



The Buyer's Guide for Life Scientists

The Essential Guide to Ultralow Freezers

Purchase Considerations, Installation,
and Preventive Care.

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The Right Time to Replace

With a few key pieces of information, it's easy to know when to purchase a new ultralow freezer.

Mike May

In many labs, ultralow-temperature (ULT) freezers maintain the safety of valuable samples—the lifeblood of research and commercial labs. These units create a consistent environment of, usually, -70 or -80° Celsius that protects the integrity of a sample collection that can be worth \$250,000 or more. When used and maintained properly, a ULT can last 12–15 years, but nothing lasts forever. This article explores the best ways to evaluate ULT replacement; getting it right can avoid an expensive loss of time and money.

To know when a ULT needs to be replaced, a lab manager must know when one is operating properly. “If a unit is keeping temperature and maintaining set point—the desired temperature—then there’s no reason to replace it,” says Buckner Richardson, Vice President of International Sales at NuAire. “But, every unit has a life expectancy—sooner or later, a compressor will fail.”

Many ULTs are being replaced or added every year. According to Market Research Future’s “Global Ultralow Temperature Freezer Market, By Type-Forecast to 2022,” the global ULT market “generated \$511.9 million in 2015 and is expected to reach \$638.2 million by 2022.” This report adds that ULTs “are the type of bio-freezers utilized for the preservation of viruses, bacteria, drugs, enzymes, chemicals, cell preparations, and tissue samples among others.”

Beyond merely replacing failing ULTs, the Market Research Future report indicates that better performance can also drive the purchase of new units. This study notes that some vendors “have developed more energy-efficient ultralow temperature freezers that could save more than 20% of the energy consumed by the ULT freezers.”

The key question is: What tells a lab manager that it’s time for a new ULT?

Performance and power

In some cases, a ULT’s performance might indicate impending compressor doom. For example, after opening and closing the door, it might take hours to get back to temperature set point. “That’s a problem,” says Richardson. If it cannot be fixed, it is time to acquire a replacement freezer. In a properly performing ULT, the average cool-down time to set point is around 10 minutes after a door opening and closing.

For a specific ULT, a lab manager can turn to the manufacturer for baseline data. This will include various metrics: pull down (the time from starting a ULT until it reaches its set point), warm up (how fast a ULT’s temperature rises after a power or compressor failure), and power consumption. A user needs to refer to a manufacturer’s data because some of these

metrics vary considerably from one model to another. For example, pull down and warm up can vary by three times or more between manufacturers.

A lab manager can use these metrics to see how a ULT is performing, but care must be taken before using these metrics to decide if a ULT should be replaced. For example, the metrics mentioned come from specific locations in a ULT, and where they get measured matters. Pull-down time in the center of a ULT, for example, can be very different from the top or bottom.

Dollars and sense

In some situations, especially when a ULT contains hundreds of thousands of dollars' worth of samples, a lab manager might prefer to replace a unit before it acts up. In a case like that, a small investment could prevent a tragedy.

"If a freezer is ten years old, think about replacing it," Richardson suggests. "You don't want to wait until a unit fails, because you could lose \$100,000 of cell samples when you could have purchased a replacement ultralow for a fraction of the cost." Instead of taking that risk, some lab protocols call for changing out freezers after some number of years. Alternatively, lab managers use a metric based on energy use and performance to decide when to replace a ULT. For example, a plug-in energy meter can be used in a 4-6 hour test of the voltage, wattage, and amperage draw of a ULT. Tracking that over time can help a lab manager estimate the best time for a replacement. As a baseline to use, a ULT's energy consumption increases by about 3% every year.

The economics of ultralow replacement can be pretty simple. If a compressor goes out, that's a \$3,000–4,000 repair. That's about half the cost of a new freezer, and it's time to get a replacement. "If a



Blizzard Ultralow Freezers come standard with a built-in monitoring system that displays system performance with multiple alarm conditions to keep your samples safe. A voltage monitor displays power input and automatically makes adjustments to supply consistent power to the freezer.

repair is 25% of the cost of a new one, then replace it," says Richardson, "especially if the freezer is over ten years old."

