



Liviri

PASSIVE VERSUS ACTIVE COOLING

SUSTAINABLE, PASSIVE COOLING STRATEGIES FOR OPTIMIZING E-GROCERY STAGING AND DELIVERY

Thermal packaging is crucial to the successful delivery of perishable foods. And the type of cooling mechanism you choose for staging and delivery plays a key role in keeping goods fresh from start to finish.



WHEN EXPLORING SUSTAINABLE COOLING STRATEGIES FOR E-GROCERY IT'S GOOD TO KNOW YOUR OPTIONS. Active cooling requires energy-hungry, temperature-controlled storage solutions such as refrigerated trucks, walk-in refrigerators and freezers.

The alternative is to maintain the quality of perishable goods with either ice or standalone coolant. This is known as passive cooling — a more cost-effective, environmentally preferable option that doesn't require electricity or high impact, fuel-generated refrigeration systems.



THE E-GROCERY ERA

Driven by consumer demand for click-to-order convenience, E-Grocery pickup and delivery continues to surge.

AS A RESULT, chilled and frozen staging space is becoming increasingly coveted real estate in crowded warehouse spaces. Refrigerated trucks are also in high demand. And microfulfillment distribution centers, or “hubs” that deliver to local “spoke” grocery stores, have increasing cold-chain requirements as more and more food is transported to pickup locations.

Passive cooling totes and containers help E-Grocery businesses overcome these challenges. That’s because with the right amount of coolant and proper ice management, chilled food can be kept at the Food and Drug Administration-specified temperature range for 10 to 15 hours — even in hot environments.

Economical EPP insulated boxes, additionally, reduce demand for refrigerated trucks, chillers and freezers, making passive cooling a more environmentally friendly option.

According to Project Drawdown¹, disposal and displacement of chemicals used for refrigeration is a leading cause of increased greenhouse gases (GHGs), with food waste following closely behind. The combined negative GHG contribution of refrigerant chemicals and food waste is more than three times worse than the total effect of carbon dioxide emissions estimated by the Intergovernmental Panel on Climate Change (IPCC)².

In addition to decreasing environmental impact, passive cooling shipping provides grocers and perishable food shippers more flexible staging options to get their goods out by not requiring dedicated space for active cooling. It also offers convenient door-to-door protection for consumers.

7 BEST PRACTICES FOR PASSIVE COOLING

It is easy to integrate passive cooling in perishable food and grocery pickup and delivery strategies. Here are some basic guidelines for retailers interested in implementing passive cooling solutions:

1

Measure cold chain success based on when food crosses critical temperature thresholds, not by concrete rises in temperatures.

Chilled Food

dairy, proteins and meat

MUST STAY BELOW **40° F** 4.4° C

Frozen Food

fruits, veggies and frozen meals

START TO SOFTEN AT **20° F** -6.6° C

Ice Cream

BEGINS TO MELT AT **10° F** -12.2° C

Focus on staying below the temperature requirements instead of measuring how much the temperature rises inside your sustainable packaging. For example, requiring that ice cream removed from a -10° F freezer increases no more than 5° F is not a realistic or necessary requirement, especially since ice cream doesn't begin to melt until 10° F. Instead, concentrate on adding appropriate coolant and insulation to ensure ice cream always stays below 10° F to prevent melting and the formation of ice crystals.

2

OPTIMIZE COOLANT LOAD

Liviri has tested hundreds of different use cases to determine the right amount of coolant needed to achieve optimal food quality protection. The following factors impact how much coolant is needed:

External temperature profile. Does the product require a staging room temperature? A bump in external temperature for transport on a hot truck? (Additionally, be prepared to adjust coolant for different times of the year.)

