KUEHNE+NAGEL

Healthcare Logistics

Temperature-controlled corridors: Moving from active to passive packaging

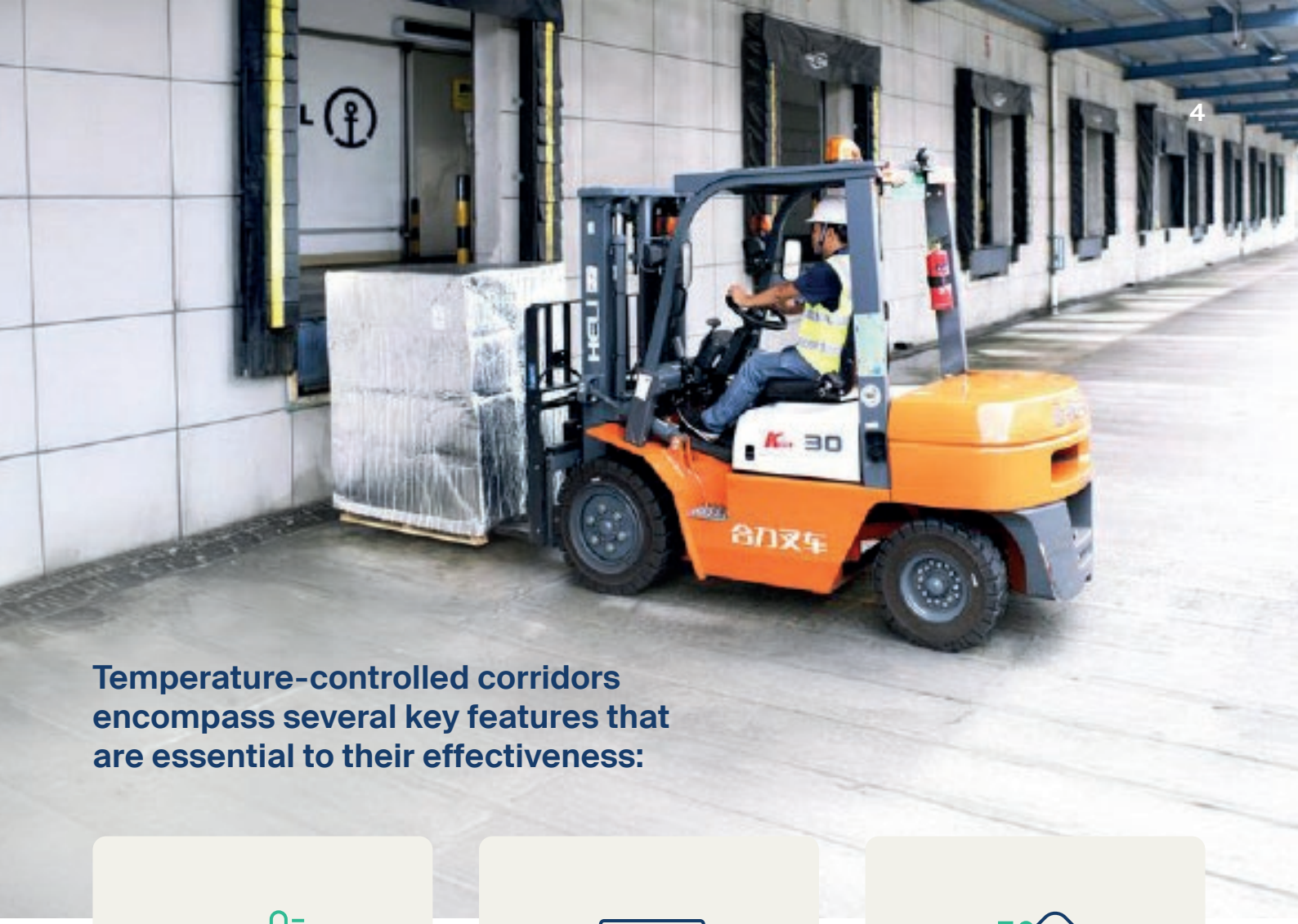
Understanding temperature-controlled corridors

From the heart of Denmark, penned by Kristine Palm, Vice President of Global Air Logistics Healthcare

In the ever-evolving landscape of healthcare logistics, ensuring the safe transport of temperature-sensitive pharmaceuticals and biopharmaceuticals is a critical challenge. From vaccines to biologics, the integrity of these products hinges on maintaining a precise temperature range throughout the supply chain. Enter the world of dedicated temperature-controlled corridors—an innovative solution that prioritises product integrity while meeting the increasing demand for efficient, cost-effective, and sustainable healthcare logistics. Central to the success of these corridors is a strategic shift from active to passive packaging (for the +2 to +8°C and/or +15 to +25°C temperature ranges).

Key features of temperature-controlled corridors

Temperature-controlled corridors are pre-established transportation routes designed to maintain a consistent, +2 to +8°C or +15 to +25°, temperature range for temperature-sensitive healthcare products. These corridors leverage existing infrastructure and logistics networks to create a seamless cold chain environment throughout the supply chain. Spanning across airports, warehouses, and last-mile delivery hubs, temperature-controlled corridors are strategically planned and monitored to minimise temperature excursions and ensure the integrity of medical products from manufacture to end user.



