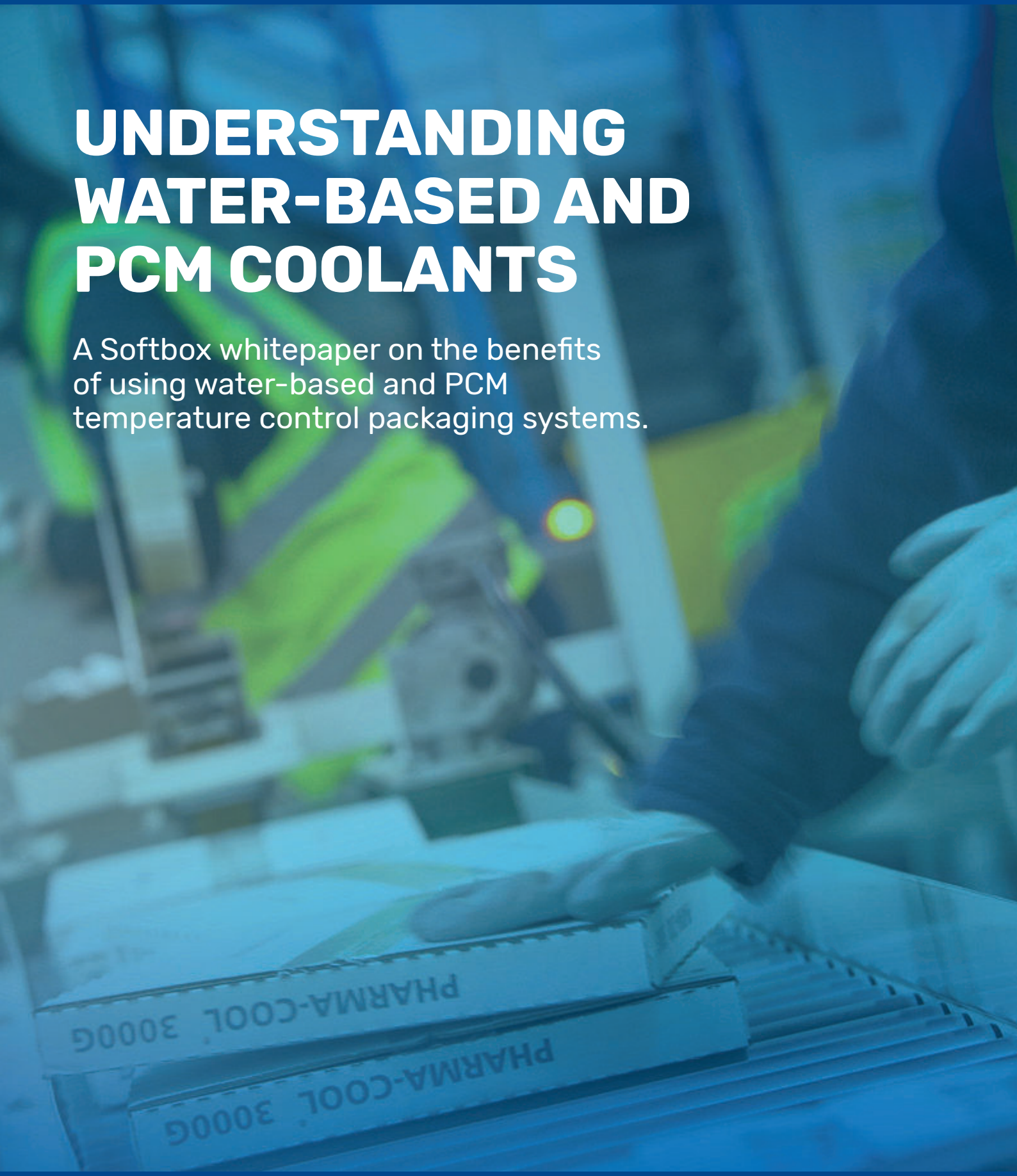
Softbox
TEMPERATURE CONTROL PACKAGING SYSTEMS

UNDERSTANDING WATER-BASED AND PCM COOLANTS

A Softbox whitepaper on the benefits of using water-based and PCM temperature control packaging systems.



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Introduction to water-based and PCM coolants

This document provides guidance on the selection of water-based or PCM Pharma-cool coolants, and details the benefits of both types of Pharma-cools based on Softbox qualification methodology.

