sustainable Purchasing Guidelines

Water

Trade Waste Approval
Water Management Program

Green Chemistry

My Green Lab – Green Chemistry

Other Resources

Freezer Maintenance Guide

CONTACTS

Green Labs Assistant
greenlabs@pf.uq.edu.au
(07) 3365 7580

Sustainability Office
sustainability@uq.edu.au

P&F Assist
pfassist@pf.uq.edu.au

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