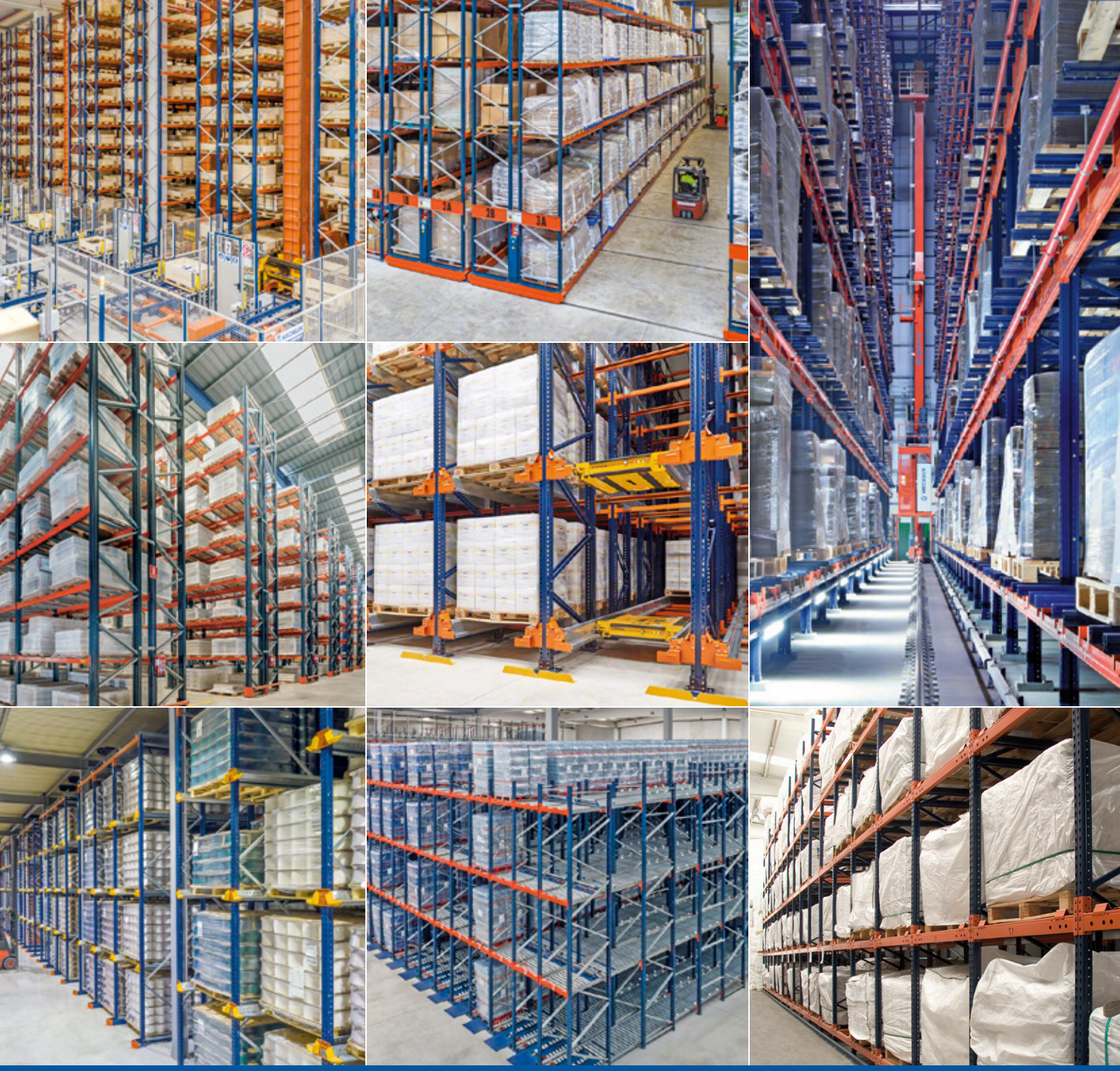


Storage solutions for pallets

MECALUX

Storage solutions for palletised products

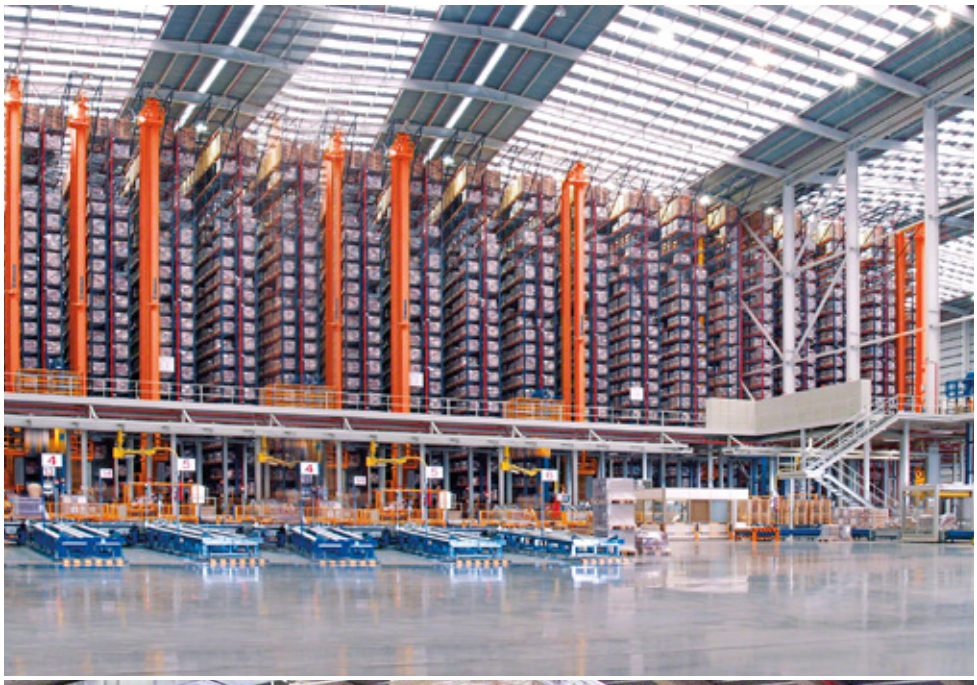
Which is the best solution for your facility?

There is no exact formula for determining the solution that best suits a company. However, there are factors that affect this choice. The ideal solution must fulfil the requirements and conditions of each specific case.

You may already be familiar with the different pallet storage systems available on the market. The purpose of this catalogue is to describe the steps that can help you select the system that perfectly meets your needs.

This requires you to know the following information:

- Number of pallets to be stored,
- Number of SKUs,
- Number of pallets per SKU,
- Space to be occupied,
- General operation (flow of goods),
- Available maintenance systems or the possibility of replacing them,
- Investment capacity.



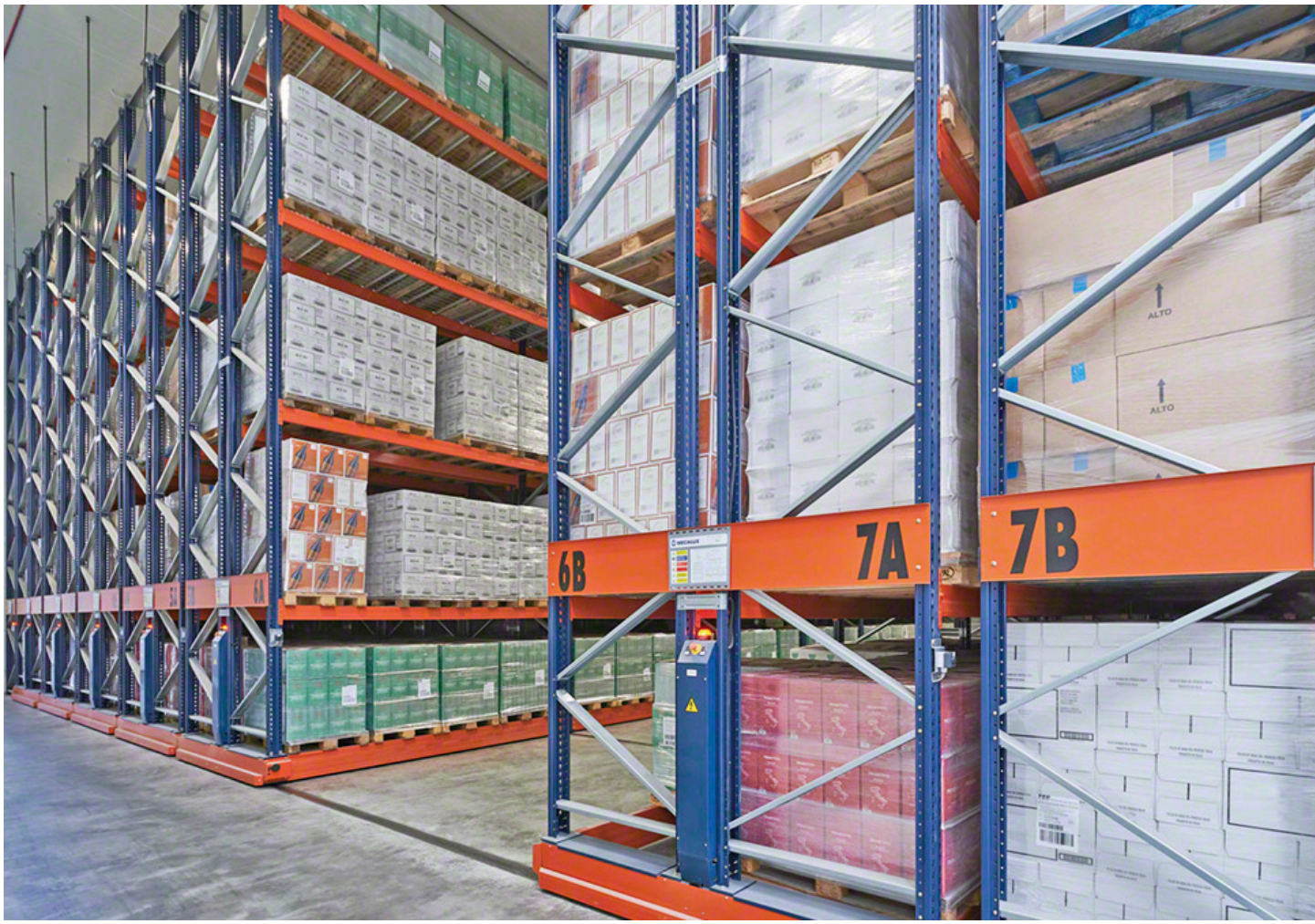
The contents of this catalogue are divided into two parts:

- Direct-access systems
- High-density systems

Knowing the features and advantages of each system will help you to select the most appropriate solution for your warehouse.