Both water-based and PCM Pharma-cool coolants achieve cooling by changing states or phases, most commonly from a solid to a liquid, a process which absorbs heat. Either type of Pharma-cool can be used to maintain the two most common product temperature ranges:

2°C to 8°C (Chilled)

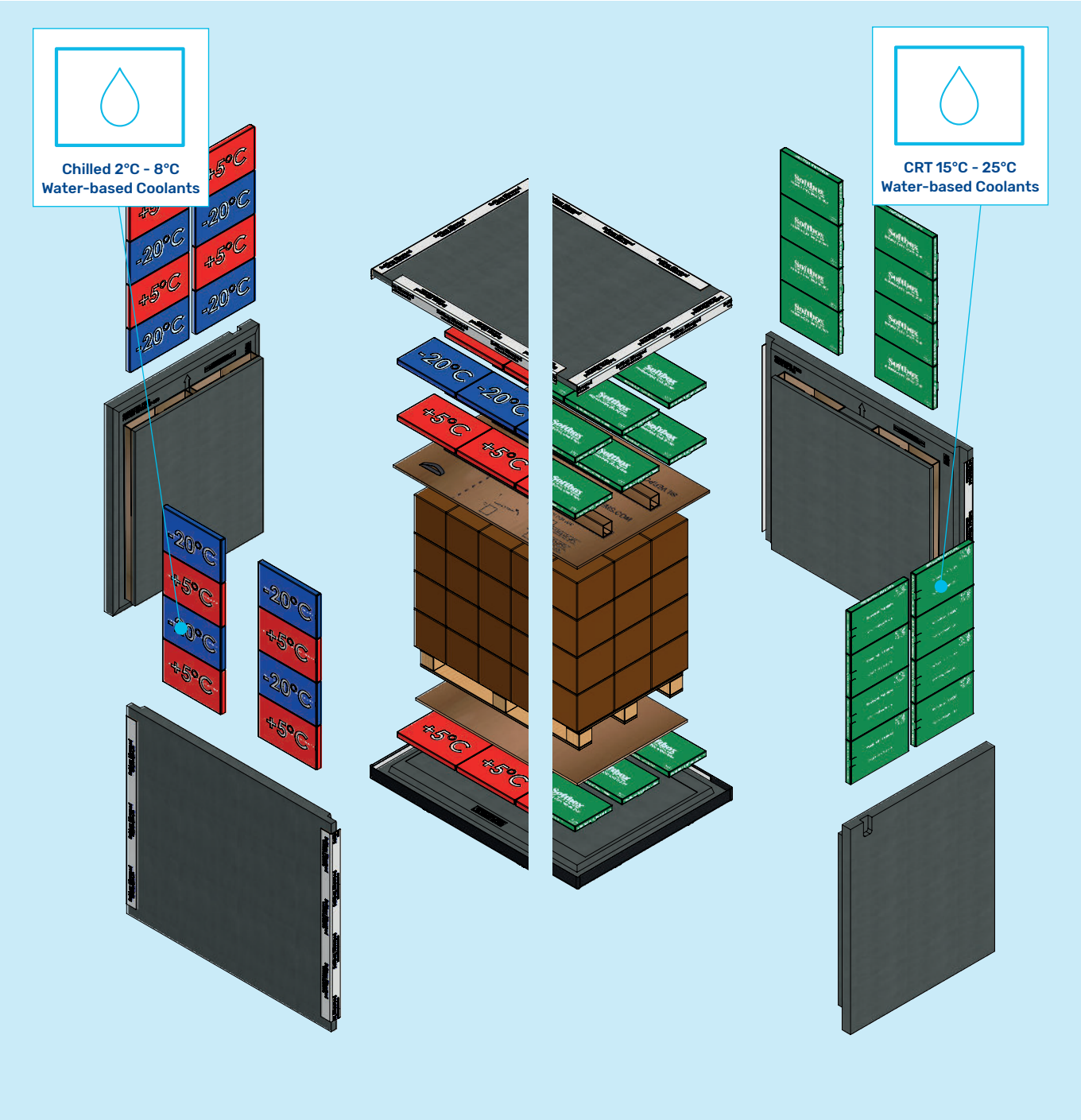
15°C to 25°C (Ambient)

Water-based coolants

Water goes through phase change at 0°C which is a few degrees colder than the ideal temperature for the shipping of temperature sensitive goods with a temperature range of 2°C to 8°C.

To achieve the optimal temperature range, a thermal 'gradient' is created using a combination of Chilled (+5°C) and Frozen (-20°C) Pharma-cools within a layer of internal insulation. This combination results in the desired 2°C to 8°C temperature range being maintained within the shipping system for a specific duration.

Ambient or CRT (Control Room Temperature) products tend to have a temperature range of 15°C to 25°C, so Pharma-cools are conditioned at 20°C without the need for phase change to occur.

