



ecomate[®]

BY FOAM SUPPLIES, INC.

Ecomate[®] Five-Year Performance Study

*A clinical evaluation of physical
properties over an extended
period of time.*





Introduction

The purpose of this study was to evaluate the long-term insulation performance of products produced with ecomate® blown foams after five or more years.

More than 20 different refrigeration products from a variety of manufacturers and industries using ecomate® foam were kept after production and stored in a warehouse in ambient conditions for a minimum of five years. The same products were tested when first manufactured and the results were used as the baseline for this study. Among the products were exposed skin soft drink dispensers, ice bins, roto-molded food service carriers, doors and walk-in cooler panels.

The data from the following case study tests proved that products made with foams blown with ecomate® perform extremely well over time with typical or no degradation of physical properties.



INSULATED SHIPPING CONTAINERS

CASE STUDY 1

Boxes from the original test were stored in a warehouse for approximately 5.5 years. The boxes were re-tested in accordance with the original test method outlined below.

Method: A block of dry ice was placed in the container. The lid was closed and sealed with shipping tape. The ambient temperature of the room in which the test was performed was 21°C (70°F). The temperature inside the box was measured with a thermocouple, and allowed to stabilize for one hour before reaching stasis. The initial temperature was measured, and the test began at that point. The interior temperature was then measured and recorded every 24 hours. The results were as follows:

Initial Testing

Starting Point – X

24 Hours – No Change

48 Hours – Increase of 2°C (4°F)

72 Hours – Increase of 3°C (6°F)

Total rise in temperature = 3°C (6°F) over 72 hours

5 Year Re-Test

Starting Point – X

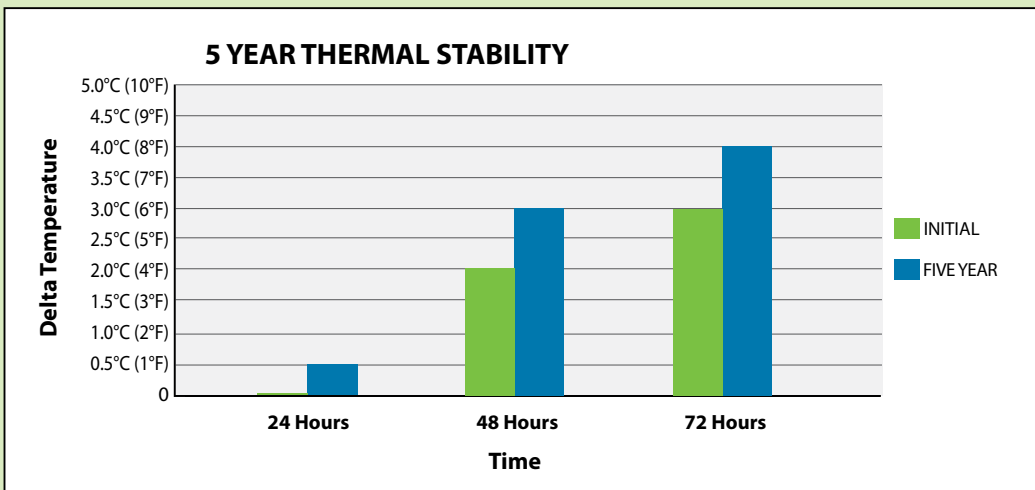
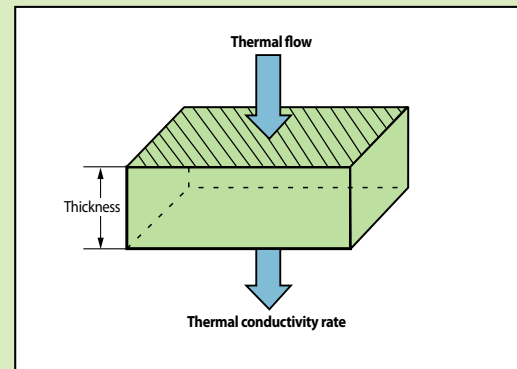
24 Hours – Increase of 0.5°C (1°F)

48 Hours – Increase of 3°C (6°F)

72 Hours – Increase of 4°C (8°F)

Total rise in temperature = 4°C (8°F) over 72 hours

Conclusion: Difference between initial and 5 year tests = 1°C (2°F) over 72 hours



SOFT DRINK DISPENSERS (134a vs. ecomate)

CASE STUDY 2

Soft drink dispensers with exposed foam skins from the original test were stored for 5+ years and then tested using the ice melt method according to industry standards.