It's not just a compressor failure that can trigger a replacement. Other damage, often caused by improper use (see "Best Practices", page 6), can cost enough to make replacement the best choice from an economic perspective. As an example, replacing all of the gaskets costs a couple of thousand dollars. That hits or surpasses Richardson's 25% rule, and it's time for a new freezer.

Ultimately, a lab makes up its own rules for when and why to replace a ULT. The key is making sure that the rules in place prevent a disaster. That requires a set of testing procedures and decision points based on the results. Then, the testing must be performed as planned. That way, a lab manager can follow an objective method for keeping ULTs working as needed. Only then can a lab's precious and pricey samples stay safe.

Best Practices

From placement and power to racks and routines, it pays to use an ultralow freezer right.

Mike May

The function and life of an ultralow-temperature (ULT) freezer depend on proper usage and preventive maintenance. Some elements of proper use start at the very beginning of ownership and others last until a ULT's last days. However, getting them all right ensures getting the best performance from start to finish.

Some of the keys steps to using a ULT the correct way only take minimal effort. Part of that is knowing the right steps. "Having a checklist is a good thing to do," says Buckner Richardson, Vice President of International Sales at NuAire. Those steps should lead a lab manager to use a ULT as designed, and it all begins with where it goes.

Freezer location

Proper usage starts with the placement of a ULT in a lab. If the room is hotter than 90°F (32°C), it is much too hot for a ULT. "This happens in laboratories without air conditioning," says Richardson, "and the freezer cannot breathe."

Respectable ULT manufacturers test how much heat a ULT can endure. "The manufacturer puts an air-cooled ULT in a room at 110°F (43°C) and tracks performance until the freezer fails," says Richardson. "NuAire has had one such an occurrence with a ULT

operating in a high temperature environment for a year, but they are designed for no hotter than 90°F (32°C)."

Despite the guidelines that go with any ULT, buyers still put some of the units in the improper location. When it comes to placing a ULT where it's too hot, Richardson says, "that is a common mistake."

The temperature is one part of placement, but there is more. If there is more than one ULT in a room, it creates even more heat, and the ULTs need space for ventilation. That means following the manufacturer's guidelines for spacing. NuAire, for example, recommends clearance of 8 inches (203 millimeters) above a ULT and 5 inches (127 millimeters) on the sides and back. The NuAire guidelines add: "Avoid side by side spacing unless a ULT freezer is located in a specially designed freezer farm. There should be no storage on top of a ULT freezer."

If the options for placing a ULT cannot meet the environmental requirements, water-cooled condensers may be added. That can overcome some of the constraints. Even then, as many placement guidelines as possible should be followed. At the very least, a lab manager should keep a ULT out of direct sunlight.

Still, there are other aspects of proper use to consider.



Intended use

When asked about some of the most common errors in using a ULT, Richardson says, “One big mistake that we’ve seen in the field is deliberate abuse.” By that, he means using a ULT as a flash or blast freezer. “Sometimes, a blood bank, for example, wants to freeze plasma or cryoprecipitate as quickly as possible,” Richardson explains. “Someone takes something at room temperature or warmer and puts it in a ULT, when he or she requires a blast freezer.”

If someone needs a blast freezer, that is what he or she should acquire. The use of a -80°C ULT as a blast freezer damages the ULT. “What goes in a ULT should be frozen,” Richardson says. “If you load a ULT full of warm samples and expect them to be rapidly frozen, you can get away with that for a while, but eventually, the ULT wears out.” He adds, “It’s a fairly common event we have noticed.”

Even though a high-performance ULT can handle a limited number of unfrozen samples, that doesn’t make it a good idea. In general, a best practice is to avoid placing warm samples in a ULT.

As Richardson points out, “You can break a compressor in a few years by abusing a ULT.” As a reminder, he adds: “A -80° freezer is to store samples essentially indefinitely.”

Electrical source

To maximize the life of a ULT, there’s another element of use to keep in mind—the plug. A manufacturer will note the proper power for a ULT. For example, most ULTs operate around 220 volts at 60 hertz on a 15Amp, single-phase circuit. NuAire guidelines state that “some customers need 115V with 20Amp single-phase circuits. Very few freezers can maintain even -57°C at 115V and 15Amp, the exception being small, low interior volume freezers.”