Direct access systems are characterised by the pallets being next to a working aisle. This provides great accessibility to the pallet and maximum occupancy of all storage locations. However, it decreases the use of the available surface area. These solutions are best suited when there are many SKUs and few pallets per SKU.

High-density systems provide greater surface occupation and therefore maximum capacity. Nevertheless, direct access to pallets is lost. Additionally, some systems may offer low operational throughput and have a lower effective capacity, i.e., a larger number of empty locations. These systems are appropriate if there are few SKUs and many pallets per SKU.



Since in many cases it is necessary to separate products according to consumption criteria, your solution may be a combination of different storage systems.

Goods can be handled with forklifts, semi-automated machines or fully automated machines. Automation has many advantages, but only if it is what you really need.

The final objective is to help generate business for your company. Competitiveness requires minimising investment and operational costs. This means that it is essential to implement the best solution with the shortest return on investment.

Mecalux offers the experience it has gathered over 50 years of creating storage solutions. Our technical and sales departments will help you find the solution to fulfil your requirements.

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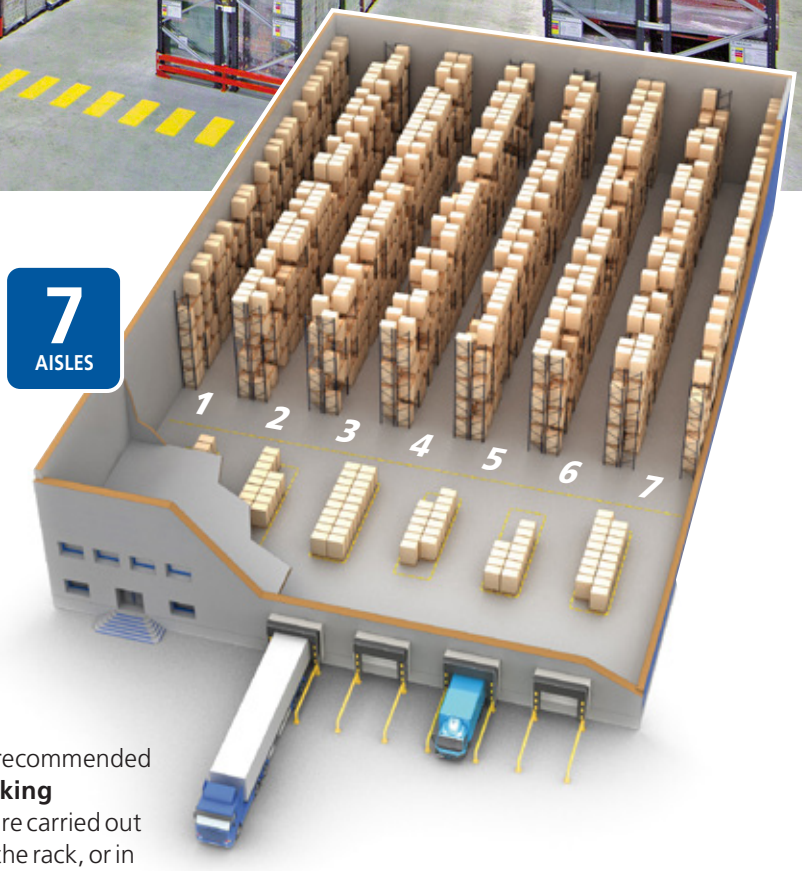
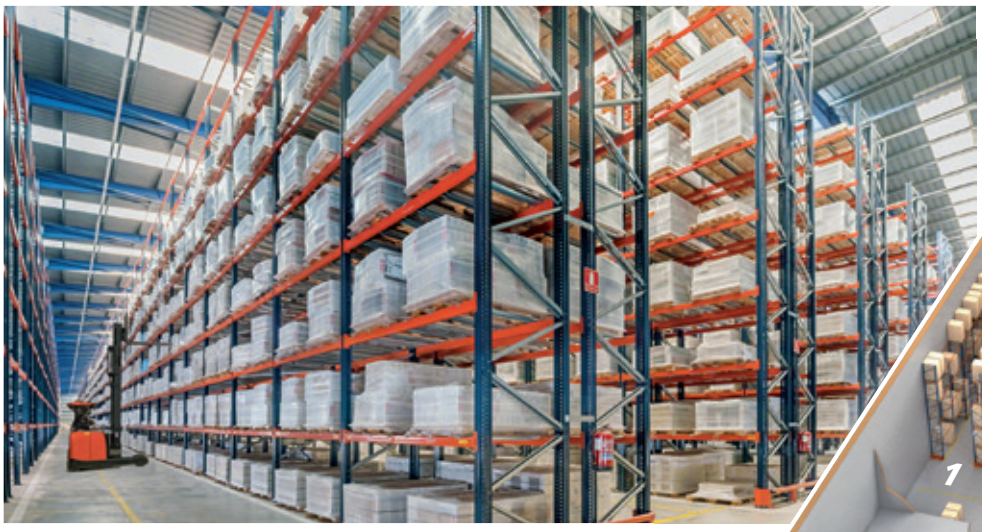
Systems with direct access to pallets

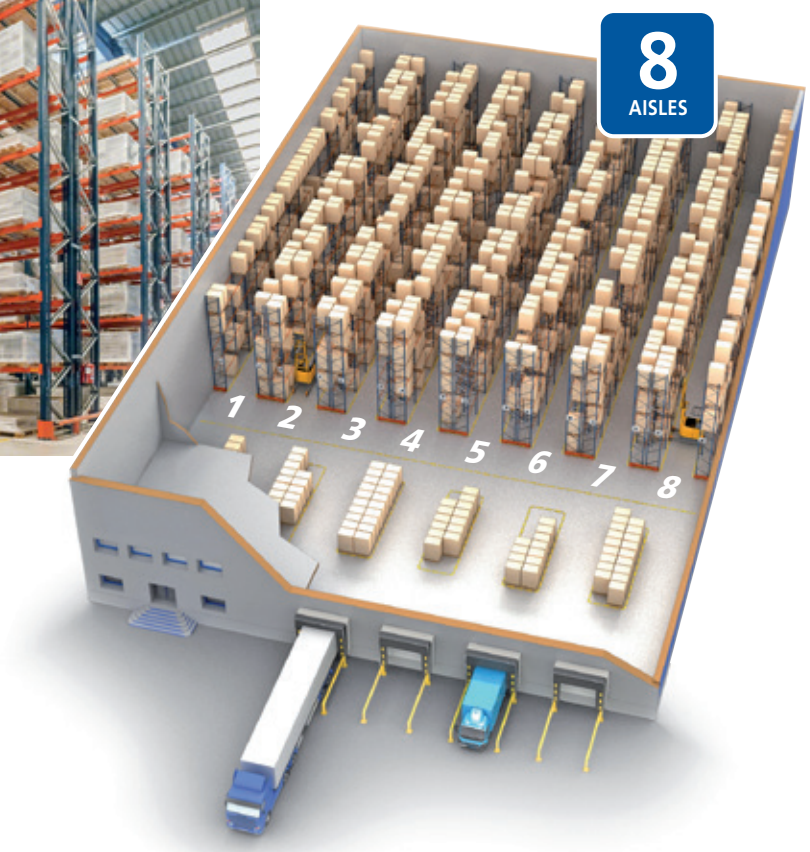
Pallet racks are characterised by providing direct access to all stored pallets. This is true for both static racks and those on mobile bases.



1 Adjustable pallet racking

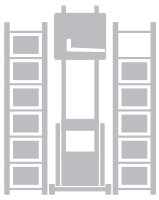
- ✔ This is the most **versatile system for any warehouse**, although the number of storage locations may be lower than in other options. Aisles between racks have a width from 3,200 to 3,500 mm to allow forklifts to operate.
- ✔ It is used in facilities where **many SKUs are handled with fewer pallets** per SKU, as well as when there is a high turnover of goods.
- ✔ These racks are **appropriate for multi-customer warehouses**, storing very diverse products and **pallets of different sizes**.
- ✔ They are also recommended whenever **picking operations** are carried out directly from the rack, or in facilities used to **store bulky products**.
- ✔ They can also be used in small warehouses where products with high consumption rates do not account for a significant number of pallets. When combined with other systems, they are perfect for storing products with low and medium turnovers.
- ✔ **Double-deep racks** can also be installed in this system, although it is limited by the height of the racks and the weight of the pallets themselves.

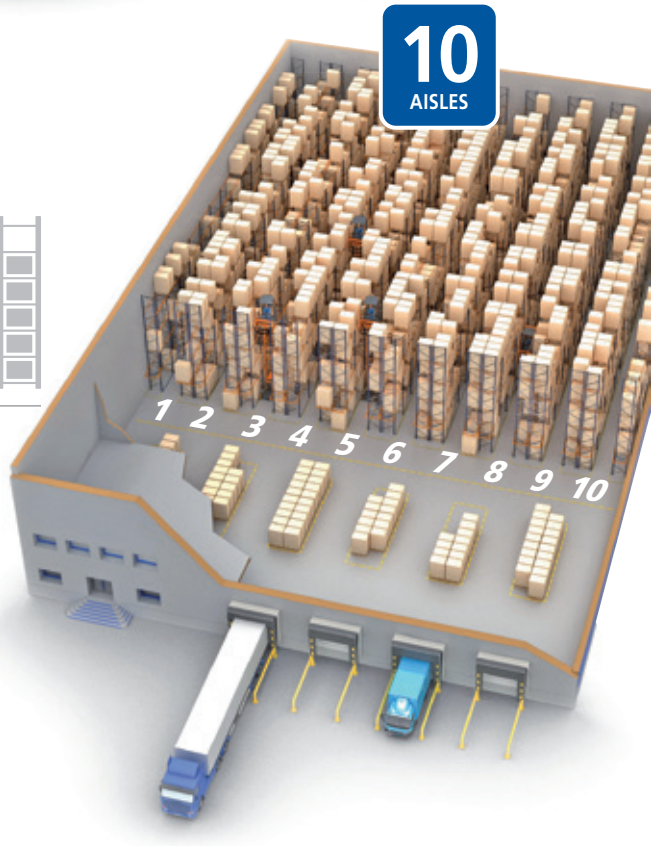


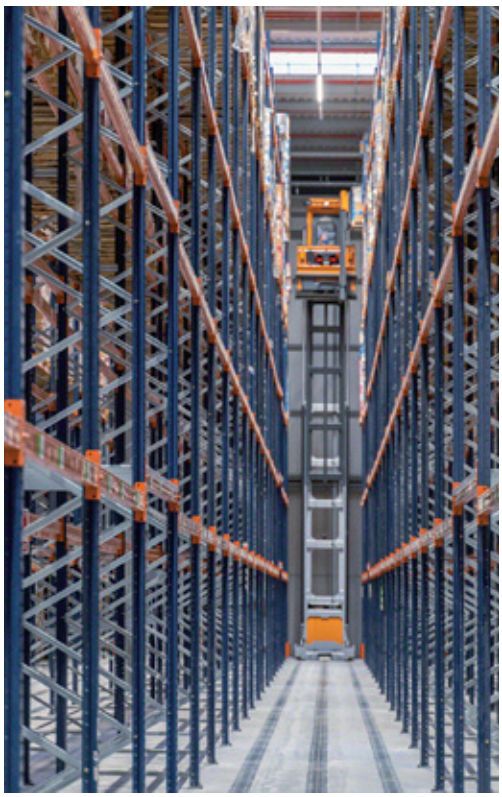


Adjustable pallet racking with reach trucks

- ✔ In addition to the advantages of pallet racking, the use of this system with reach trucks increases the **storage capacity**. Aisles are narrower (from 2,600 to 2,900 mm) and racks can be higher, increasing the use of space and the height of a given storage surface area.