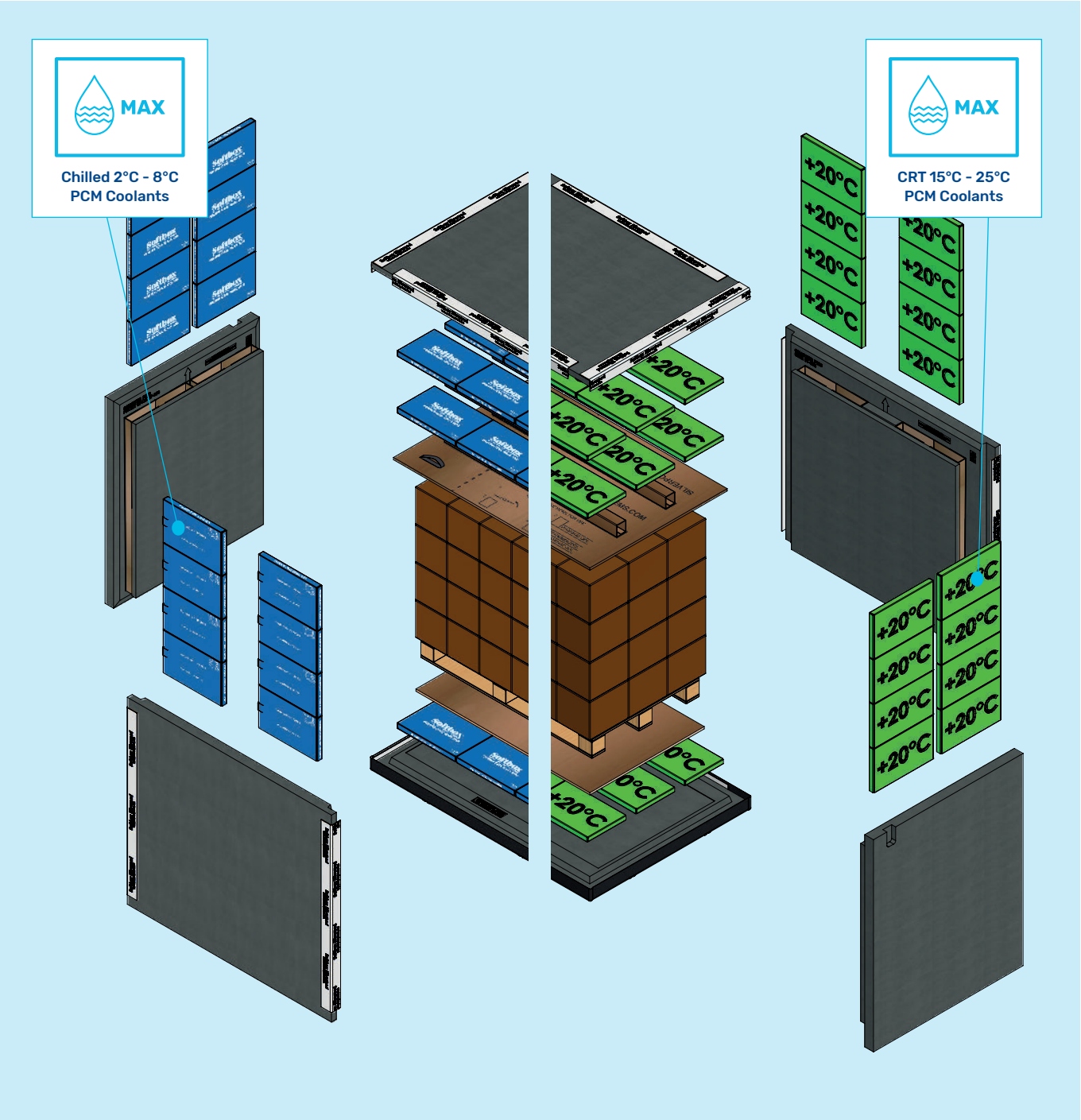


PCM coolants

PCM coolants work on a similar principle to water-based coolants; however, as these have been designed to have a phase change or “melting” point at the desired product temperature (i.e. 5°C) only a single layer of insulation and coolant is required. This simplifies the pack-out configuration and conditioning process.

PCM means ‘Phase Change Material’ which is a term used to describe a range of different materials which are mixed and conditioned to provide very specific temperature control.

PCM Pharma-cools for ‘Ambient’ or CRT use cooling materials with a Phase Change point of 20°C so are ideal for products with a temperature range of 15°C to 25°C.



Benefits of PCM coolants

Using Pharma-cool PCM coolants has the following benefits over water-based coolants, particularly when shipping temperature sensitive products requiring strict 2°C to 8°C thermal performance:

All-Year (Universal) Configuration with ONE Pharmacool type and temperature

Enable cold storage before and during shipping, without incurring temperature excursions.

