

ENERGY STAR Laboratory Grade Refrigeration Webinar Discussion Notes

September 22, 2010

Introduction

Laboratory grade refrigerator and freezer manufacturers and other stakeholders participated in a Web meeting hosted by the U.S. Environmental Protection Agency (EPA) on September 22, 2010. The purpose of the meeting was to discuss the Data Analysis and Framework Document for Laboratory Grade Refrigerators and Freezers, which was published by EPA on September 7, 2010. The Framework Document and EPA's slide presentation can be found at www.energystar.gov/newspeccs (click on "Laboratory Grade Refrigerators and Freezers").

Below is a summary of the discussion led by Christopher Kent, ENERGY STAR Product Development Manager, and Matt Malinowski, ICF International.

Discussion Summary

Mr. Kent reviewed the history of the program, the goals for the discussion, and the scope of the data analysis. Mr. Malinowski then presented an analysis of test data submitted to EPA by three manufacturers, focusing on: the impacts of door type, defrost strategy, and end-use application on measured equipment performance. Mr. Kent concluded the meeting by sharing a potential schedule for the development of an ENERGY STAR specification for laboratory grade refrigerators and freezers, but stressed that additional test results would be necessary for the development process to continue.

Specific items discussed at length by the meeting participants are summarized below.

Scope

EPA received data from manufacturers on a variety of laboratory grade refrigerators and freezers operating at -20 and -30 °C. EPA did not analyze explosion-proof, walk-in, or ultra-low temperature (ULT) units.

- An institutional user noted that ULT units have significantly higher energy consumption and savings potential, and should therefore be considered for inclusion in an ENERGY STAR program.

ENERGY STAR Response: The current ENERGY STAR test supplement is not applicable, because ULT units, which are used for archival storage, will spend little time with the door open. During the development of the supplement, it was decided that EPA should first address general purpose units since they represented the largest share of the market and then investigate the inclusion of ULT and other product types.

- One manufacturer offered to share with EPA proposed test conditions for ULT units based on the ASHRAE test standard and ENERGY STAR supplement.
- There is a lot of significant support from the university community to include ULT units because of their high energy consumption.

ENERGY STAR Response: Specification development is a data driven process. While EPA may ultimately be interested in ULT units, there may not be enough data to develop specification requirements at this time. However, EPA could work in parallel to further develop test conditions for ULT units and cover them at a later date.

- An institutional user expressed interest in including explosion-proof refrigerators and freezers in the specification, at least until it can be demonstrated that they cannot meet the same specifications as non-explosion proof units.

- Manufacturers felt that there actually might be some differences in design of explosion-proof units (e.g., controls) that could impact energy performance.

Performance Metrics

EPA analyzed the impacts of various equipment characteristics on performance—in particular, energy consumption and the average standard deviation of temperature (a measure of temperature stability). These metrics are included in the ENERGY STAR Supplement to ANSI/ASHRAE Standard 72-2005.

- In addition to energy consumption and temperature uniformity/stability, an institutional user suggested that EPA also consider BTU capacity, which impacts the ability to remove heat under heavy load.

ENERGY STAR Response: BTU capacity is not measured by the ENERGY STAR Supplement. Although ANSI/ASHRAE Standard 72-2005 does touch on calculating BTU capacity, it is only in the context of remote refrigerators. Measurements of BTU capacity would require agreement on an appropriate test procedure as well as further testing.

- Similarly, one manufacturer asked whether EPA intends to consider performance under different thermal loads.

ENERGY STAR Response: This was discussed early in the Supplement development process. Determining a thermal load that would be representative and consistent across the many different applications would be challenging and would delay the development process. EPA, with the help of industry stakeholders, decided to test units in the worst case scenario (i.e., empty) to ensure a level playing field. It is EPA's hope to then address thermal load as a user-education element on using equipment properly to achieve desired energy savings. Overall, EPA prefers to keep the specification criteria simpler in this regard.

- Manufacturers expressed concern about using the average standard deviation of temperature to measure uniformity. Rather, the metrics should speak to users and mimic the Red Cross and American Association of Blood Banks (AABB) standards (i.e., appropriate temperature ranges).

