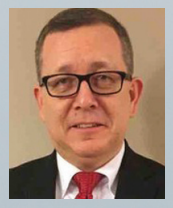


BY STEVEN LYNUM

HOW TO EVALUATE YOUR NEXT ULTRA-LOW TEMPERATURE FREEZER PURCHASE: *Caveat Emptor*

The development of ultra-low temperature freezers spans decades of progress in component design, electronic supervision and cabinet construction.

From refrigerants and compressors to controllers, cabinet insulation and data logging, manufacturers have established a myriad of internal operating metrics shaped to position their ultra-low temperature freezers as the best on the market.

In recent years, however, the industry-wide creation of ENERGY STAR® criteria for universal assessment of freezer performance has begun to bring credible, third-party insight into a reality that was previously left to manufacturers alone.

Today, facility and biorepository managers, along with end users, are becoming more knowledgeable about key performance factors that ultimately define the suitability of an ultra-low temperature freezer for their application. As a result, the demand for independent testing and comparative evaluation of leading ultra-low temperature freezers on the market has grown, while purchasers have broadened their view of freezer specifications to evaluate the concept of performance at a higher level. This embraces three primary deliverables essential to stored product safety: reliability, recovery and energy efficiency. The first of these is reliability.

Reliability

Because an ultra-low temperature freezer is acquired to safeguard years or even decades of clinical research at temperature setpoints of -80°C, or -70°C, failure is never an option. The value of frozen contents is difficult or even impossible to determine. Specimens are often irreplaceable. Therefore, uptime is the most important function of an ultra-low temperature freezer. It is also the single most challenging attribute that leads to uncertainty and impact on reproducibility in scientific research.

This chronic uncertainty weighs on the entire industry. The global repository of generations of research depends on the performance of a cold storage product group that, if not properly engineered, places inordinate stress on the machines as well as the people who place their life's work inside.

In the life science market, there is no central agency to corroborate manufacturers' claims of reliability, uptime and other performance attributes critical to safe storage of biological materials. Purchasers must depend on the integrity and social responsibility of the manufacturer, truthfulness of published specifications, referrals from colleagues and testing performed by their own institutions or by independent agencies.

Consultation with facility maintenance personnel responsible for out-of-warranty service, or those who are factory trained and authorized to perform in-warranty service, can be highly credible sources of information.

Independent service repair companies with reputable service technicians are unlikely to recommend poor performing freezers in order to earn money fixing them; the stakes are too high. Whether in-house or independent companies, these insights can offer valuable context in advance of a purchase decision.

Recovery

The exponential worldwide growth in the volume of stored frozen biologicals has brought forth a demand for better energy management. New cooling systems have established impressive statistics for reducing power requirements. These include cascade platforms with variable speed compressors as well as alternative

engines. All must maintain ultra-low temperatures for indefinite storage while restoring setpoint temperature quickly and efficiently following door openings. Unfortunately, the need to reduce energy consumption has pushed some systems to the edges of prudent performance.

Temperature recovery requires a combination of system anticipation and rapid platform response within the parameters of a safe mechanical performance envelope. Thus, the freezer must be designed for the worst-case reality of daily operation where room temperatures can be high, line voltages may fluctuate due to aggregate power demands leading to brown-out conditions, and access to stored product may be more frequent than normal. The accumulation of frost on door gaskets and dust on condenser coils is another reality that engineers must confront.

While recovery and uniformity are related, recovery speed, which is a prime indicator of reserve refrigeration capacity and high ambient temperature tolerance, remains at the forefront of performance attributes. Interior temperature recovery and uniformity are essential to the relationship between storage location and the viability of stored product over the long term.

A thorough evaluation of ultra-low temperature freezer purchase alternatives demands an understanding of recovery rates, measuring criteria such as ambient temperature at time of test, control probe location, duration of outer and inner door openings, and freezer load. Manufacturers who publish best-case recovery rates measured under ideal conditions may not account for actual use scenarios in their literature.

Independent documentation of recovery performance should be a prerequisite when comparing competitive freezers, and an essential consideration when purchasing any ultra-low temperature freezer whether for replacement or new laboratory design.

Energy Efficiency

Development of more energy efficient ultra-low temperature freezers has continued to reveal significant improvements in the interplay between electronic sensors embedded within the cooling circuit, firmware with algorithms programmed to anticipate cooling demand, and cooling engines or compressors designed to remove heat from the cabinet to the outside environment. As a result, the power consumption gap between leading ultra-low temperature freezers from various manufacturers has narrowed. Today, purchasers must emphasize reliability over initial acquisition cost.