Temperature-controlled corridors encompass several key features that are essential to their effectiveness:

Temperature-controlled facilities

Warehouses and storage facilities along the corridor are equipped with advanced temperature control systems to maintain the required temperature range.

Real-time monitoring

Temperature monitoring devices and sensors are deployed throughout the corridor to provide real-time data on temperature conditions.

Rapid response mechanisms

In the event of temperature deviations, rapid response mechanisms are in place to address and rectify the issue promptly.

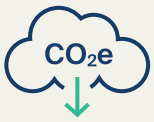
In addition to being designed to ensure compliance with stringent regulations and quality standards, temperature-controlled corridors offer a more holistic approach to improving supply chain efficiency. There's more to temperature-controlled corridors than just temperature control; they have become an essential tool in the drive for sustainability in the healthcare industry.

Passive packaging: The game-changer

Welcome to the multifaceted world of passive packaging, a world in which advanced insulation materials and phase-change technology is used to maintain specific temperature ranges without the need for external power sources.

Passive packaging systems are a critical component of temperature-controlled corridors, providing an additional layer of protection for temperature-sensitive medical shipments. Historically, the healthcare industry has relied heavily on active packaging systems—powered containers with built-in temperature control mechanisms—while effective, these systems are costly, energy-intensive, and logistically complex. Passive packaging systems, on the other hand, use insulating materials and phase change materials (PCMs) to maintain the desired temperature range.

Sustainability advantages of passive packaging



Reduced carbon footprint

Active systems require electricity to maintain functionality, contributing significantly to greenhouse gas emissions. In contrast, passive packaging reduces these emissions entirely, relying on design innovation rather than energy consumption.

Enhanced scalability

Passive packaging solutions are lighter and easier to handle, reducing fuel consumption during transport and lowering the overall environmental impact of supply chain operations.

Cost advantages of passive packaging

Lower operational costs

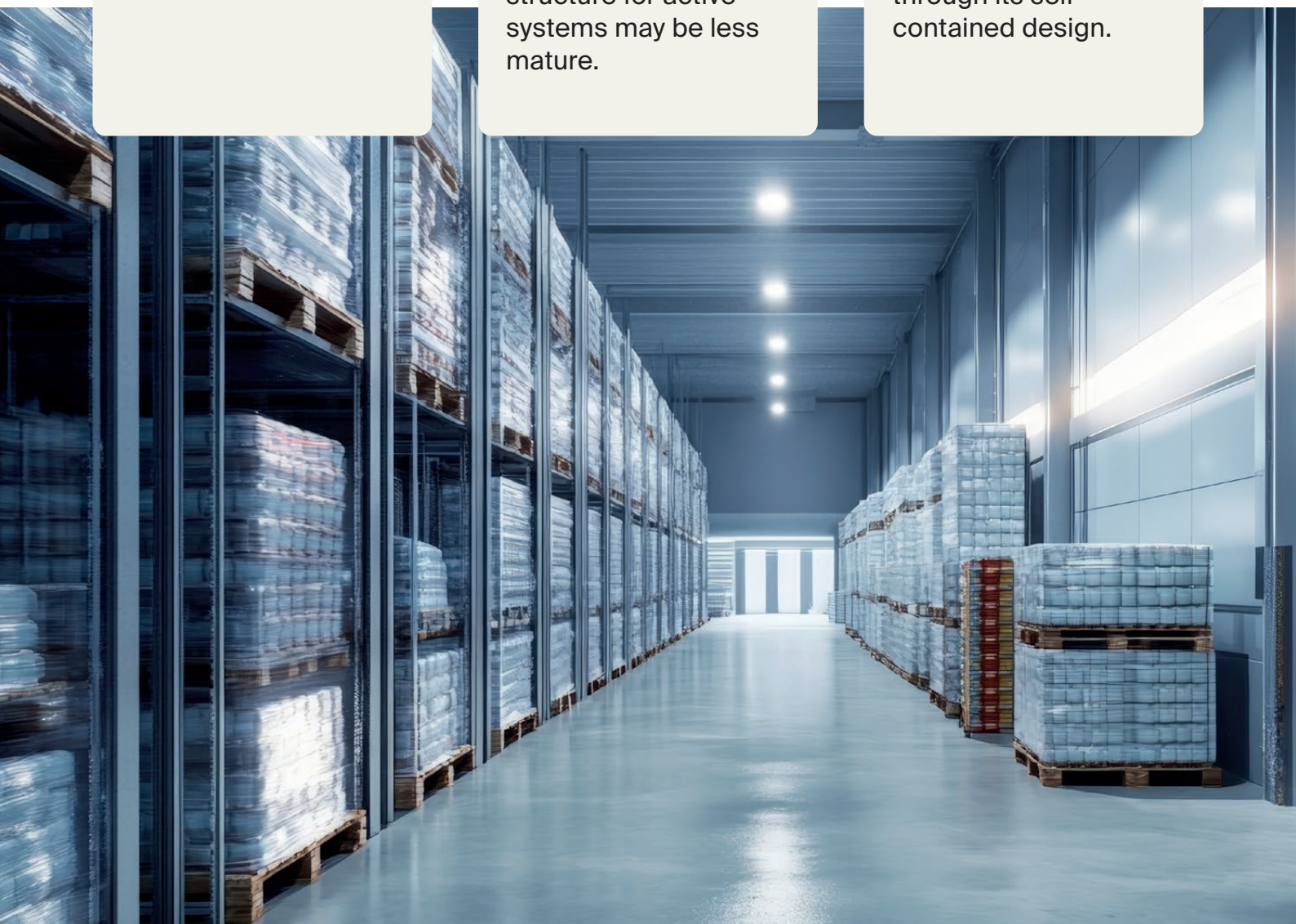
Unlike active systems, passive packaging does not bear the same risk of high demurrage costs.