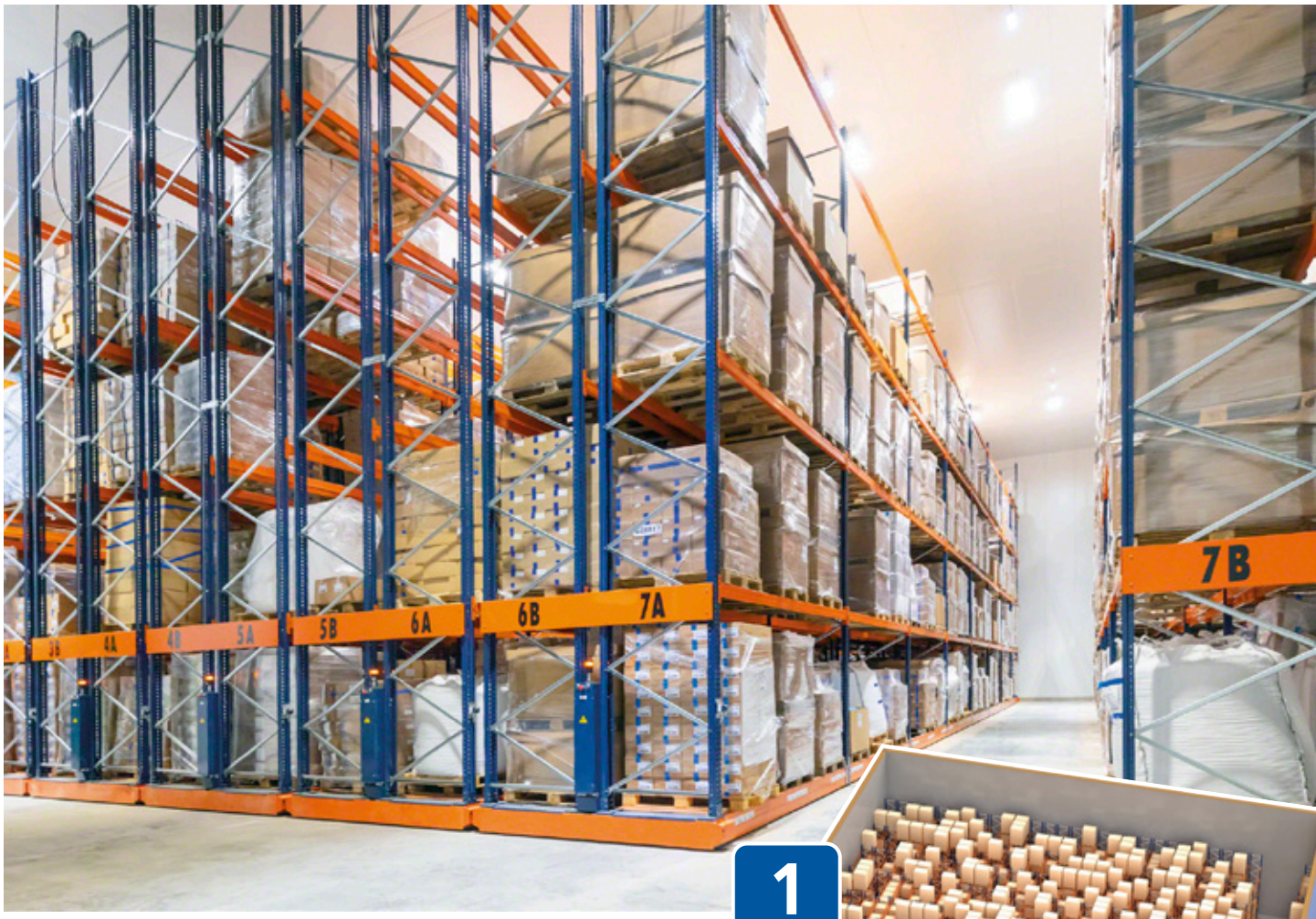






Adjustable pallet racking with turret trucks

- ✔ Turret trucks are used to handle loads in facilities with particulary **high pallet racking** (up to 15 m tall).
- ✔ These machines provide a **substantial gain in storage volume**, as they operate in even narrower aisles (from 1,500 to 1,800 mm), optimising the space and increasing the storage area.
- ✔ To boost efficiency and reduce labour costs, a turret truck can be replaced with an automatic trilateral stacker crane.



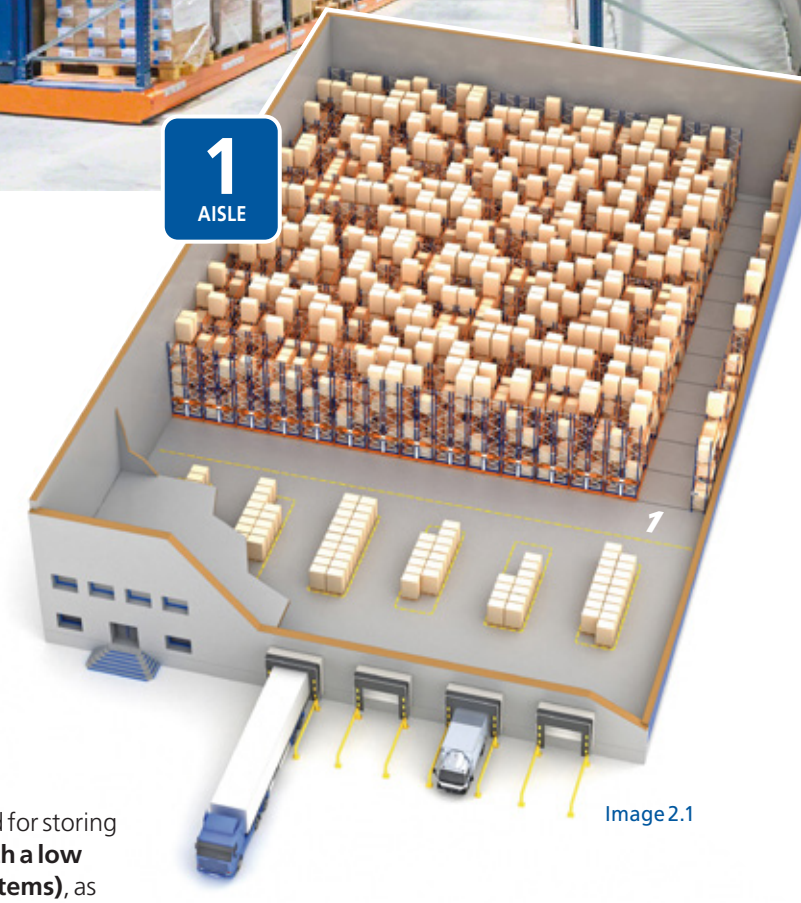


Image 2.1

2

Adjustable pallet racking on Movirack mobile bases

- ✔ Racking is **compacted** so that a single working aisle can be used to access several aisles.
- ✔ This system can increase **storage capacity by 80% to 120%** compared to static racks, at the cost of less agile operation.
- ✔ It is applicable for facilities with a **lower number of forklifts in operation**.
- ✔ It is best suited for storing **products with a low turnover (C items)**, as well as goods that must remain static for some time or that are pending quality tests.
- ✔ It is ideal for small and medium-sized **cold storage facilities**, provided the warehouse is no taller than 11m.

It allows considerable and permanent energy savings, as only half of the warehouse volume must be refrigerated compared to a warehouse with static racks.

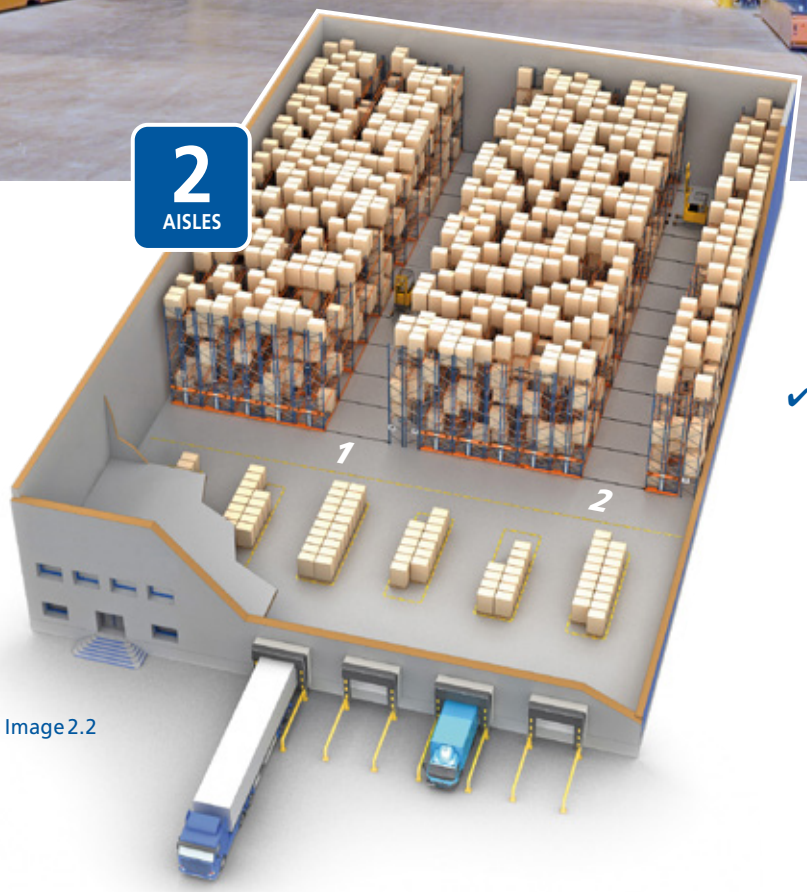


Image 2.2

✔ Installing a Movirack system with a single access aisle (image 2.1) provides **maximum capacity**. However, setting up two or more aisles (image 2.2) provides **greater speed** in handling pallets and in warehouse operations, at the cost of a lower capacity.