Blizzard ES (Energy Saver) NU-99728J offering 728 Liters (25.7 ft³) of usable storage space featuring a multiple point gasket design for maximum door sealability.

Running a ULT on too low of voltage can create problems. “If no voltage booster is installed when needed, the low voltage can cause a compressor to run hot,” Richardson explains. “That can shorten the life of the compressor.”

To take advantage of a ULT’s potential, samples must also be placed appropriately inside. “We have found a large number of laboratories use the racks they have, which do not appropriately fit the freezer resulting in lost storage space,” Richardson notes. “Spend the money on the right shelves to fully utilize the freezer.”

Preventive maintenance extends life

Proper use also includes preventive maintenance, such as removing frost or ice that builds up inside a ULT. “If they do not remove snow and ice build-up, eventually a tear in the gasketing will form on the inner and, if not dealt with immediately, the outer door,” Richardson says. “In the worst case scenario the outer door will freeze shut eliminating access to your samples.” The condenser filter should also be cleaned annually. In addition, the door gaskets should be kept clean.

This article explores the top things to do and what to avoid when it comes to the proper use of a ULT. Even before ordering a ULT, a lab manager should know its placement in the lab and provide the necessary power outlets and appropriate environmental conditioning. Once the ULT is installed, Richardson’s idea of a checklist still comes into play. It can, for example, remind users in a lab to not put warm samples in a ULT. This list can also include aspects of preventive maintenance.

Overall, the real key is keeping in mind a ULT’s designed task—maintaining samples at a really low temperature for a long time. That’s a ULT’s job, and using it right extends its life.

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Preventive Maintenance

Just a few simple activities can ensure optimal freezer performance.

Ultralow freezers, which typically operate at -86°C , are used in laboratories and hospitals worldwide and are intended for reliable and long-term storage of temperature-sensitive research samples such as blood, plasma, and organ tissue. However, as with any essential piece of laboratory equipment, failure to follow best practices will result in sub-optimal performance, and may be detrimental to precious sample material as well as to the freezer itself. Implementation of preventive maintenance measures will help to ensure that an ultralow freezer remains in a satisfactory operating condition, and will avoid unnecessary shortening of the usable lifetime.

Although servicing and advanced maintenance of laboratory equipment should always be performed by a trained service technician, there are a number of ways in which end users can carry out preventive maintenance of ultralow freezers. Preventive maintenance involves routine inspection of equipment, and allows any possible sources of failure to be detected and corrected in a timely manner. Just a few simple activities can ensure optimal freezer performance, minimize energy consumption, and will ensure that the manufacturer's warranty and compliance are met; we've detailed some of the main actions here.

Remove frost or ice build-up

Repeated opening of the freezer door may result in a build-up of frost or ice, which can stop the outer door from sealing properly; it's therefore good practice to inspect the door seals and gaskets for ice build-up every time the freezer is opened. "To help minimize ice build-up, we try to get samples in and out as quickly as possible, but also scrape the ice away from the door seals every two weeks and make sure that the ice does not build up on the inner doors," says Tim Avis, Research Scientist at Discuva. "Every year we have a general clear out of old stocks, and use this opportunity to defrost the whole freezer."

Clean the condenser filter

The condenser is one of the main operating components of an ultralow freezer, and functions to transfer heat from inside to outside. If dust is allowed to build-up on the condenser filter, the ability of the condenser to transfer heat to the ambient environment is compromised; it's therefore important that the filter is cleaned regularly. "To help maintain the efficiency of the freezer, we clean the filter once a year," adds Avis.

Clean the door gaskets

The function of a freezer gasket is to form a tight seal around the edge of a door, preventing warm air from entering the chamber or cold air from leaving. All ultralow freezers are fitted with an outer door gasket as standard, however many manufacturers also gasket the inner doors to help maintain a uniform temperature within the internal compartments of the freezer. "I regularly check the door gaskets for leaks," says Adam Hudson, Scientist at LGC Limited, "which can easily be spotted by an accumulation of ice at any weak points. I also wipe them down with a soft cloth occasionally, to remove any dust or dirt that could compromise their performance."