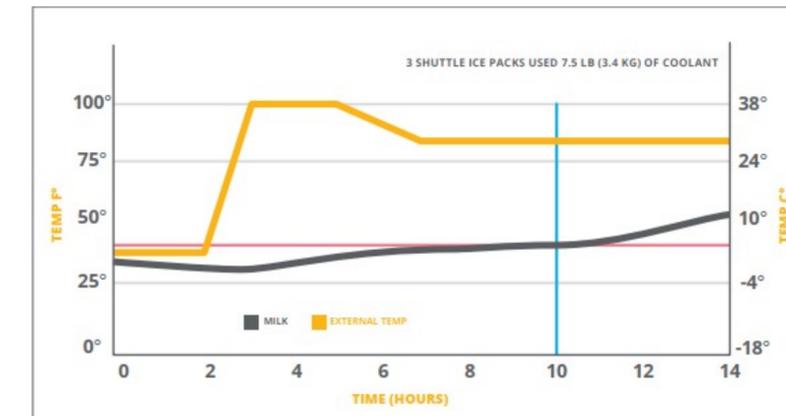
Cold-chain duration requirements

Coolant type

Desired state of food when it arrives to the consumer. Grocery customers expect that their ice cream and frozen foods will be delivered frozen solid. In contrast, customers who order premium beef for meal kits may want food to arrive partially thawed, so it's ready to consume.

Liviri sprint⁴⁵ CHILLED GROCERIES FOR SAME-DAY DELIVERY

Liviri Sprint⁴⁵ keeps groceries under 40°F (4°C) in summer heat for up to 10 hours with 3 Liviri Sprint ice packs.



Simply adjust coolant load based on external temperatures to keep your contents below 40°F (4°C) for 10 hours.

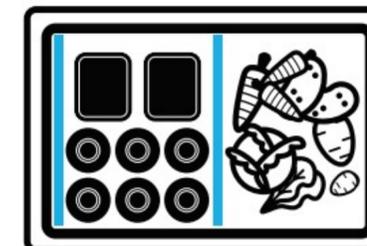
AVERAGE TEMPERATURE (10 HRS)	COOLANT REQUIRED
UP TO 46°F (UP TO 8°C)	No ice required
46°F - 55°F (8°C - 13°C)	1 Sprint ice pack
55°F - 64°F (13°C - 18°C)	2 Sprint ice packs
64°F - 78°F (18°C - 26°C)	3 Sprint ice packs

*Each Liviri Sprint ice pack weighs 3 lb (1.4 kg), and contains 2.5 lb (1.1 kg) of coolant

When you don't need 10 hrs of chill time in summer heat, optimize the amount of ice to shave weight.

SHORTER DURATIONS	COOLANT REQUIRED
UP TO 3 HOURS	No ice required
3 - 5.5 HOURS	1 Sprint ice pack
5.5 - 8 HOURS	2 Sprint ice packs
8 - 10 HOURS	3 Sprint ice packs

*At average external temperature of 78°F (26°C)



PACKOUT BEST PRACTICES:

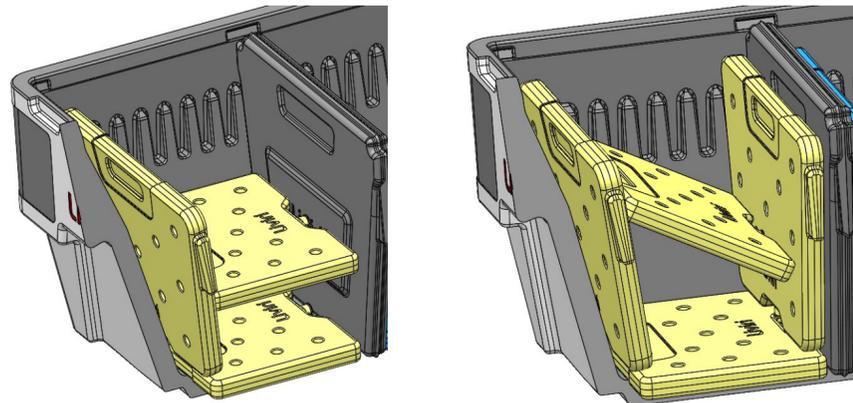
Sandwich proteins/dairy with ice packs on sides and bottom for best performance.

3

MAXIMIZE DIRECT CONTACT WITH COOLANT

To achieve the best results with the least amount of coolant, it's essential to sandwich food between ice packs to maximize direct coolant contact. When shipping in extreme heat, enclose goods within a box of coolant using horizontal ice packs on the bottom of the container, plus vertical ice packs on the sides, to increase cold-chain performance.