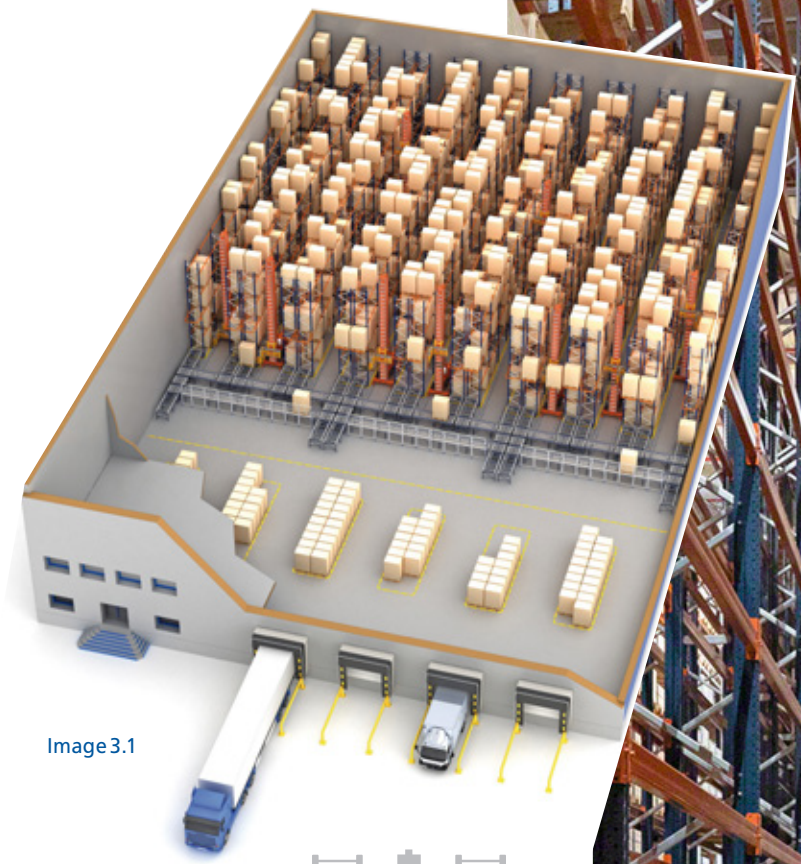
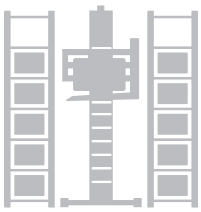


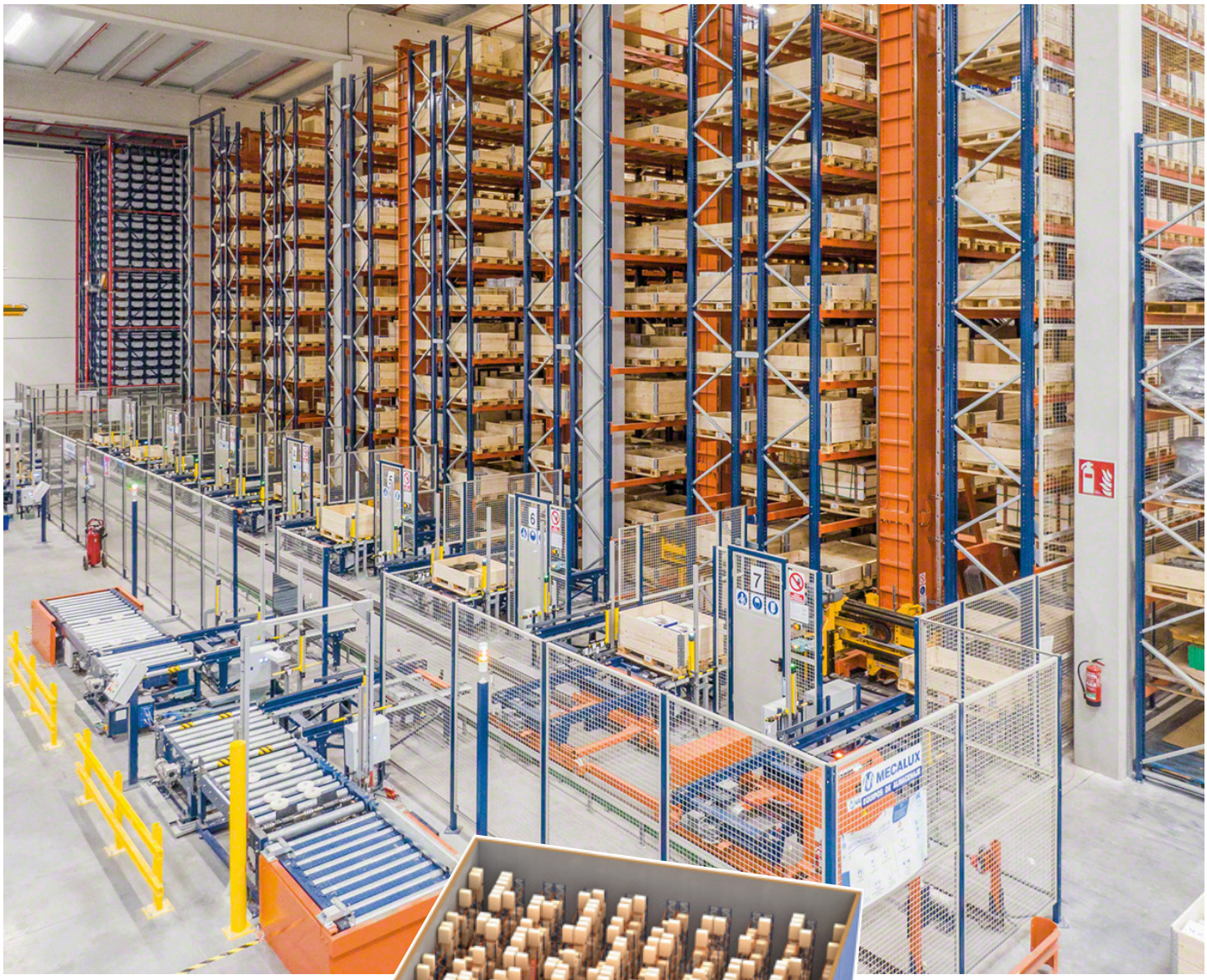
Image 3.1

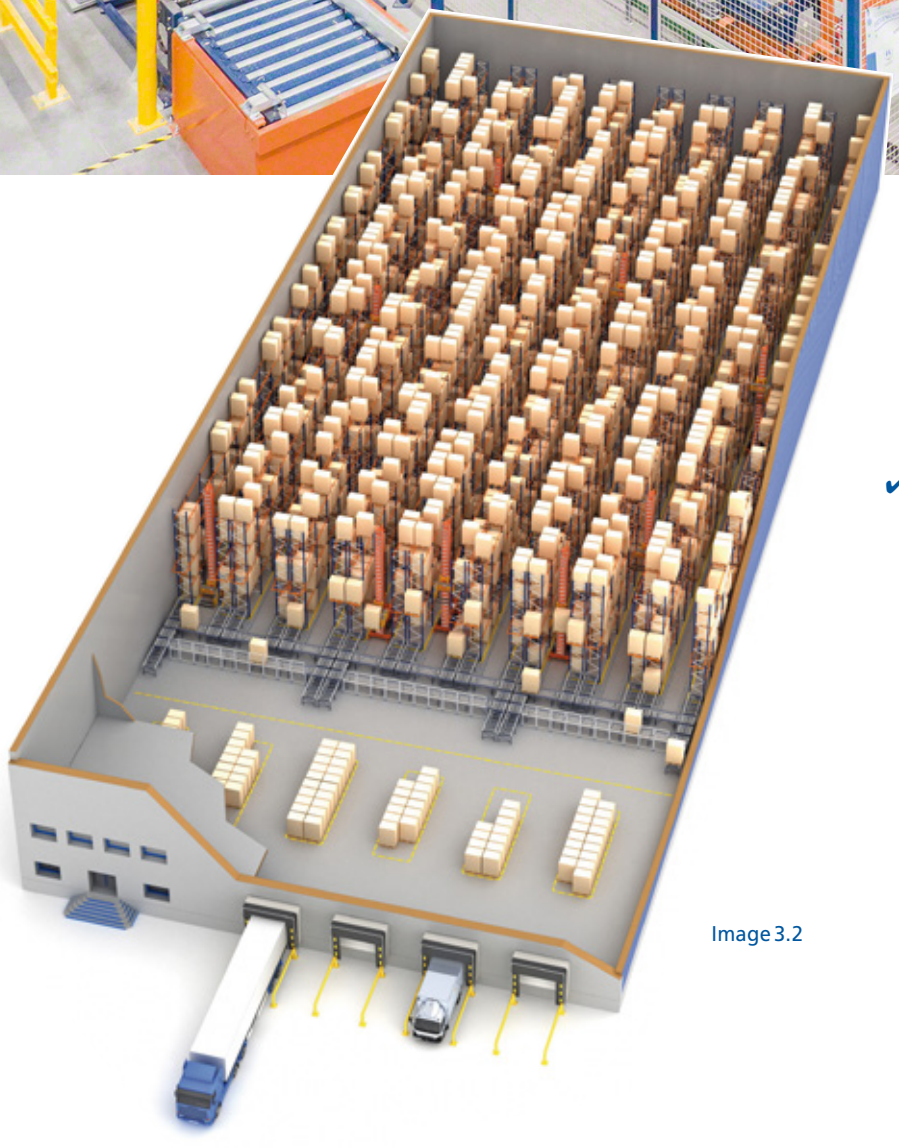


3

Adjustable pallet racking with automatic trilateral stacker cranes

- ✔ The **automation** of the pallet racking system eliminates the need for operators to place the pallets in the racking.
- ✔ This system also provides a **considerable increase in productivity**.
- ✔ Other advantages include **cost savings**, **streamlined operations** and **enhanced safety** in the facility.
- ✔ Although it is true that an investment is required, the **return on investment** is quick.