Store materials appropriately

Ultralow freezers perform best when the airflow within them is uninterrupted, and the use of a racking system not only maximizes storage space but also ensures that the correct airflow is maintained. "We use a freezer racking system to allow us to easily locate our samples," explains Giovanna Cacciola, Senior Scientist at Innova Biosciences. "This permits us to stack boxes and containers neatly, and means that the amount of time for which the door remains open is kept to a minimum." It is also important that materials are not stored on top of the freezer, since these can trap warm air and cause the compressor to operate more frequently to maintain temperature; not only will this raise energy costs, it will also reduce the lifetime of the compressor.

Don't ignore freezer alarms

Ultralow freezers are fitted with alarms to indicate high temperature, low temperature, power failure, prolonged door opening, system monitoring failure,



Blizzard Ultralow Freezers feature insulated inner doors and a multi-point gasket system to create a tight seal to minimize frost build-up.

and more. Although these can usually be muted, it is essential that they are not ignored. "The ultralow freezers which I use are all equipped with an alarm test button," notes Hudson. "The alarm is checked routinely within the cleaning and maintenance schedule, and each freezer is clearly labeled with the details of a point of contact."

Ultralow freezers contain irreplaceable samples, costly reagents, and often years of research. By treating them with the respect they deserve and performing simple preventive maintenance, these vital pieces of laboratory equipment will provide many years of reliable service.

Key Considerations when Purchasing

Size, placement, frost, energy, and maintenance are among the topics discussed.

Overview

Ultralow temperature (ULT) freezers are designed to operate between -86°C and -45°C , but usually operated at a set point of -70°C or -80°C . ULT freezers have a typical service life between twelve and fifteen years. When considering the replacement of a ULT ten years old, or older, there are many variables to consider. New technology solves some of the issues found in older freezers and reflects new trends in Ultralow Range (ULR) freezer construction.

Types of ULT freezers and popular options

- ULT freezers come in two basic types, chest freezers and upright freezers. Chest freezers are more efficient than uprights, but due to common space limitations fewer chest freezers are purchased. Less than 5% of ULT freezer sales are chest style. Chest freezers last longer because the efficiency of their design requires less use of the compressor.

The same efficiency also allows for temperature set points to be reached more quickly, and maintained.

- One popular option is the twin ULT freezer with separate compressors. Some manufacturers also provide a backup compressor so if one fails, the other maintains temperature.
- ULT freezers with vacuum insulated panel (VIP) insulation have more capacity within a small footprint, and so are a good option where floor space is limited. A VIP panel is thinner due to the lower thermal conductivity of a partial vacuum compared to the conventional foam insulation necessary to achieve the same thermal insulating properties. It is important to protect the integrity of VIP panels. Cracks caused by temperature fluctuations can compromise the partial vacuum conditions and degrade insulating properties. Opening and closing the door of a VIP insulated freezer too frequently can lead to cracks in the insulation, causing failures.

- Another ULT freezer option is to have two compressors. In most freezers, twin compressors don't function as backups. They are independent and one functions as a high stage compressor that cools down the low stage condenser. This isn't a standard option in the industry yet because it is price prohibitive, but some manufacturers justify the price with performance improvements.

Refrigerants

- After CFC's were banned, ULT freezers switched to HCFC refrigerants. Currently, freezers which are the most energy efficient use hydrocarbon refrigerants (HFCs).
- The ULT freezer industry is trending towards using highly efficient, but flammable, refrigerants such as R170 Ethane, and R270 Propane. The United States and France do not yet allow flammable refrigerants despite the many years both have been in use elsewhere. ULT freezers using flammable refrigerants are popular in the European pharmacy industry, but not yet available in the United States due to regulatory restrictions. ULT freezers using flammable refrigerants are 50% more energy efficient than models using conventional refrigerants after pull down, and have decreased potential for oil logging.

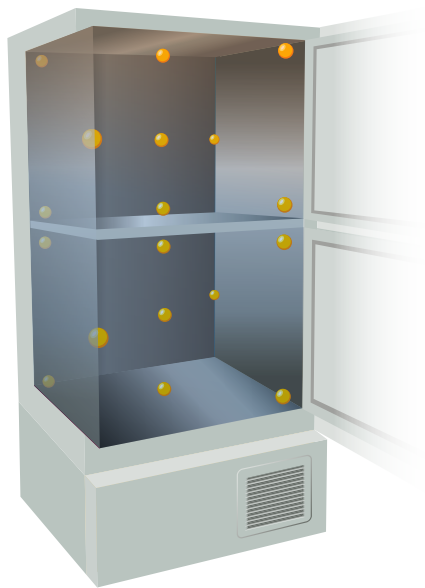
How long does it take for ULT freezers to cool?