For best performance ice cream should be sandwiched in between horizontal ice packs with at least one vertical ice pack on the side.



Vertical ice packs work best for tall items like milk and juices or with full boxes to maximize ice contact.



Minimize direct ice contact with fruits and veggies to avoid freezing and/or damaging produce.

4

USE THE RIGHT COOLANT FOR THE JOB

32° F / 0° C

Ice packs are best for keeping chilled and most frozen foods cold for the longest period of time — since they melt the slowest.



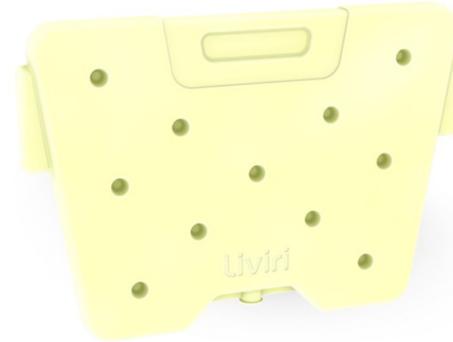
Weight: 3.06 lbs. (1.39 kg)
Coolant: 2.35 lbs. (1.06 kg)



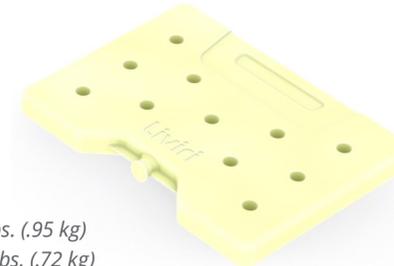
Weight: 2.10 lbs. (.95 kg)
Coolant: 1.60 lbs. (.72 kg)

5° F / -15° C

Ice packs are best for keeping ice cream below 10° F (-12 Celsius) and frozen food below 20° F (-6.6 Celsius) for up to 12 hours.



Weight: 3.06 lbs. (1.39 kg)
Coolant: 2.35 lbs. (1.06 kg)



Weight: 2.10 lbs. (.95 kg)
Coolant: 1.60 lbs. (.72 kg)

Dry ice is excellent at keeping ice cream below 10° F (-12 Celsius) and frozen food below 20° F (-6.6 Celsius) for longer periods of time — but it can be challenging to manage.

Note: The colder the PCM coolant transition temperature, the shorter the cooling duration, and the longer it takes to freeze (in standard coolers -10° F). Therefore 5° F (-15° C) ice packs melt faster and take longer to freeze than 32° F (0° C) ice packs.

5

ENSURE THAT ICE PACKS ARE COMPLETELY FROZEN

NOT FROZEN

(brightly colored coolant)

FULLY FROZEN

(whitening of the coolant)

CONDITIONING/FREEZE TEMPERATURES

PARTIALLY FROZEN

**YELLOW
ICE PACKS**



Precondition the 5° F (-15° C) packs as cold as you can based on your freezer. We conducted our testing in a -10° F/-23° C commercial freezer, but blast freezers that go as low as -58° F (-50° C) are even better.



**BLUE
ICE PACKS**



Precondition the 32° F (0° C) packs 14° F (-10° C) to 32° F (0° C) to minimize the potential to freeze the chilled items.