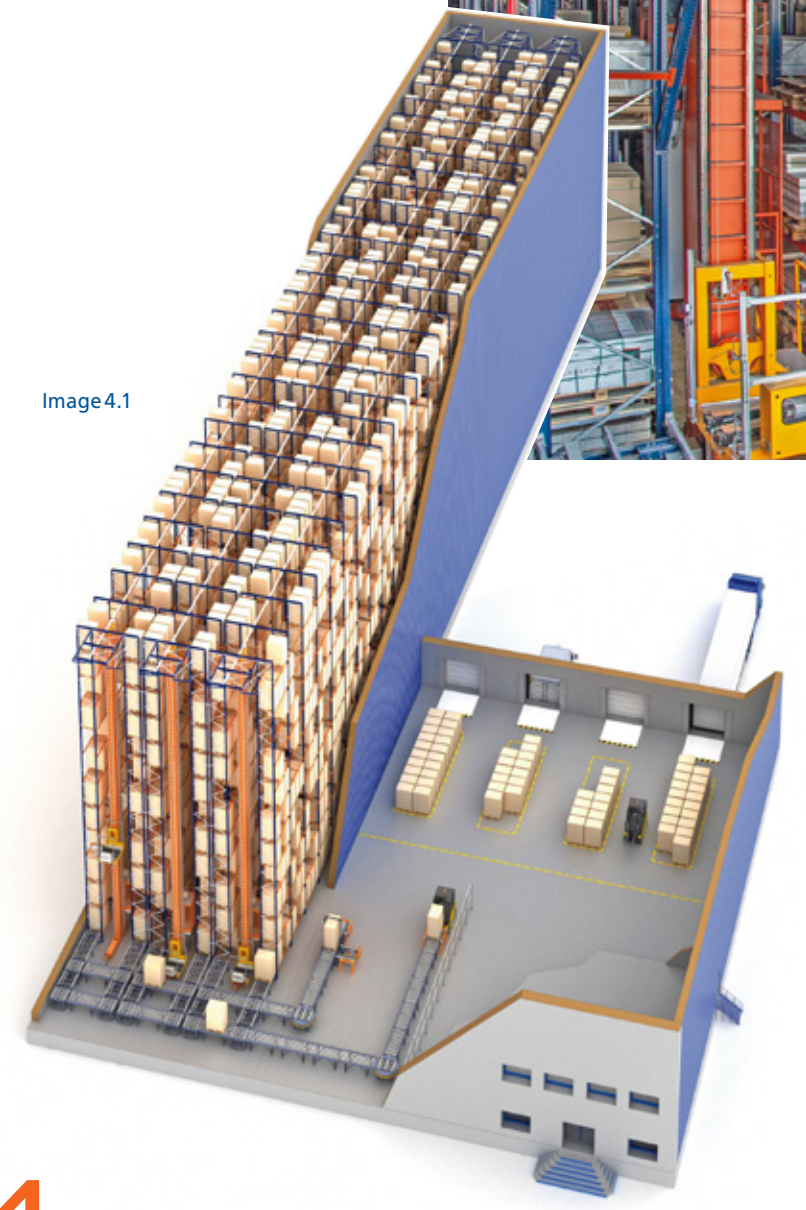


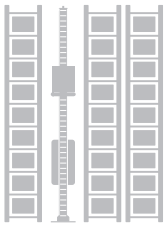


✔ If a double-length installation were a possibility, the cost per pallet stored would be less, as **the storage capacity would increase** with only a minor increment in the investment (image 3.2).

Image 3.2

Image 4.1





4

Adjustable pallet racking with stacker cranes

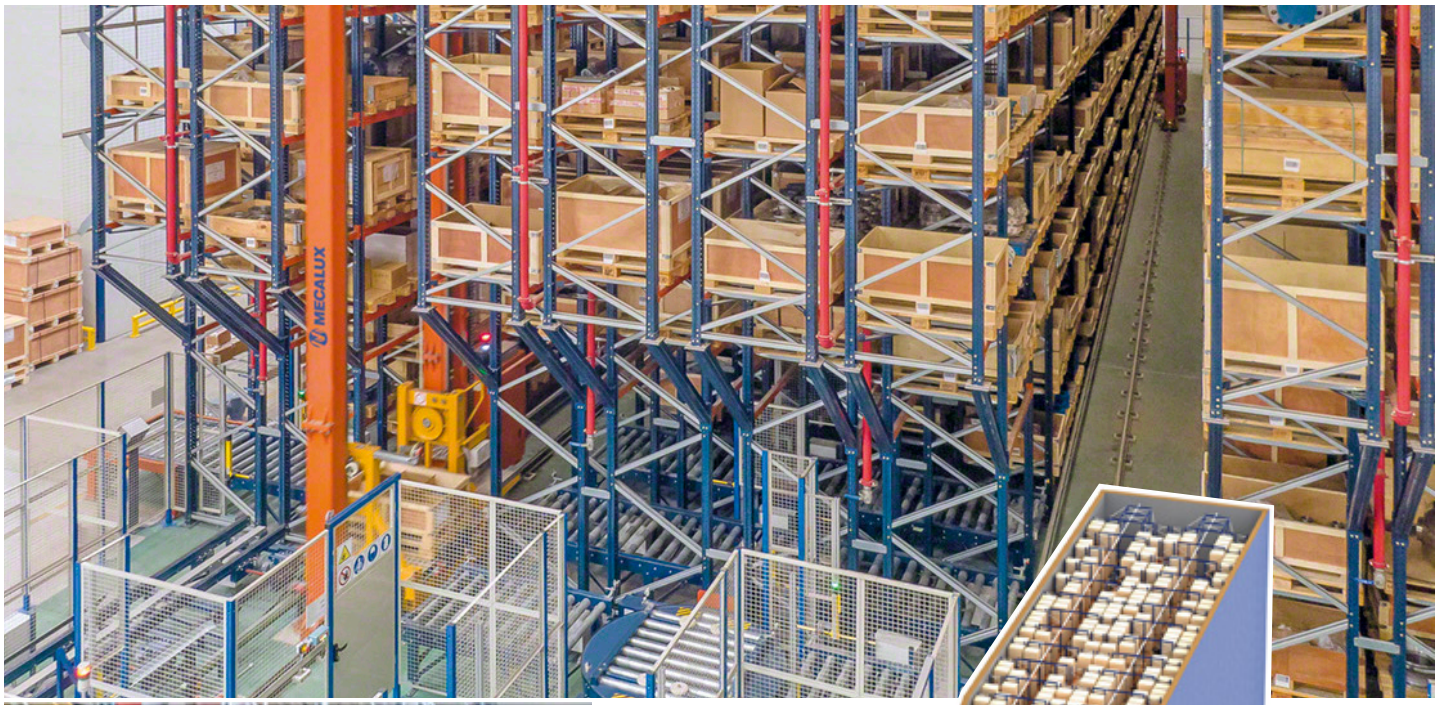
✔ If a considerably **long and high space** is available, it is advisable to install an automated solution. This provides the same storage capacity as an adjustable system, using **less surface area** and **leveraging the height** of the warehouse.

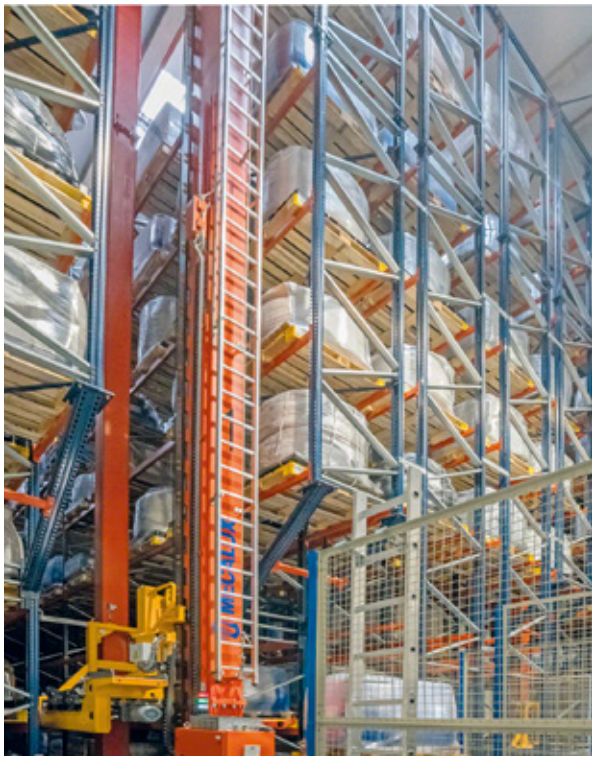
✔ The main advantage of this solution compared to a pallet racking system is the great **increase in productivity** obtained by automation, as well as improved management.

✔ Depending on the flows of movement in the warehouse, single- or double-deep racks can be set up. For **quick and direct access to each pallet**, single-depth racks are used (image 4.1), as all load units are located next to the aisle, simplifying the storage and retrieval process.

✔ Double-deep racks (image 4.2) provide a **considerable gain in capacity**, as the number of aisles and therefore of stacker cranes is reduced. This also implies a lower initial investment compared to the single-depth solution.

✔ Another difference between the two options is that single racks **are best when there are many different SKUs**, while double-depth racks are ideal when there are **several pallets with the same SKU**.





