



Whitepaper

Logistical challenges at low temperatures

7 steps for an efficient
coldstore warehouse








Introduction

The demand for cold-storage and freezer storage continues to grow. Coldstores more and more have the function of buffer storage for fluctuating demand and production. They can also help adapt to unforeseen circumstances or market fluctuations. A big influence in the demand for coldstores comes from the consumers' consumption patterns: people are eating more fresh food and less canned food.

However, storage in freezing conditions brings with it considerable challenges. Unrelenting staff shortages, difficult working conditions, high energy costs and expensive square meters. Reason enough to take a close look at the way of storing items in existing or new coldstores and see how this can be done better and more efficiently. Because coldstores are not a one-size-fits-all affair.

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The whitepaper covers seven topics. After going through these steps, you will know exactly which factors to take into account when building or renovating a coldstore warehouse. In this way you will be well prepared to plan an efficient warehouse with the right suppliers.

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Is an automated warehouse the next step for you? Or a hybrid solution, combining automatic and manual warehousing? We are happy to discuss your options and help you find a suitable and future-proof solution. For more information, please contact us at mail@reesinkls.com or +31 (0) 850 010 020.



Functionalities

The first step is to determine **the coldstore's intended functionality**. Will the coldstore be used for own storage? Or will the warehouse (also) be used as a service for external parties?

Production coldstore

Coldstore as production buffer. Adjacent to the production line is the company's own coldstore. Semi-finished or finished products are stored here for later processing or transport.

Public coldstore

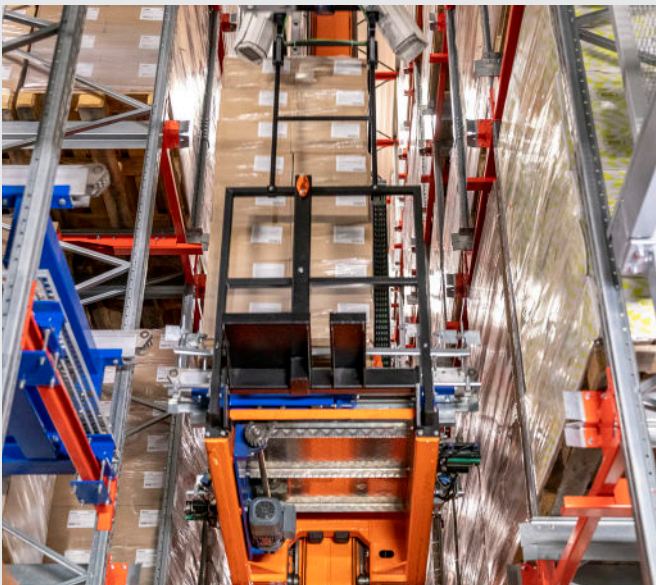
Coldstore as a Service. In these coldstores, goods from external parties are stored. This service is often combined with the processing, packaging and transport of food or goods. A dedicated coldstore is set up especially for a specific customer or product.

This type of storage is a growing business, and the coldstore needs to be very flexible in this case. After all, customer demand is constantly changing. An automated solution anticipates this better and can adapt faster to change.

Coldstore with cranes at Prè Pain

In 2011, bake-off supplier Prè Pain decided to automate their coldstore. The 13m high warehouse can accommodate 12.500 pallets. Seven straight running pallet cranes fitted with forks or shuttles ensure that at least 50 trucks can be loaded every day.

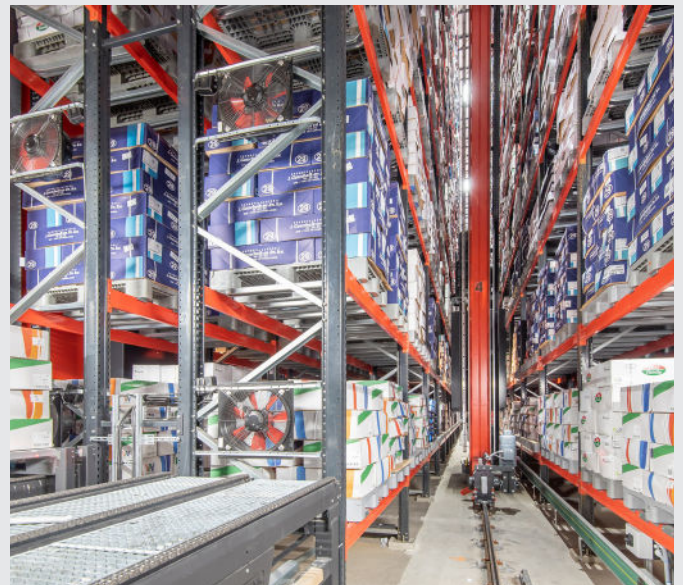
When the bread comes off the production line, it is packed in a box or bag. If it does not go to the customer fresh, it is stored in the coldstore. Depending on the product, it can be stored up to three days in the coldstore, which operates fully autonomously with seven self-propelled pallet cranes.