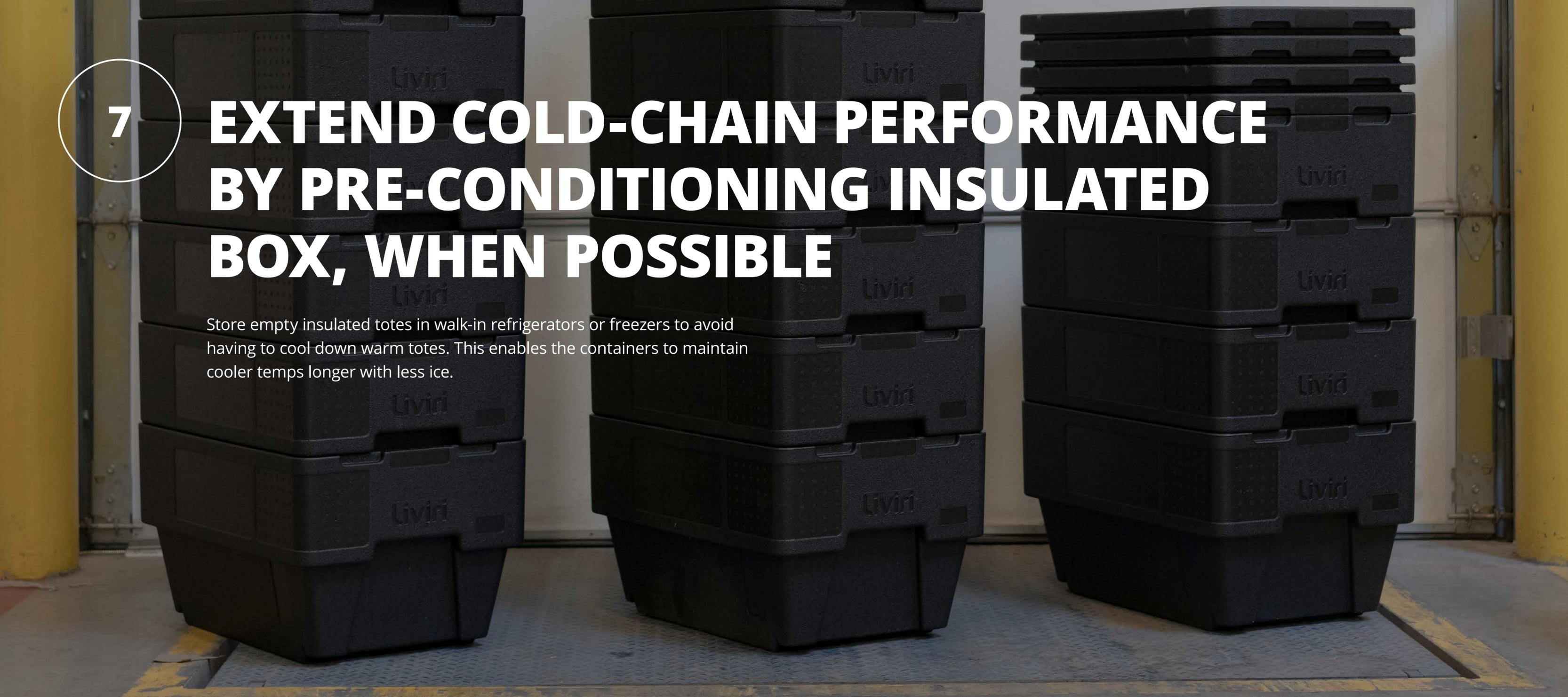
- Use racks to separate ice packs to ensure good air flow for faster freezing
- Do not freeze ice packs in insulated totes since insulation keeps cold air out
- Implement first in, first out rotating ice system to ensure that the most frozen packs are used

6

REDUCE EMPTY SPACE IN SUSTAINABLE PACKAGING. THE MORE DENSELY A BOX IS PACKED, THE LONGER IT MAINTAINS DESIRED TEMPERATURES

Use thermal dividers to combine frozen and chilled items in the same box. Or, combine multiple orders in the same box to eliminate dead air space.



The image shows three stacks of black, heavy-duty insulated totes (coolers) stacked on a metal floor inside a walk-in refrigerator. The totes are arranged in three columns of varying heights: the left column has 4 totes, the middle column has 5 totes, and the right column has 6 totes. Each tote has the 'Liviri' brand name embossed on its side. The background shows the interior of a walk-in refrigerator with yellow-painted metal walls and a metal floor with yellow safety lines.

7

EXTEND COLD-CHAIN PERFORMANCE BY PRE-CONDITIONING INSULATED BOX, WHEN POSSIBLE

Store empty insulated totes in walk-in refrigerators or freezers to avoid having to cool down warm totes. This enables the containers to maintain cooler temps longer with less ice.

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¹ www.drawdown.org/solutions/refrigerant-management

² www.ipcc.ch

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