- The pull down time is the time it takes to get to -80°C after set-up or installation. After a power failure, the time it takes to reach -60°C is called the holdover time.

- After a door opens ULT freezers are designed to recover the temperature as soon as possible. Every time an upright ULT freezer door is opened it takes 10 minutes to recover its temperature back to its setpoint.
- Flammable refrigerant gas helps pull down faster, and saves around 15% electricity.
- Warm up can be slowed down by having effective insulation, door gaskets, and a claw door. All three are important.
- Quality manufacturers supply graphs to show how their systems compare to others with data on pull down, heating up, power consumption. Pull down and warmup numbers vary widely, with some systems taking 3 times as long as others. Be aware of the location inside the freezer where temperature was measured in the manufacturers' data, as pull down times measured in the middle of a chamber can vary considerably versus measuring at the top or bottom.

How much temperature variation inside can be expected?

- It's important to select a ULT freezer with the best temperature uniformity. Typically, temperature variation is only a few degrees away from set point, but it is best to review the manufacturer's test data. The data should specify the location of the testing probes, typically top, middle, and bottom of inner chambers, and explain how loaded the freezer was during testing. It is typical that uniformity is better when a freezer is fully loaded.



Temperature sensor location

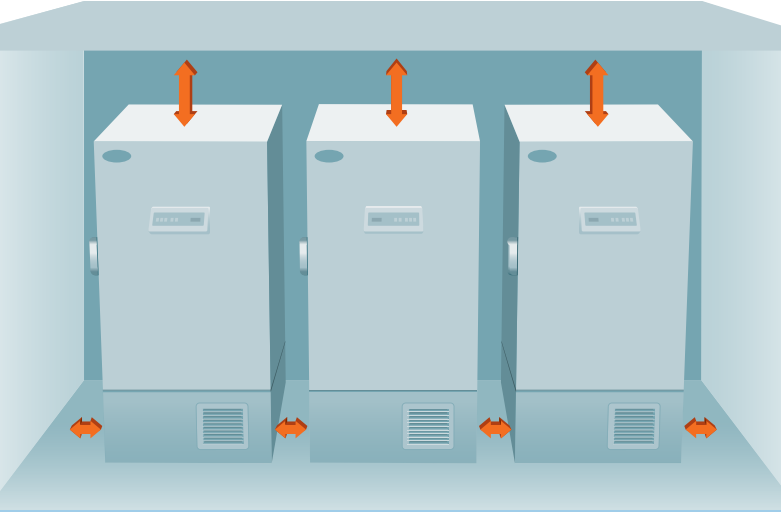
Size matters — Capacities and space

- To determine the size of freezer needed, users look at the capacity and how many racks and sample boxes it can store.
- A current trend is for freezers to have pull-out drawers, especially in large capacity freezers. But drawers and heavy inventory racks can make it difficult to reach and access the top compartments of the freezer for some technicians. In order to help alleviate this problem, some manufacturers offer options to access drawers from the side, making it easier to open and locate and return samples.
- The exterior size of a ULT freezer is of importance when considering capacity and efficiency. Energy consumption per cubic foot is higher for small freezers when compared to large freezers, but it may not be the primary factor when selecting a freezer.

- Labs with limited space often use freezers which are smaller based on size constraints. Energy costs become important for users in university or research settings, and many opt to purchase large freezers and share the space between groups in order to minimize energy consumption and look for the largest capacity at the lowest price possible per vial to determine the most efficient way to produce frozen vials.
- Users should consider if a mixture of strategies combining total efficiency as well as local needs may be suitable.
- How long the samples will remain stored in the freezer is also an important factor. Most ULT freezers are designed to reach a consistent set point and last that way for more than a decade.

Where the freezer will be located matters

- The location in which a freezer will be placed is important in determining the size and which model will be used.
- Whether the freezer will be located alone, or within a group of freezers is also a matter for consideration.
- Regional considerations, such as average air temperature, should be considered if a freezer will be located in a space without climate control.
- Freezers need proper ventilation so the warm air can reach the return registers. A minimum space of 8" (203 mm) on top and clearance of 5" (127 mm) on the sides and back should be maintained.