Coldstore as a service at Grolleman

With facilities for packaging, cooling, freezing and storage, Grolleman Coldstores is a logistics service provider for the food industry. In recent years, their location in Apeldoorn has undergone various transformations resulting in a highly innovative, sustainable and automated storage and buffer location with space for 42.000 pallets.

The warehouse consists of a coldstore with racking and cranes, an extended building with mobile racking and a completely new silo building warehouse with eight automatic pallet cranes since 2019. The 42.000 pallet spaces have a high occupancy rate, depending on the world market for meat. This is constantly changing, so Grolleman has to be very flexible in their function as buffer storage.





(Un)certainities

The required storage capacity is not always a given and depends on many aspects. This makes it extra important to build a warehouse solution that adapts to the market demands. It is essential **to gain insight into future developments** of volumes and distribution structure and stability in the nature and size of the goods.

Therefore, conduct thorough research and develop scenarios that answer the following questions, among others:

- » What is my main market and how does it develop?
- » What trends and developments are taking place and how do they affect my business?
- » How does current transport and distribution take place and is this subject to change now or in the future?
- » Who are my customers? And how do they move?



Warehousing in practice: Meal boxes

The sales of meal boxes in the Netherlands grew enormously during the Covid-19 crisis, according to research by ABN Amro's economic bureau. A growth which, according to them, will continue. What does this mean for the storage problem of the meal box suppliers?

A meal box consists of various products. The picking process is therefore characterized by 'piece picking'. Traditional storage on pallets is not efficient. Storage is therefore mainly in containers.



Our advice:

Go for a hybrid coldstore: partially automated and partly manual.

Remain flexible with a hybrid coldstore

Is your business in a market where there is a lot of uncertainty? Then opt for a hybrid coldstore: partially automated and partially manual. For example, with a section of mobile shelving, where pallets of different sizes can be stored. Having a hybrid storage solution allows you to scale up and down, depending on the needs of your business.

Goods-to-person oplossing met Miniload

Goods-to-person is a modern method of order handling which combines automated storage with precise, ergonomic order picking working stations. Miniload cranes are well suited for the storage of large quantities of totes, trays or boxes. The available space is used as effectively as possible. Import and export of the goods takes place according to the goods-to-person principle. The goods are automatically brought to the order picker at the desired moment.

A miniload crane can operate up to a temperature of -40 degrees Celsius and is therefore very suitable for a coldstore.



Temperatures

Everyone has their own definition of 'cold'. With cold storage, the temperature is above zero, with frozen storage, it is below zero. But even within this range, there are many different possibilities, which in turn have a great influence on the warehouse operation. This requires specific knowledge and skills.

For example, -32 degrees Celsius or -25 degrees Celsius makes a difference to steel and cables. Therefore, **determine in advance the most suitable temperature for your goods**. Also, the buffer areas between different parts of a warehouse, such as a corridor, require attention. Here, movement takes place from cold to warm and vice versa. This affects the systems. For example, condensation: getting wet and then freezing again can be fatal for equipment. Therefore, make sure that you start working with the right option or combination of solutions.