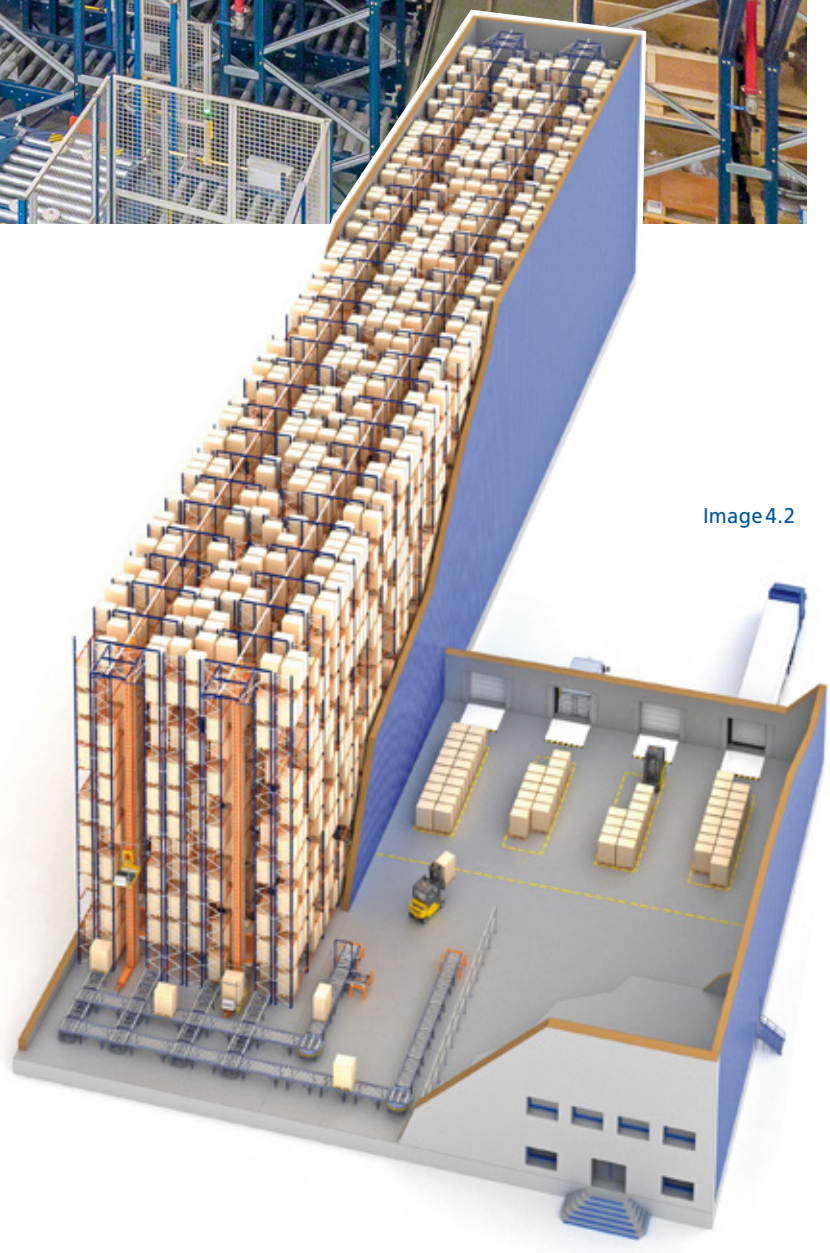


Image 4.2

- ✔ With double-depth systems, **direct access to the second pallet** is achieved by relocating the first pallet. The management system controls this task automatically.

- ✔ Although the initial investment in automated racking solutions is higher than for adjustable systems, a reduction in operating costs (maintenance units, personnel, etc.) is obtained quickly. The **result is a rapid ROI**.

High-density systems

When it is necessary to maximise the use of the available space and store many pallets of the same SKU, high-density systems are ideal.

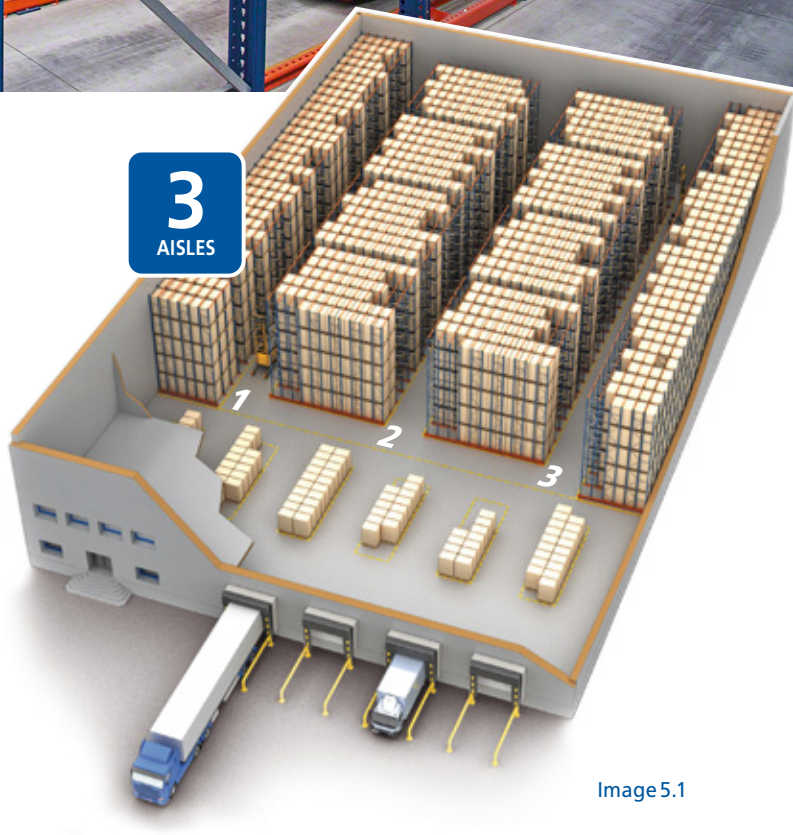


Image 5.1

5

Drive-in pallet racking

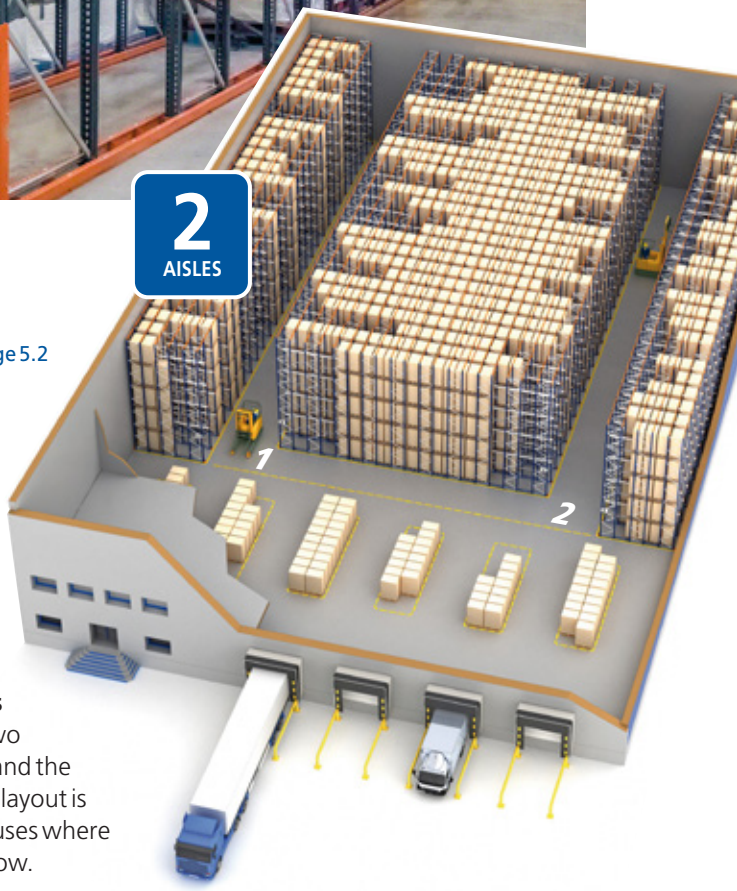
- ✔ This is the **simplest** and **least expensive** of all compacting solutions. It consists of racking with lanes inside, where pallets are placed on support rails.
- ✔ This system is perfect for storing **many pallets of the same SKU** (consumer products) and when specific turnover rules are not a priority.
- ✔ The **storage capacity** is greater than in the pallet racking system, although more time is needed for each operation.

Forklifts must enter the aisles to deposit the pallets. The deeper the aisle, the greater the storage capacity.

- ✔ It is possible to install drive-in racks with **different layouts**, depending on the load management needs.

✔ Image 5.1 shows drive-in racking with three access aisles. This increases **agility in handling** due to the shallow depth of the aisles, although the use of more working aisles reduces the storage capacity.

Image 5.2



✔ In the case of image 5.2, **the capacity increases considerably** as only two working aisles are used and the space is maximised. This layout is appropriate for warehouses where the product turnover is low.

✔ In addition, this is the most frequent system for storing **many pallets per SKU** and when the time the pallets remain in storage is not a priority.

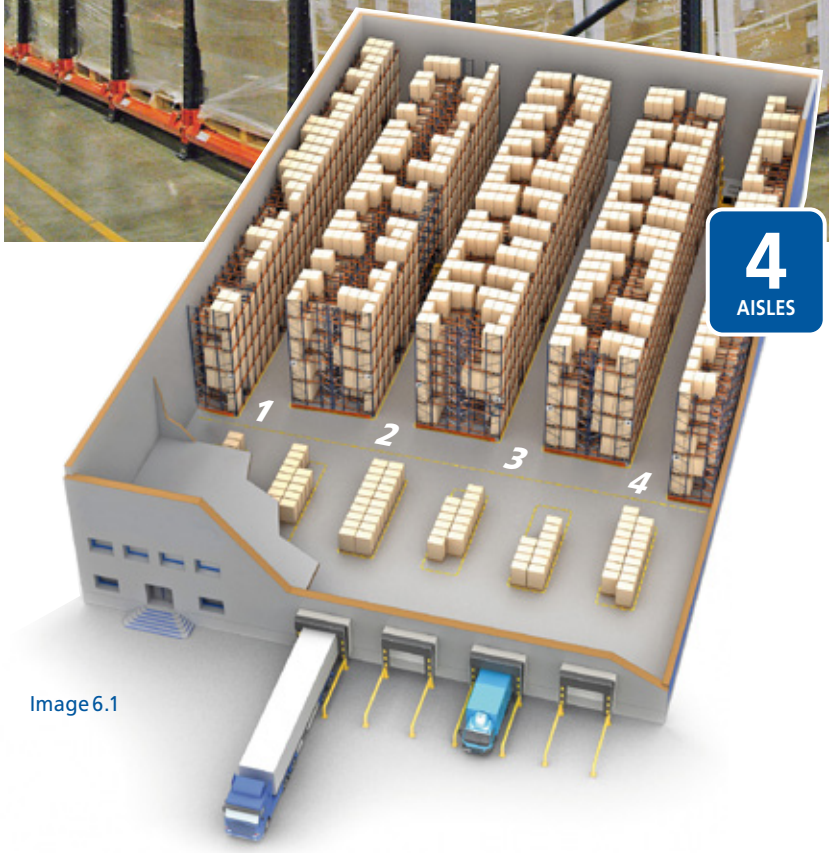


Image 6.1

6

Push-back racking with trolleys or rollers

✔ This system differs from drive-in racking in that each level can house a different SKU. For this reason, it is useful when the products stored have medium consumption rates.

✔ This system allows shorter handling times, as the forklifts do not need to enter the aisles to retrieve or deposit the pallets.

✔ In a push-back racking system where pallets are placed on trolleys (image 6.1), it is possible to install levels of up to four pallets in depth. This allows easier access to the pallets.