Scalability and flexibility

Passive solutions are easier to deploy across multiple geographies, making them ideal for temperature-controlled corridors in emerging markets where infra-structure for active systems may be less mature.

Reduced risk of downtime

Unlike active systems, which are vulnerable to power failures and mechanical issues, passive packaging ensures uninterrupted temperature control through its self-contained design.



Kuehne+Nagel's temperature-controlled corridor solution: An overview

The temperature-controlled corridor solution minimises ambient exposure, reducing it to minutes or hours—far less than the traditional flow, where products face multiple ambient exposures, up to 12 to 24 hours on average.

In 2024, Kuehne+Nagel launched +2 to +8°C temperature-controlled corridors between Stuttgart and Birmingham (US), Brussels and Chicago, Chicago and Shanghai, Chicago and Stuttgart, with many more corridors and temperature ranges planned for 2025.

The Kuehne+Nagel process in short:

- Temperature-controlled haulage is used to transport goods to the origin GxP facility.
- The packaging, which incorporates PCMs and re-usable covers, ensures a constant temperature of +5°C throughout the entire journey.
- The unit load devices (ULDs) are assembled directly within cold chambers, minimising ambient and cumulative exposure to mere minutes.
- IoT temperature-monitoring devices are installed to facilitate end-to-end temperature monitoring and manage deviations during transit.
- The shipment documentation includes IATA temperature-sensitive labels and the specified temperature range on the house air waybill (HAWB).
- Transfers from the airport are handled using temperature-controlled trucks to ensure consistent temperature management until the goods reach the airline handling agent warehouse.

Before shipments depart, lane risk assessments are completed. The HyperCare team monitors shipments from end-to-end and intervenes or informs in the case of delays or unexpected temperature changes. Teams of experts coordinate issue resolution centrally. Risk mitigation can occur at any touchpoints during the shipment.

The future of temperature-controlled corridors in healthcare logistics

As the healthcare sector continues to prioritise sustainability and cost-effectiveness, temperature-controlled corridors will become increasingly important in shaping the future of logistics. Companies will likely continue to explore hybrid models that combine both passive and active packaging technologies depending on the product's needs, transport duration, and budget.

Future trends and innovations may include:

Enhanced monitoring technologies
The development of more sophisticated temperature-monitoring devices and sensors will provide even greater accuracy and real-time data.

Innovative packaging materials
Ongoing research and development of advanced insulating materials and PCMs will lead to more efficient and sustainable passive packaging solutions.

Expansion of temperature-controlled corridors
The establishment of additional temperature-controlled corridors in regions with challenging climates and logistical conditions will further enhance the global cold chain network.

Integration with digital platforms
The integration of temperature-controlled corridors and passive packaging systems with digital platforms and IoT (Internet of Things) technologies will continue to enable seamless tracking and management of temperature-sensitive shipments.

Conclusion

Temperature-controlled corridors and passive packaging systems are revolutionising healthcare logistics by ensuring the safe and efficient transportation of temperature-sensitive medical products. These innovations address the challenges of maintaining the cold chain and provide reliable, cost-effective, and sustainable solutions. As the healthcare industry continues to evolve, the adoption of temperature-controlled corridors and passive packaging systems will play a crucial role in delivering high-quality medical products to patients around the world, safeguarding their health and well-being.

About us

With approximately 80,000 employees at almost 1,300 sites in close to 100 countries, the Kuehne+Nagel Group is one of the world's leading logistics providers. Headquartered in Switzerland, Kuehne+Nagel is listed in the Swiss blue-chip stock market index, the SMI. The Group is the global number one in air and sea logistics and has strong market positions in road and contract logistics.

Kuehne+Nagel is the logistics partner of choice for 400,000 customers worldwide. Using its global network, logistics expertise and data-based insights, the Group provides end-to-end supply chain solutions for global companies and industries. As a member of the Science Based Target Initiative (SBTi), Kuehne+Nagel is committed to sustainable logistics by reducing its own environmental footprint and by supporting its customers with low-carbon logistics solutions.

→ kuehne-nagel.com

KUEHNE+NAGEL