Roughly speaking, there are four possibilities:

1. Cold storage

- » Mainly applicable for fresh produce, fruit, vegetables, fish and meat products
- » Presence of moisture in storage, affecting machines and materials
- » Item, package and pallet picking is common
- » Temperature range: 2 - 8 degrees Celsius

2. Frozen storage

- » Mainly frozen products, fruit concentrates, vegetables, potato products, fish and meat, or pharmaceutical products
- » Dry air, which has a positive influence on materials
- » Temperature has a major influence on the use of machines
- » Mainly pallet picking, also colli picking possible
- » Temperature range: -40 to -25 degrees Celsius

3. Multifunctional cold and freezer storage

- » The type of products varies
- » Systems must be prepared for humidity due to fluctuating temperatures
- » Equipped for combination of pick possibilities
- » Temperature range: from - 30 degrees Celsius to 8 degrees Celsius
- » ideal for public coldstores, because they need to be flexible to customer demand changes

4. Freezer storage

- » Mainly meat products
- » Dry air which has a positive influence on materials
- » Mainly pallet storage
- » Temperature range: colder than -30 degrees Celsius





Product groups

The product groups to be stored have a major influence on warehouse design. Most coldstores are used in the food and pharmaceutical industries. A well-known example are vaccines, such as the Covid-19 vaccine, which must be stored at a specific freezing temperature. But you can also think of fruit and vegetables, dairy products, fish, meat and seafood, or manufactured foods.

It is important to know what type of products need to be stored now and in the future. After all, these products and their characteristics determine the storage method.

Most common products stored in a coldstore:



Fruit and vegetables

- » Not all of them can be stored together: smell and flavour can be affected.
- » Some products need to ripen or not, which may also require different temperatures.

Common warehouse solution: warehouse crane, 1-2 pallets deep. As it concerns fresh products, high throughput is essential and multi-deep storage is not efficient.



Dairy

- » Cheese needs to be turned every so often, so recurrent actions need to be factored-in
- » Some products are vulnerable to transport/handling.

Common warehouse solution: warehouse crane, with shuttles as load handling device. Multi-deep storage is possible as it often involves large batches.



Fish, meat and seafood

- » Freezing meat requires a specific process, as otherwise the structure of meat may change. A freezing cell or tunnel is often used for this purpose.
- » Meat is often stored in boxes, which can cause unstable stacking. Therefore, unstable loads must be taken into account in such a warehouse.
- » Seafood is an expensive commodity. They are often packed in smaller quantities and distributed more finely, which results in more order picking movements.

Common warehouse solution: crane warehouse, 1 or 2 rows deep because the goods have a high turnover rate.



Manufactured food

- » Such as ice cream or baguettes. They are often large batches, which offers the possibility of multi-deep storage.

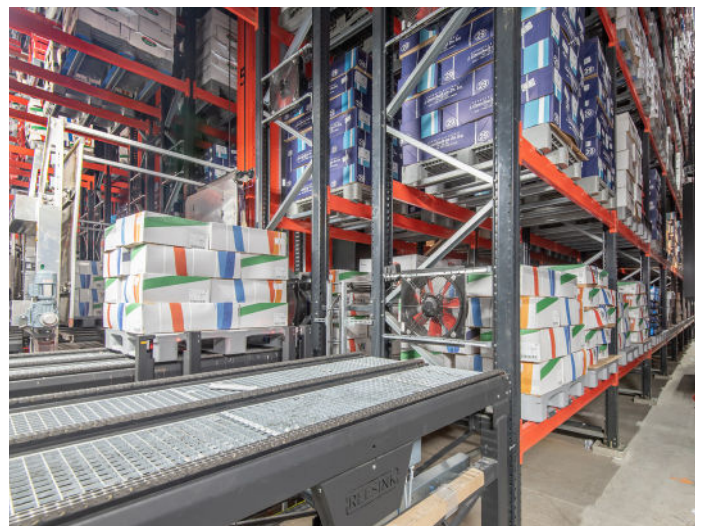
Common warehouse solution: cranes with shuttles that can store pallets multi-deep but also 2D or 3D shuttle systems can be used here.



Pharmaceuticals

- » Medicijnen zoals vaccins
- » Vaak kleinschalige opslag

Veelvoorkomende warehouse oplossing: manuele opslag of miniload.





Storage & handling

From the previous steps, a mix of characteristics that the warehouse must fulfil is shaping up. The next one to be considered is **the choice of storage and shipment**. The way goods are stored and retrieved in the warehouse is decisive for the overall efficiency.

Storage options

Full pallets storage and retrieval

The product is purchased in full pallets, so only full pallets go out after entry. This is a relatively simple form of order processing.

