

Lab Energy Savings

Description

Refrigerators / Freezers

One of the most significant consumers of energy in laboratories are cold storage units. Notably, ultralow freezers can consume nearly as much energy as a small house. There are many ways to support more sustainable utilization of laboratory refrigerators/freezers.

[su_spoiler style="fancy" icon="chevron" title=" Store items at appropriate temperatures"]

- Avoid using an ultralow freezer as general storage. Ultralow freezer space comes at a premium and should be used for critical/sensitive samples.

[/su_spoiler] [su_spoiler style="fancy" icon="chevron" title=" Chill up ultralow freezers: -70°C setpoint instead of -80°C "]

- In the current day, ultralow freezer thresholds are conventionally set at -80°C; however, storing samples at this temperature is not well founded. Although this 10°C change in temperature comes at a considerable cost (up to 30% increased energy consumption), the existing standard for storing samples at -80°C is not scientifically justified [{source}](#). Biologically relevant temperature thresholds are as follows:
 - Crystallization (freezing) point of water (0°C)
 - 1st re-crystallization (-60 to -63°C)
 - 2nd re-crystallization point (-130 to -135°C)
- The primary justification for setting ultralow freezers to a lower setpoint is to improve sample integrity in the unfortunate event of a unit or power failure. However, this concern can be readily addressed through the following:
 - Connecting critical units to emergency power
 - Connecting critical units to monitoring systems.
 - Implementing stringent temperature alarm thresholds.
 - Many peer institutions have implemented ultralow freezer chill up initiatives [{source}](#).
 - Increasing the ultralow freezer setpoint to -70°C will impart substantial energy savings and may also prolong equipment lifespan.

[/su_spoiler] [su_spoiler style="fancy" icon="chevron" title=" Reduce temperature fluctuation "]

- Minimize open door time by organizing contents and implementing an inventory system (such as box maps).
- A full freezer better maintains temperature relative to a partially full unit. If not operating at maximal capacity, pre-stage the unit with empty racks and boxes to help hold temperature.

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- Regularly remove door/gasket ice build-up.
- Defrost units as needed.
- Clean/replace filters on a routine basis.

- Regularly clean freezer coils.

[/su_spoiler] [su_spoiler style="fancy" icon="chevron" title=" Unit staging & sharing "]

- Ultralow freezers discharge a considerable amount of heat. These units are optimally staged in centralized location/room, maintaining 6-8" free perimeter, near an exhaust duct. This will reduce HVAC burden.
- Consolidate storage space. Store compounds that are stable at higher temperatures, such as most nucleic acids, at -20°C.
- Share refrigerator/freezer storage space with other investigators.

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Autoclaves/Dishwashers

- Avoid running partial loads. Coordinate with colleagues to run loads at optimal capacity.
- Use appropriate autoclave cycles for your particular load of waste. Please refer to the [EH&S recommended sterilization cycle parameters](#).

Biosafety Cabinets

- Turn off the blower when not in use. This confers immediate energy savings as well as prolongs filter/blower lifespan. Upon turning on the unit, be sure to allow the blower to run at least 5 minutes to normalize airflow dynamics and establish a HEPA filter charge gradient.
- Do not use the UV light. The use of UV light as a means of BSC surface disinfection is discouraged in the BMBL. Lamp efficiency wanes over time, which is further compounded by poor penetrating power.

Chemical Fume Hoods

Chemical fume hoods are exhausted enclosures laboratories that when used properly minimize exposure to hazardous gases, vapors, and dust that may be encountered in laboratory processes. Due to continuously moving conditioned air out of the lab, fume hoods are highly energy intensive. Massachusetts Institute of Technology (MIT) found that "an older fume hood in a MIT lab can use more than 3 times as much energy annually as a single-family home. The energy to filter, move, cool and/or heat air is typically the largest energy demand in most lab facilities."

- Closing fume hood sashes when not in use is one of the most impactful things to save energy in a laboratory. For variable-air-volume fume hoods, closing the sash reduces the exhaust rate to its minimum.

Other Equipment and Lights

- Turn off lights when the room is vacant.
- Turn off and unplug equipment when not in use.
- Label equipment and light switches to encourage personnel to routinely turn them off when equipment or the room is not in use.