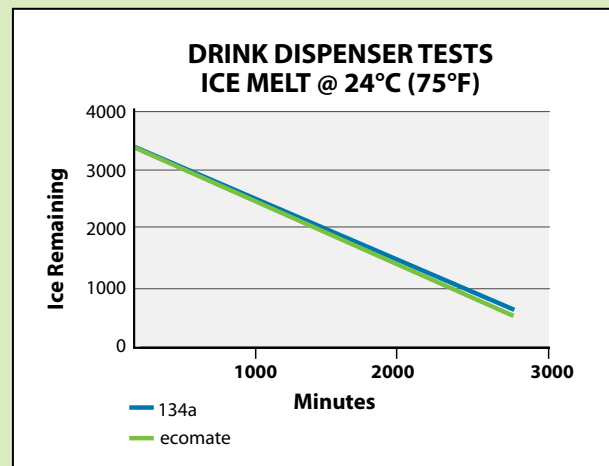
Method: One-gallon plastic jugs were filled with equal amounts of tap water and then frozen. Lids for the units were constructed from identical pieces of extruded polystyrene to maintain test consistency. A jug of ice was placed into each unit, and the lid was placed on top and sealed. At 24-hour intervals the water was poured off each jug and the jug was then re-weighed to calculate the melt. All units were tested at an ambient temperature of 24°C (75°F) to simulate a convenience store atmosphere.

Test: Identical units were constructed and tested using foam systems blown with different blowing agents. The test units were foamed with the manufacturer's current

HFC-134a system and an ecomate system. The test was designed to compare both the differences blowing agent technologies, and also the insulation values after multiple years in the field.

Results: The results are plotted on the graph below.

Conclusions: After 5+ years of storage, the unit foamed with ecomate® showed a negligible 0.5% more insulation value loss over time than the HFC-134a control. Neither unit exhibited a change in physical dimensions greater than 1%.



COMMERCIAL REFRIGERATORS

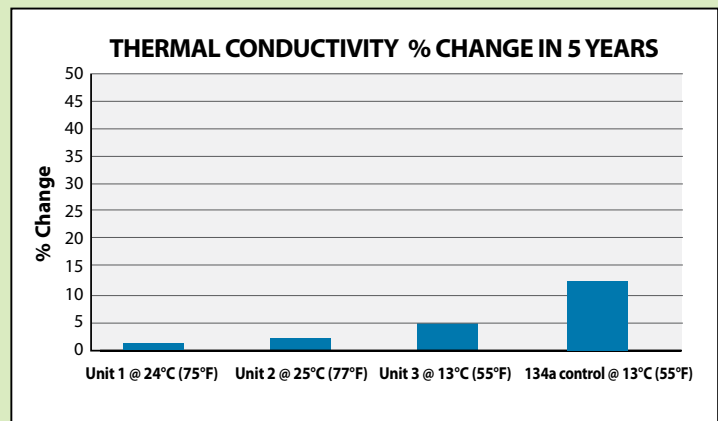
CASE STUDY 3

Individual samples were taken from three commercial refrigerators to compare insulation values from the time they were originally foamed. All refrigerators were stored in ambient conditions in a warehouse, and were at least five years old.

Method: Samples were tested at different temperatures relating to their particular end-use and market, but all follow-up testing was run at the same temperature as the original test. All samples removed from the units were tested in accordance with ASTM C-518, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus".

Conclusions:

- Unit #1 – Cold Vending Machine: 5-year-old sample run at 24°C (75°F) showed an increase in k-factor of 1.2%.
- Unit #2 – Cold Vending Machine: 5-year-old sample run at 25°C (77°F) showed an increase in k-factor of 2.4%.
- Unit #3 – Glass Front, Reach-in Cabinet: 5-year-old sample run at 13°C (55°F) showed an increase in k-factor of 4.9%. (Control unit shot with an HFC-134a foam showed an increase in k-factor of 12.5% over the same time period.)





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