When installing multiple freezers in a row it is important to space the freezers at a minimum 5-inches (127 mm) apart and away from the walls, as well as allow for at least 8-inches (203 mm) of spacing between the ULT and ceiling.

- ULT freezers are not flash freezers or blast freezers. They are meant to store and conserve product that is already frozen. Excellent freezers might be able to tolerate being loaded full of warm product, but regular ULT freezers will break down with time under that type of use. It is best to load the chamber at most a quarter full with free-frozen product, and avoid putting warm product into it. A facility such as a blood bank, which has a high volume of warm product which must be cooled quickly, might make the mistake of purchasing a ULT freezer when a blast freezer would be more appropriate. Continued use of a ULT freezer to rapidly cool warm product can cause the freezer to suffer mechanical failure more quickly.

Avoid side by side spacing unless a ULT freezer is located in a specially designed freezer farm. There should be no storage on top of a ULT freezer.

- Another major consideration is if the freezer will need to pass through a standard-sized door opening. Most freezers are built to international standards of 90 cm (35 1/2") wide and 2 m (78 3/4") high, the size of a standard European door. A rule of thumb manufacturers recommend is to purchase as big a freezer at the best price per ft³ capacity that still will be able to pass through the door. Larger freezers should have parts which can be removed to fit it through a door.
- The decibel rating of a ULT freezer becomes important if it will be located next to an office or other quiet work space. Good quality freezers need not be noisy; NuAire ULT freezers are rated at only 47dba, versus competitive freezers rated at as much as 73dba.

Avoiding frost

- Frost can accumulate on ULT freezers when water vapor comes into contact with cold interior surfaces. Frost build-up can interfere with closing inner doors or even the outer door if excessive frost turns into ice. Every ULT freezer will accumulate frost, this is simply the nature of very low temperature surfaces when humidity is present.
- The best freezers provide features to minimize frost build-up. For example, claw latches to secure inner freezer doors, tighten the hinge against the gasket. Low-wattage halo bypass heaters help keep gaskets around the outer door clean. Insulation on the inner doors as well as the outer doors help maintain temperature to the greatest extent possible.

- Most ULT freezers that are designed for environments having a maximum humidity of 80% and 32°C maximum ambient air temperature. ULT freezers typically make use of air-cooled condensers, so if the ambient temperature is too high, cooling efficiency is degraded. Avoid placing a ULT freezer in an area exposed to direct sunlight, or in an enclosed area without adequate ventilation. If it is necessary to place freezers closer than 10 cm in an enclosed area, water cooled condensers may be needed.
- Oil logging, or ice build-up in the refrigerant, can become an issue in ULT freezers. In the mid-1980's, almost every ULT freezer had this problem due to paraffin wax-based oils. This type of wax was prone to solidify in capillary tubes. Wax-free synthetic oils largely eliminated this problem. However, ice can still form in capillary tubes for other reasons.

- To prevent oil logging, manufacturers use heaters inside the capillary tubes to prevent oil from becoming too cold. Oil can also be run through separators outside of the system to remove ice and reduce maintenance down time due to oil logging.

What facilities concerns are there?

- ULT freezers need chilled process water, reliable power, and vacuum.
- High quality freezers provide a manual way for operators to release the door when vapor lock occurs, with a vacuum release valve
- Higher end freezers also need data ports to communicate logged data or for remote temperature sensing, and some need battery backup power.
- Freezers located in areas with seismic activity have brackets that secure the unit to the walls.
- The proper power source is important, as well as correct receptacles in the area where the ULT freezer is located. Most are 208V-2230V at 60 Hz, 15Amp single-phase circuits, but some customers need 115V with 20Amp single-phase circuits. Very few freezers are able to maintain even -57C° at 115V and 15Amp, the exception being small, low interior volume freezers.
- Some ULT freezers provide voltage boosters, for buildings that provide less than the rated 220V in the USA or 230V in Europe. There is a greater need for voltage boosters in the United States where it is common to have 208V available, instead of 220V. A freezer compressor will fail much more quickly if run at lower than correct voltage. The voltage booster can lengthen the life of a compressor.