Thermally robust 'Pack, Ship & Forget'. Excursion reduction over water-based systems used in uncontrolled lanes

Greater performance (168 hours+)

Increased payload. Lower shipping weight. Fewer overall system components. Reduces operational complexity resulting in fewer overall system components

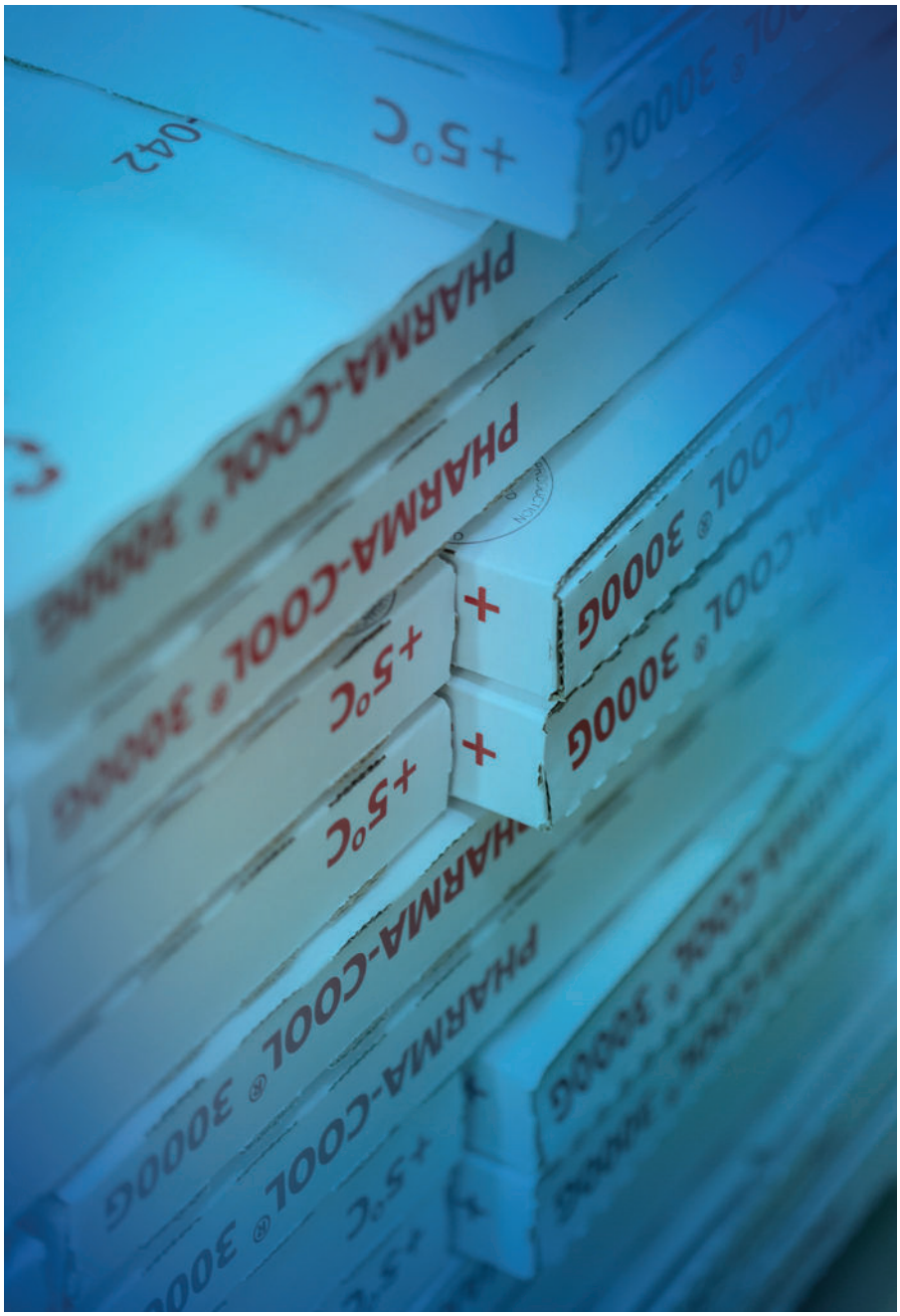
No risk of cold shock. Seasonal pack-outs are not required

Water-based or PCM?

The decision to select a shipping system with either water-based or PCM Pharma-cools depends on a number of factors;

- Lane characteristics such as Phases of Temperate and/or Extreme Temperatures
- Is it shipped as general cargo, or using a specialised service?
- Shipping duration, for example Short haul / Domestic 24 to 72 hours or Long haul / International 72 to 120+ hours
- Desired Qualification profile (I.e. ISTA 7D)
- Patient need, shelf life and product value
- Complexity of packing operations
- Conditioning capabilities (Ambient, Frozen and Chilled facilities)
- Short, Narrow or No product stability data
- Previous temperature excursions on the shipping lane

Softbox can provide the most suitable shipping systems and optimal Pharma-cool configurations based on different scenarios and help you assess and identify the root cause for any historic excursions.



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