ENERGY STAR Response: EPA seeks to provide consumers with relevant energy consumption data to aid in their purchasing decision process. EPA requested that testers provide both the standard deviation and max/minimum temperatures collected during the test period. EPA seeks input from consumers on what data would be helpful in determining the appropriate product for their applications, i.e., tolerance from set point for each product type, etc.

Door Type

Based on EPA's analysis of the refrigerator test data submitted by manufacturers, there was no apparent difference in performance due to door type. Both glass and solid door units were able to achieve similar energy consumption and temperature stability for a given volume. This issue does not apply to freezers, as all freezers tested had solid doors.

- EPA inquired as to why data show little difference in performance between solid and glass door units.
 - Manufacturers responded that lab grade units are constructed very differently from food grade, with little difference between glass and solid door units due to:
 - Triple-paned glass
 - Insulation
 - Better gaskets

- One manufacturer further explained that these improvements to glass door insulation are due to pharmaceutical customers' concerns with condensation on the doors.
- A further suggestion was that door hinging may have an impact (sliding doors do not seal as tightly as swinging doors) and should be analyzed separately.
- Finally, one manufacturer inquired whether EPA was looking into the area covered by glass, as some units have doors that are partially solid and partially glass

ENERGY STAR Response: Door types have not been differentiated by the proportion of glass. However, EPA did address this in the commercial refrigeration specification and would be interested in additional information and data regarding the differences in performance based on glass area. EPA is interested in feedback from stakeholders on how to address this issue, especially in light of defining a product family and qualifying models within a family.

Defrost Strategy

EPA was unable to find a clear impact of defrosting strategy on the performance metrics discussed earlier. Although there did appear to be a relationship between defrost strategy and energy consumption/energy intensity for refrigerators and -30 °C freezers, and defrost strategy and temperature stability for -30 °C freezers, there was insufficient data to generalize these relationships.

- One manufacturer expressed concern with treating continuous-defrost units as a separate category, as it is a type of defrosting that is triggered by a timer.
- Manufacturers would not expect defrosting to matter for refrigerators, but its effects should become pronounced for freezers at -20 and -30 °C.
- Automatic and manual defrosting serve very different needs and should not be compared to each other, even if the standard deviation metric indicates similar performance.
- EPA asked whether end-users are more concerned with the duration or magnitude of temperature deviations from the set point.
 - An institutional user responded that users want to know both the full temperature range/degree swing and also the temperature variation during steady state.
 - However, the requirements of university researchers will be much different than those of pharmaceutical workers or blood-bank operators.
 - Furthermore, purchasing decisions regarding defrost type do not primarily concern energy consumption.
- Additional comments on defrosting:
 - Manual defrosting is typically performed every 1–2 years. Samples are moved to another freezer or a cooler in the interim.
 - Most manufacturers recommend manual defrost every 6–12 months, depending on usage.
 - Excessive frost buildup will negatively influence temperature uniformity.

Intended Application

EPA also analyzed the impact of end-use application—as submitted by manufacturers—on performance. Again, there were few non-general use units from which to draw wider inferences on the potential impact of application on energy consumption.

- Manufacturers stressed that units for blood storage are critical to the market and should be included in the analysis. Furthermore, EPA should determine categorization based on application when choosing levels.

Enhanced Testing and Verification

EPA updated manufacturers on recent changes to the ENERGY STAR program to support enhanced testing and verification (ET&V), beginning on January 1, 2011, including third-party certification of test results, use of recognized laboratories, and annual submission of unit shipment data.

- One manufacturer asked how Underwriters Laboratories' (UL's) new "Go Green" program interfaces with the ENERGY STAR ET&V program.

ENERGY STAR Response: This is separate from the ENERGY STAR ET&V efforts. EPA has had discussions with UL regarding their interest in participating as an EPA-recognized certification body and accrediting laboratories.

Timeline

Finally, EPA presented the following timeline for the laboratory grade development process during the online meeting. Manufacturers should submit further test data by December 2010, if possible, or contact EPA if they require additional time or have any other requests.

Comments on Framework Document due to EPA	September 30, 2010
Additional product testing and data analysis	September–November 2010
EPA decision whether to develop specification	December 2010
Potential Draft 1 specification released for comment	January 2011 (Potential)
Potential stakeholder meeting to discuss Draft 1	February 2011 (Potential)