> “An energy-efficient freezer that cannot respond to high ambient temperatures or cannot recover quickly following door openings neglects a key requirement for stable, long-term storage at ultra-low temperatures.

Purchasers must demand temperature recovery and uniformity more than insignificantly different energy costs. And purchasers must demand a rebalanced performance equation where reliability, recovery and operating costs are properly apportioned to protect a priceless inventory.

An energy-efficient freezer that cannot respond to high ambient temperatures or cannot recover quickly following door openings neglects a key requirement for stable, long-term storage at ultra-low temperatures. The industry-wide adoption of ENERGY STAR criteria for measuring and documenting power consumption has offered a new set of standards by which freezers can be evaluated. Energy consumption alone, however, should not be a primary performance attribute if achieved at the expense of recovery and uniformity.

As energy efficiencies continue to equalize, customers should expect energy savings over the life of the freezer that supersede the cost of operating installed freezers running on older conventional platforms. Most importantly, investments in energy efficient freezers should be made only within the context of why freezers are required in the first place: reliable, uniform and responsive ultra-low temperature storage of critical research.

Toward this end, purchasers should demand comparative data generated through independent evaluation of all products under consideration. Through this effort, test conditions and criteria should remain constant across the board so that strengths and shortcomings can emerge in support of a purchase decision.

Summary

While manufacturers’ specifications typically offer features and benefits, dimensions, site preparation and voltage requirements, the operation of an ultra-low temperature freezer in situ is best evaluated by a systematic review of third-party or internally commissioned testing independent from manufacturers’ claims.

An example of an internally commissioned comparison of ultra-low temperature freezers was presented at the International Society for Biological and Environmental Repositories (ISBER) 2018 Annual Meeting, Dallas, TX, “Comparison of Energy Efficient -80°C Freezers for Biorepository Storage.” Here, the Mayo Clinic Biorepository Program Biospecimens Accessioning and Processing (BAP) Core Laboratory compared three leading upright ultra-low temperature freezers under controlled conditions.

This report is available from The Mayo Clinic or at **https://www.morressier.com/article/5ada8a0ed462b8029238e4de?utm_source=laboratory-focus&utm_medium=editorial&utm_campaign=ult-freezers.**

Steven Lynum is President, PHC Corporation of North America, formerly known as Panasonic Healthcare Corporation of North America, a subsidiary of PHC Holdings Corporation, Tokyo, Japan, which is a global healthcare company involved in the three core businesses of Medical Devices, Healthcare IT and Life Sciences.

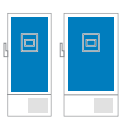
To see this story online visit **https://biotechnologyfocus.ca/how-to-evaluate-your-next-ultra-low-temperature-freezer-purchase/**

PHCbi

Introducing the ultra-low temperature freezer with the lowest total daily energy usage in its class.[1]

ENERGY STAR® Certified and independently tested by a nationally recognized testing laboratory.

- 7.30 kWh/day, Steady State Energy Consumption
- 7.87 kWh/day, Daily Energy Consumption



Now expanded to include 25.7 cu.ft. and 18.6 cu.ft. upright models MDF-DU502VH-PA and MDF-DU702VH-PA, VIP ECO series freezers are configured to operate on either 115V, AC or 220V, AC power systems.

Your Life's Work, Our Brand.

PHCbi brand VIP® ECO -86°C ultra-low temperature freezers deliver performance without compromising reliability. Our unique variable differential cascade refrigeration uses natural refrigerants so that you can achieve the quality of cold you need with the global sustainability you desire.

Benefits include fast temperature recovery, greater resistance to high ambient temperature and excellent top-to-bottom interior temperature uniformity. All designs are life tested and field-proven for stable, reliable preservation of specimens essential to clinical trials now and into the future.

Visit **www.phchd.com/us/biomedical/vip-eco.**

PHC Corporation of North America
Formerly Known as Panasonic Healthcare Corporation of North America

PHC Corporation of North America
1300 Michael Drive, Suite A, Wood Dale, IL 60191
Toll Free USA (800) 858-8442, Fax (630) 238-0074
www.phchd.com/us/biomedical

1) Based on independent third-party testing for model MDF-DU702VH-PA at time of publication. ENERGY STAR test results for submitted products can be compared for performance across the competitive market. Results are published on the ENERGY STAR website www.energystar.gov. See Panasonic Certification Number 4787624501.

PHC Corporation of North America is a subsidiary of PHC Holdings Corporation, Tokyo, Japan, a global leader in development, design and manufacturing of laboratory equipment for biopharmaceutical, life sciences, academic, healthcare and government markets.