- Backup kits are also an important consideration if a freezer is located in areas where power failures are common. CO₂ backup kits alert staff of a power problem, while maintaining set temperature for a short time to allow staff to correct the problem. If a ULT freezer is located in an area experiencing frequent power outages (which lacks backup generators) or susceptible to hurricanes and/or other natural disasters, consider backup options.

Energy concerns

- The facility manager should be aware of additional heat load the ULT freezer will cause. Energy management strategies to mitigate the additional heat load may involve consolidating all of the freezers into one room with adequate cooling, or dispersing the heat load by separating ULT freezers to different locations.

- “Advances in ULT freezer compressor design, insulation, and cabinet design have resulted in greater efficiencies to store samples. However, the efficiency of ULT freezers decreases over time, due to loosening seals, refrigerant loss, degraded lubricants, fatigue in mechanical systems, or poor maintenance. Each year of a ULT freezer’s age translates to approximately 3% increase in energy consumption. Some ULT freezers age well; therefore, it is highly recommended to test every freezer to verify the need for replacement.”
- Some customers have a committee managing cold storage which watches energy use and performance over time.
- Regularly testing old freezers over time will show which ones are the poor performers. A four to six hour test with a plug-in energy meter helps compare the voltage, wattage, and amperage drawn for each freezer.

Price is always a consideration

- To offer low cost freezers, manufacturers eliminate certain components. Low cost freezers are risky for users who need stable, reliable performance and other options that indicate product quality.
- Moderately priced freezers will provide consistent -85°C temperatures and protect against oil logging. They may even include USB ports to plug in and manually download operation data. VIP options exist in this category, and the same freezer performance can be had paying double.

- Users who need quality control to validate their product or maintain histories such as in the pharma industry, use higher end freezers. Higher end freezers will provide better refrigeration and automated data logging options that track the operations, events, temperatures, and alarms.

NuAire Laboratory Equipment

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Maintenance often depends on lab cleanliness

- According to the EERE, dust-free freezers use less energy than dusty freezers at the same temperature. ULT freezers require a lot of ventilation. Dust or grime on the filters blocks air flow and reduces the ability to dissipate heat. Dirt on the condenser increases the amount of energy the compressor needs. Keeping the dust to a minimum and ensuring it doesn't get into the freezer will prolong the freezer's life.
- It is important that condenser filters are checked, cleaned, washed, or replaced, and that coils are cleaned with a vacuum, brush, or wet towel. Condenser filters are reusable and don't need to be changed. Those with front access are easier and faster to maintain since no tools are needed. But, if front access isn't available, virtually all freezers come on wheels that lock so they can be moved to clean.
- If a freezer was located in a temperature-controlled clean room, maintenance needs would be minimal. But, many are located near windows, open doorways, or high traffic areas. In addition, some laboratories do not perform the recommended maintenance frequently enough. This includes cleaning the filters and condenser fan, as well as removing frost at least every three months.



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Laminar Airflow Products



Polypropylene
Fume Hoods & Casework



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Works cited

1. Doyle, Allen, and Leo Angelo Gumapas. "Everything You Wanted to Know about Running an Ultralow Temperature (ULT) Freezer Efficiently but Were Afraid to Ask." Store Smart (2013). ULT Freezer Management Guide. Store Smart, 8 Mar. 2013. Web.
2. Buie, John. "Independent Guide to Purchasing a Lab Freezer." Lab Manager Magazine. Lab Manager Magazine, 7 Dec. 2009. Web.
3. Roberts, Josh P. "Ultralow-Temperature Freezers: Antarctica in a Box." Labcompare, 25 Feb. 2015. Web.



Resources

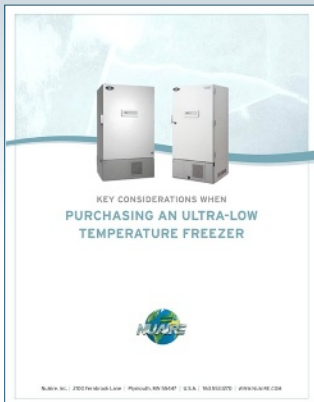
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Ultralow Freezer Buying Guide



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