Common warehouse solution: storage and retrieval with pallet cranes, shuttles or forklifts.

Full pallet or tub infeed, mixed pallet or tub outfeed

The product can be taken in smaller quantities than pallets. So, it must be possible to pick at box level.

Manual warehouse:

This type of storage can be arranged manually. A forklift truck is used to handle entire pallets for both inbound and outbound storage. An additional order-picker picks the specific boxes. In this case you need several trucks and staff members.

Automated warehouse:

Goods-to-person, a pallet or bin is taken from the storage system with help of an automated solution (crane, shuttle, AutoStore etc) and brought to an order-picking station. There, the correct items are collected, while the rest of the pallet or bin goes back into the warehouse.



Full pallet storage, mixed pallets, package and item distribution

The end customer is asking more and more often for flexibility and, if possible, to order by piece. This requires a goods-to-person solution in an automated or hybrid form.

Drum storage

Barrels are usually stored in block stacking with the help of forklift trucks. However, the market is moving towards higher buildings, which is why warehouse cranes and shuttle systems are also coming into play for this type of storage.

Boxes and containers

Goods stored in boxes and totes can be picked manually, but this presents challenges for the employees who have to enter the coldstore. A goods-to-person solution, such as a miniload or shuttle, is a good alternative here as well.



The hybrid coldstore

Changes in our eating habits and distribution structures follow each other in quick succession. You build a coldstore to be used for decades, but who can look 30 years ahead? If it's not the eating habits that change, then packaging requirements change or customers ask for smaller delivery batches.

However, there are also factors that remain the same, especially in production environments. The Euro-pallet has become a standard and will most likely remain so in the coming decades. Also, the lorries will not get any higher. This means that a number of factors in the coldstore, such as the racking pattern, have already been determined. This offers something to hold on to for the future.

In order to anticipate the certainties and uncertainties for the coming decades, a hybrid coldstore is an important consideration. The bulk of the goods will be stored in an automated warehouse, but a separate area will be set up for manual storage with trucks and manual order-picking. For example, an automated high bay coldstore in combination with a coldstore equipped for storage with forklift trucks. An order picking area above the loading docks for manual order picking is also a good example in combination with automated storage.



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With a hybrid solution, you can anticipate deviating pallets or loads. It also allows you to offer added value logistic services to customers, for example by putting together promotional packaging.



Volumes & products

Let's talk about numbers. Because **the number of products affects the degree of storage density**. The products may also have specific requirements - such as an expiry date - which impact the storage method. Usually, a batch comes from the same production, provided with a best-before date.

For small batches

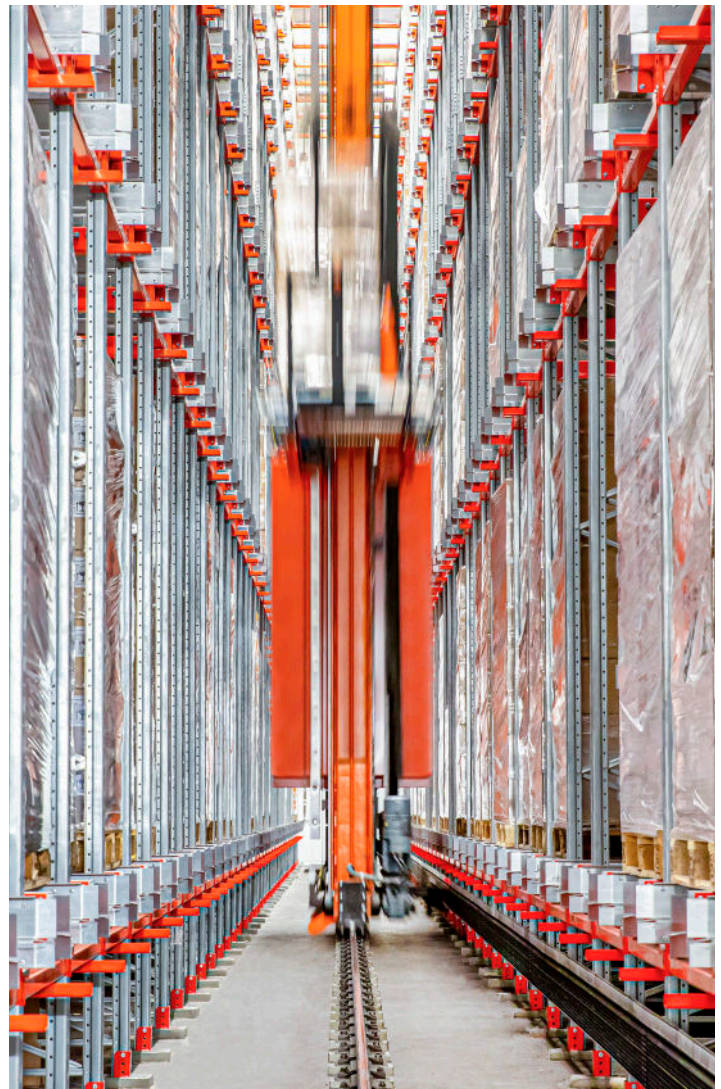
With small batches single or double deep storage is important, to enable a FiFo principle (first in - first out). This can be done manual or automatic.

