

Smart Strategies for Control Room Temperature Shipping of Mail Order Specialty Pharmaceuticals



Cold Chain Packaging

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Background

Phase Change Materials (PCMs) are not typically associated with low-cost cold chain solutions, as they compete with water-based solutions that have been used for decades. When controlling temperatures near 0°C, water is your best option regarding cost and performance. However, when the temperature requirement is at room temperature, a properly formulated and utilized PCM can far outperform water.

This results in smaller, lighter, more efficient packaging with significantly reduced storage space and shipping costs. It also has a major environmental impact related to both manufacturing and disposal.

Objectives

This case study will demonstrate how properly tested PCMs, in a mat format, can be used with the International Safe Transit Association's (ISTA) temperature profiles to create a lighter, more cost-effective solution for Controlled Room Temperature (CRT) applications.

Methods

In 2022, TempAid began testing configurations that included comparing soft pouch PCM mats to water-based gel pack configurations.

The testing had the goal of maintaining 15 – 25°C against the ISTA 7D Winter profile using four different coolers (8, 16, 23 and 50 liters), with each cooler having two different configurations: One water-based gel pack configuration and one PCM18 Mat configuration.

Results & Conclusion

Attribute	8 L PCM18 Mat	8 L Gel Pack	18 L PCM18 Mat	18 L Gel Pack	26 L PCM18 Mat	26 L Gel Pack	50 L PCM18 Mat	50 L Gel Pack
Tare Weight (lbs)	4.82	13.87	5.14	16.62	8.02	35.38	14.46	46.8
Available Payload Volume (L)	2.86	1.27	6.57	2.93	14.94	8.55	29.91	21.7
Time between 15 - 25 °C (h)	50	32	48	36	50	48	54	53

Attribute	8 L Cooler	18 L Cooler	26 L Cooler	50 L Cooler
Weight Reduction	65%	69%	77%	69%
Available Payload Volume Increase	125%	124%	75%	38%
Performance Duration Improvement	56%	33%	4%	2%

Translating Results to Total Cost of Ownership

The PCM18 configurations, for example, weigh an average of 70% less than gel pack configurations. It also showed an increase in the available payload volume by 90.5% while improving performance durations by an average of 24%. Statistically, in every case, the smaller the cooler payload, the more the potential savings. The resulting study concluded that utilizing PCM mats instead of gel packs allowed for:

- Downsizing containers without compromising payload capacity.
- Reduced required warehousing space for coolers and refrigerants by almost 12x.
- Provided recipients with lighter and less bulky containers that were easier to handle and dispose.
- Significant environmental impact due to reduced package size and energy consumption in shipping.
- Shipping more product in the same sized container, larger shipments with more product to a single receiver at the same cost point, or consolidating shipments for improved packing efficiency.
- Potential for cost savings, increased productivity, and better logistics.