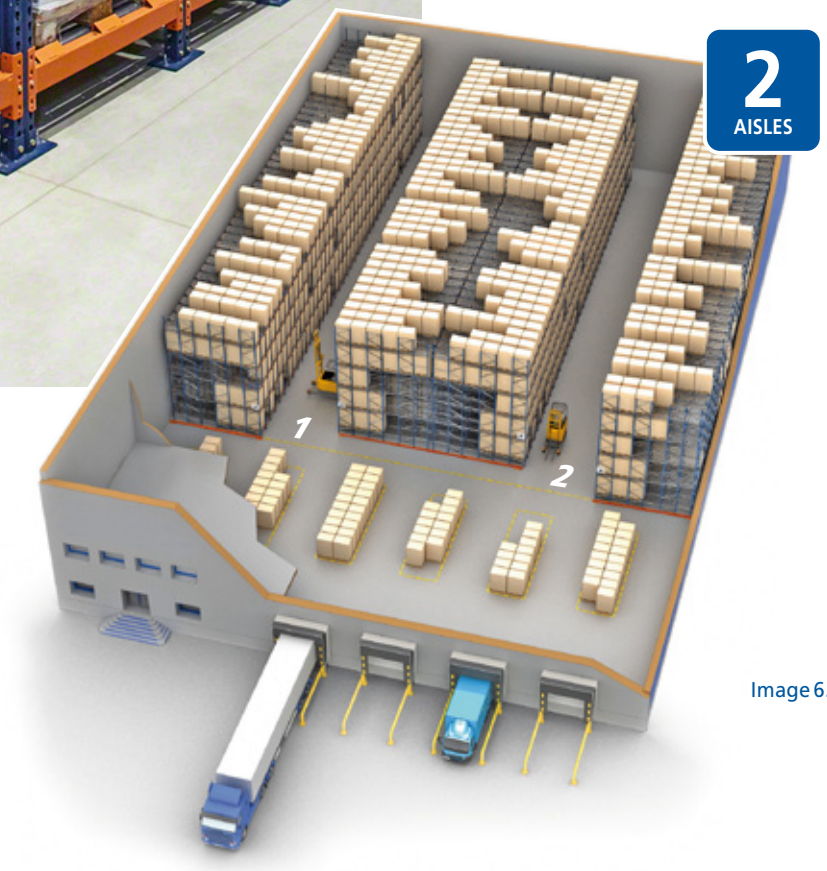


Image 6.2

✔ However, if a roller push-back system is implemented (image 6.2), the storage capacity can be increased further, as it is possible to have a depth of **up to six pallets**. So, only two aisles are needed instead of the four aisles required in an installation with trolleys.

7

Pallet Shuttle system

✔ This solution has the same advantages as the push-back system with the added benefit that there is no limit to the depth of the aisles, which can exceed 40 m. Consequently, a **greater storage volume and use of the space** are obtained.

✔ It is the choicest in situations with high turnover rates, with mass entries and exits of the same product.

✔ For distributions with a single block of racking units and a single front aisle (image 7.1), a greater storage capacity – i.e., a higher number of locations – is achieved.

In this case, the effective capacity is high as there are several channels dedicated to a single SKU. This makes it suitable when there are few SKUs and many pallets per SKU.

In addition, this option is perfect for providing **direct access to all channels** and optimising the path of the forklifts.

✔ Installations with racking on both sides of a central working aisle (image 7.2) will have a higher number of channels. These will be not as deep but allow **more channels per SKU** in addition to **increasing the effective capacity**.

Image 7.1

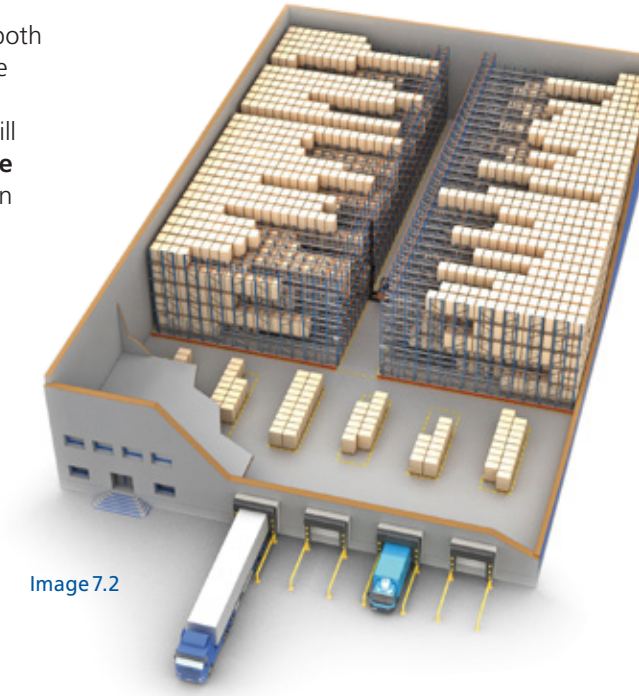


Image 7.2

Example of an installationwith racking units on both sides of a working aisle (7.2).

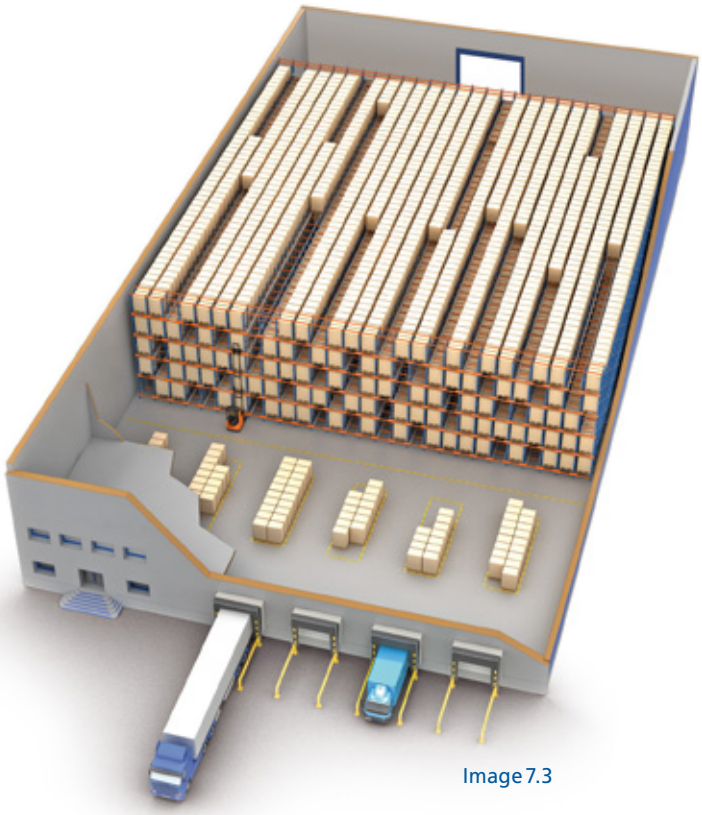


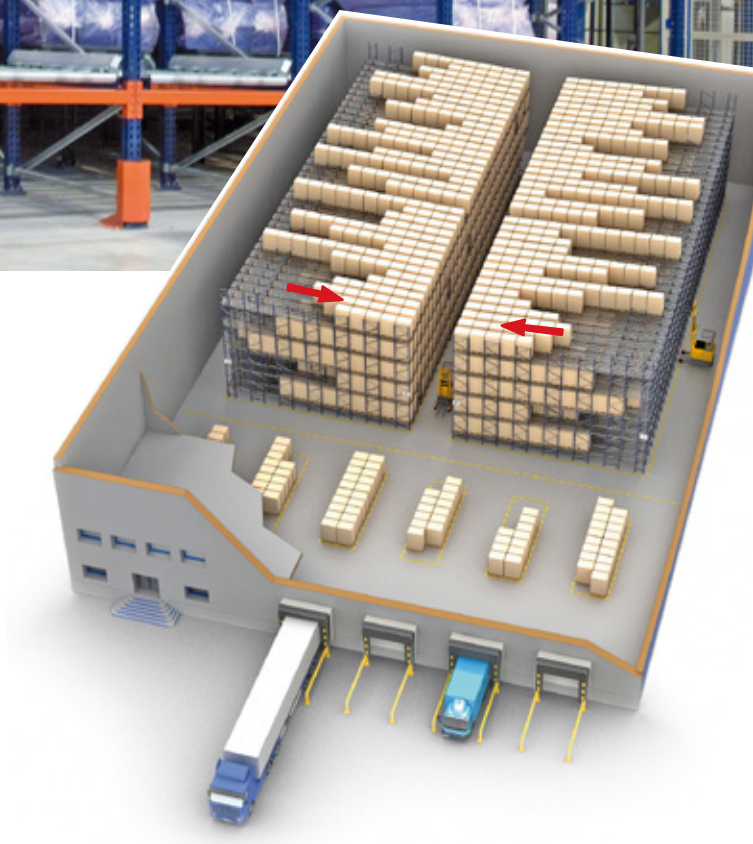
Image 7.3

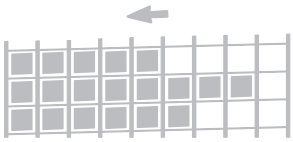
✔ Another possible layout is to install a single block of racks with two access aisles, an input and an output aisle (image 7.3). This solution is appropriate for **warehouses operating acording to the FIFO (first in-first out) method**, where pallets arrive at one end and leave at the opposite end.

✔ This scenario provides the same storage capacity as the first option (7.1). The difference is that **there is no interference between the forklifts** that deposit the pallets and those that retrieve them.

If this option is selected, it is essential to **load and unload the aisles completely** to minimise the relocation of pallets in the channel.

This is the **perfect solution when the warehouse acts as a buffer** (a temporary storage area with short stays and full loads).





8

Live pallet racking

✔ This gravity flow system is ideal for achieving a **perfect** product turnover. This makes it the optimal system for storing perishable goods as well as high-consumption products in continuous flow.