Example: meat, where each pallet must be directly traceable.

For large batches

With large batches multi-deep storage is possible, as many of the products are the same. Therefore, a pallet does not always need to be individually accessible. Also, because the expiry date of a batch is basically the same. This else well, can be done manual or automatic.

Example: Chips, or frozen vegetables. Both are from one large harvest, are usually processed in one go and then have to be stored in large batches.





Construction & regulations

Last but not least – **the location of the coldstore influences the possibilities for the warehouse.**

Make sure you take the following into account:

- ◇ Plot dimensions and building heights
- ◇ Soil conditions
- ◇ Local authority requirements
- ◇ Fire safety regulations
- ◇ Insurance conditions
- ◇ Energy consumption
- ◇ Sustainability objectives



Racking as a carrier for your building

Is the new warehouse being built from scratch? Do you want to use the available surface area as efficiently as possible, and do you want to build on a maximal height? A building based on silo construction may be a suitable and efficient solution. A unique and advanced technologically: racking that is part of the construction of the building. This way of realizing a coldstore makes building particularly cost-efficient. Considerable savings can be made on building costs because no expensive steel structure is required for the building.

Energy consumption: your coldstore as an energy buffer

Coldstores are almost always fitted with underfloor heating so that the ground does not freeze. Everything above the floor up to the roof needs to be cooled. This requires a lot of electricity. It is therefore important to consider the height of the building and the associated energy consumption. Because building vertically rather than horizontally means less underfloor heating and a more constant warehouse temperature.

Also, a taller building usually results in a relatively lower energy consumption per cubic meters. If you have a very large roof and little height: the entire roof must be continuously cooled. If you go up, the roof area is smaller and this results in relatively lower energy costs.

Nowadays, many coldstores are equipped with solar panels. A coldstore can act as a buffer. When the sun is shining brightly, you turn up the cooling and it gets colder in the coldstore. As a result, less cooling is required when there is less sunshine. Of course, this method of buffering depends on the temperature range that suits the stored products.



Getting started with your coldstore warehouse?

When designing and building a coldstore, many aspects come together; market and demand changes, logistics, technology, regulations and business economics. By going through the right steps, you will know exactly which factors to take into account when building or renovating a coldstore.

✓ Functionalities

The first step is to determine the coldstore's intended functionality.

✓ (Un)certainities

It is essential to gain insight into future developments of volumes and distribution structure.

✓ Temperatures

Therefore, determine in advance the most suitable temperature for your goods.

✓ Product groups

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✓ Construction & regulations

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The next step

Let's talk about your warehouse automation! We are here to support you, from planning to operational use. Our specialists have the know-how and the experience to provide you with first-in-class solutions. Would you like to discuss the possibilities? Then contact us for more information!

Reesink Logistic Solutions

Reesink Logistic Solutions has over 50 years of experience in warehouse solutions and automation. We provide complete automated solutions for warehouse logistics. From small-loads to heavy-loads and from e-commerce to production and third-party logistics. We design tailor-made solutions based on state-of-the-art technologies like AutoStore, AMR, shuttle, conveyor, warehouse cranes and WCS software. Over the years, we have built more than 30 coldstores across Europe and we know all the ins and outs of frozen products. In this whitepaper, we share our insights in 7 steps towards an efficient coldstore warehouse.

Contact us for more information.

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