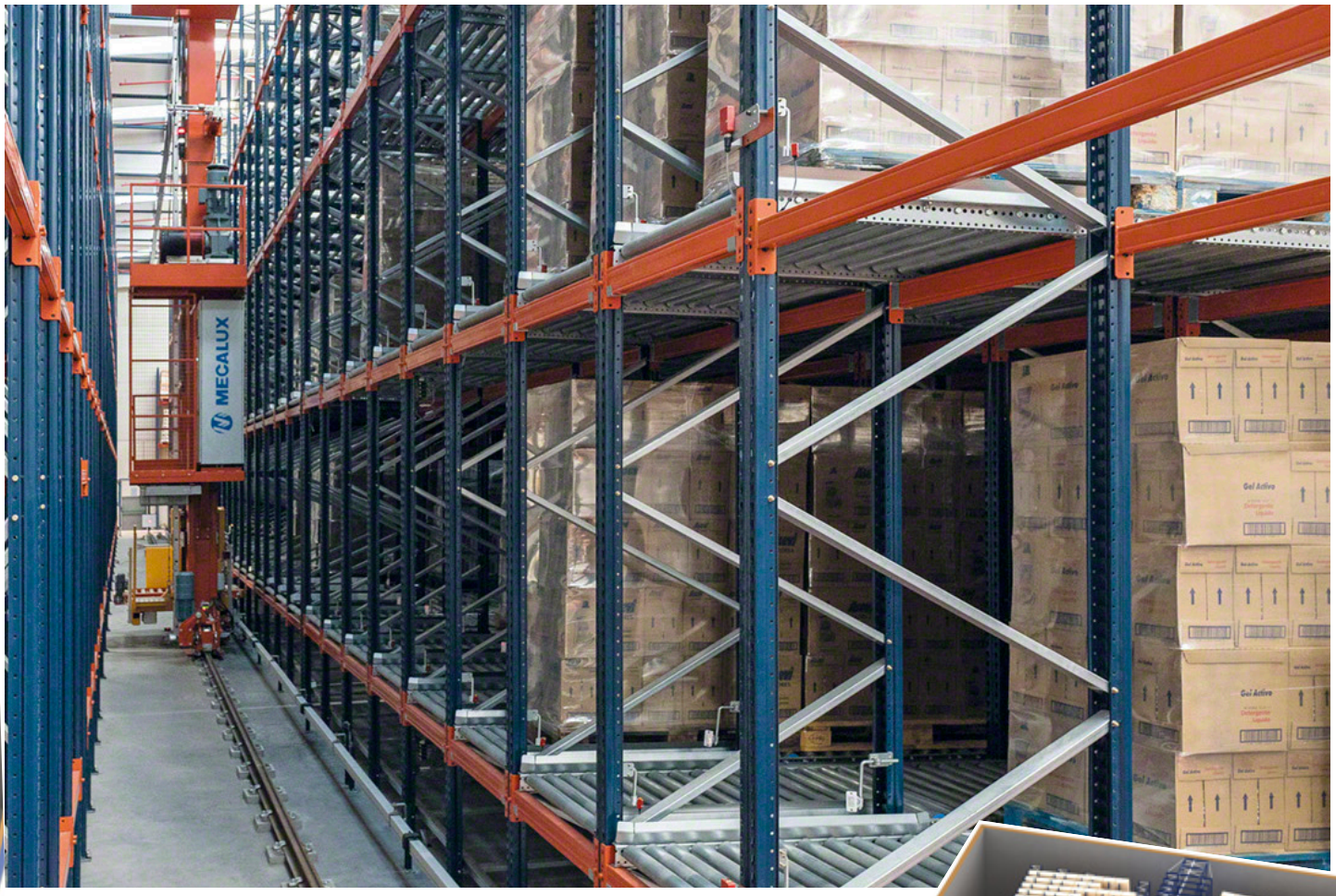
✔ There is a single SKU in each load aisle, allowing **excellent stock control**.

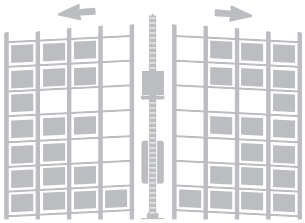
✔ The available space is optimised, achieving **maximum capacity**. Aisles of more than 20 m deep can be installed.

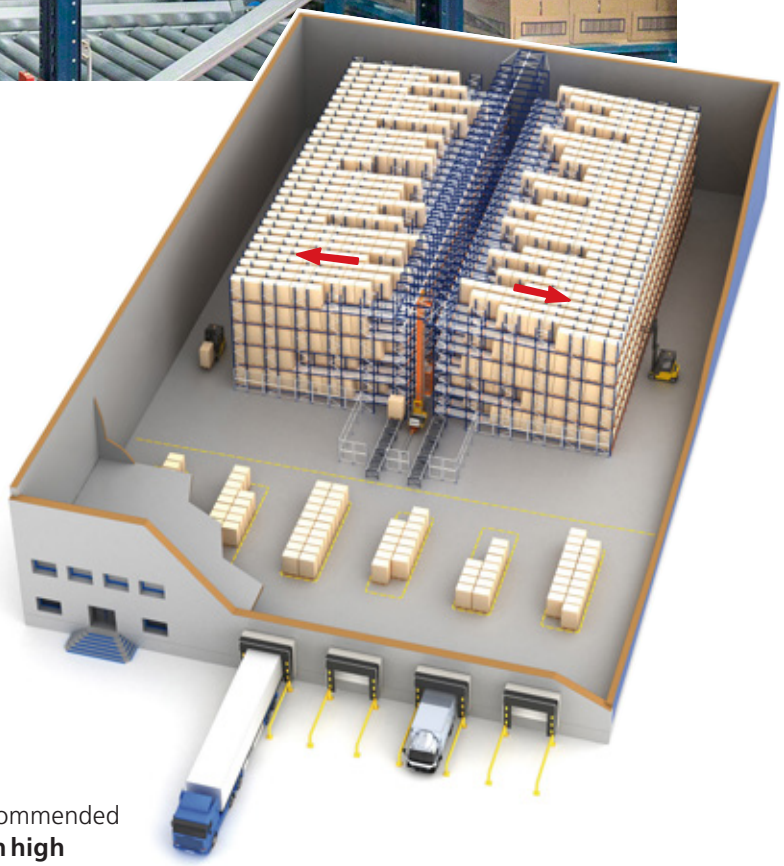
✔ Another factor to consider is the **time saved** in pallet retrieval. The easy location of stored products optimises forklift handling time.

✔ In addition, **transit interferences are eliminated** as the forklifts deposit and retrieve the pallets in different aisles. The image shows a storage system with two aisles, one for loading and one for unloading.

✔ The space saving, shorter manoeuvring times and virtual absence of maintenance allow a **quick return on investment** (in most cases, from two to three years).







9

Live pallet racking with automatic stacker cranes

✔ Setting up live pallet racking with a stacker crane in the central aisle brings all the benefits of automation. These include a **greater storage capacity** compared to other high-density systems. This is achieved by the greater height and narrower width of the aisle.

✔ In fact, stacker cranes can be installed in all aisles, creating a **fully automated solution**.

✔ This solution is recommended for **products with high consumption rates**, constant production and where turnover and cycles are essential. It can also be used as an intermediate buffer, located between production and dispatch areas.

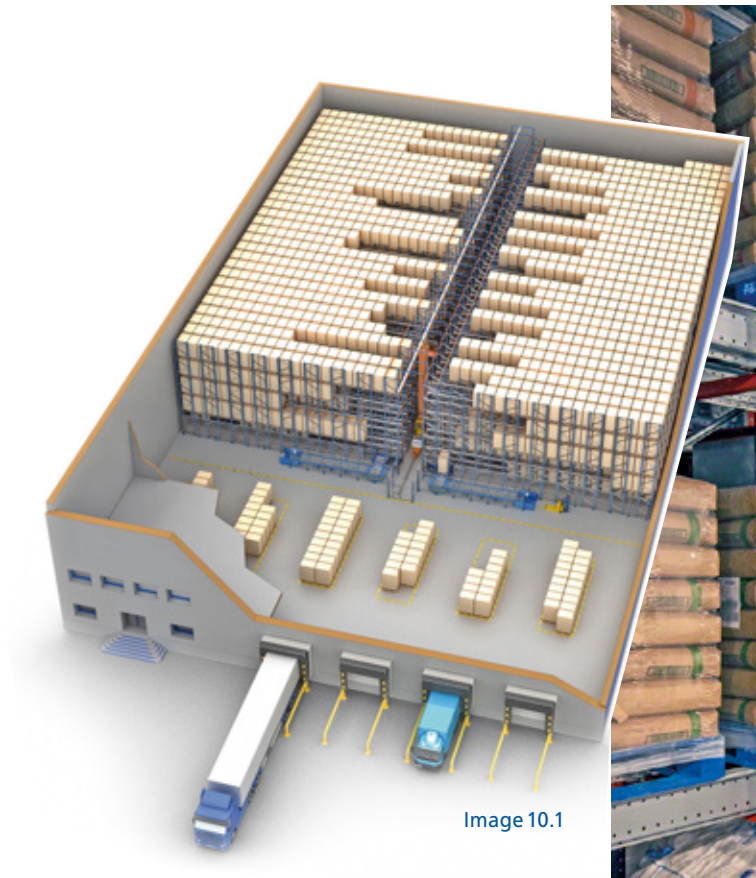


Image 10.1

10

Pallet Shuttle system with stacker cranes or transfer cars

- ✔ Installing the Pallet Shuttle system together with automated machines provides the advantages of **full warehouse automation**. It eliminates forklifts as well as their operators, replacing them with stacker cranes or transfer cars.
- ✔ There is a single central aisle in which the pallet enters and exits, thereby optimising the space available and achieving **greater capacity**.
- ✔ This solution is recommended when a **considerable increase in productivity** is required, moving many pallets/hour.
- ✔ The choice between a stacker crane or a transfer car will depend on the number of SKUs, the number of pallets per SKU or batch and the number of entry and exit movements.
- ✔ Comparing the two images (10.1 and 10.2) shows that the capacity attained in each of the solutions, in terms of number of pallets stored, is practically identical.

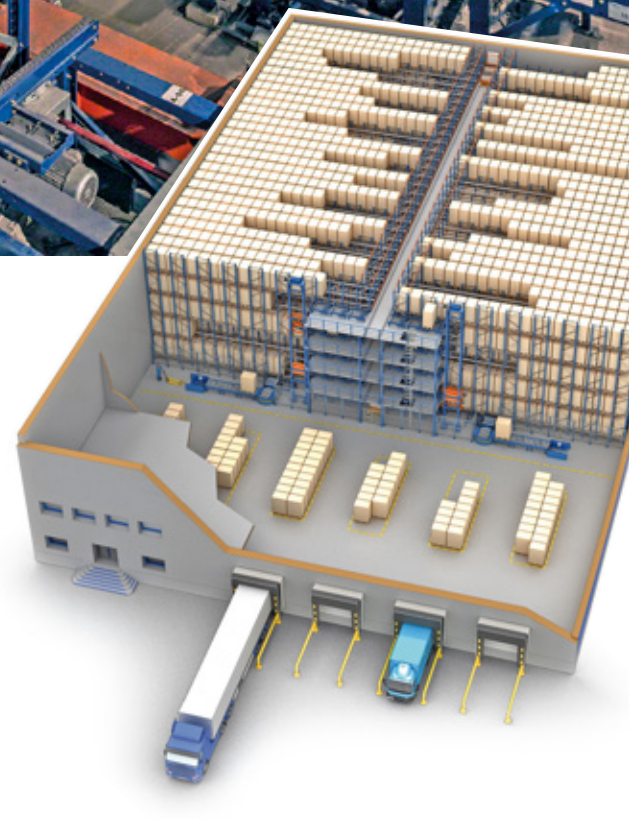
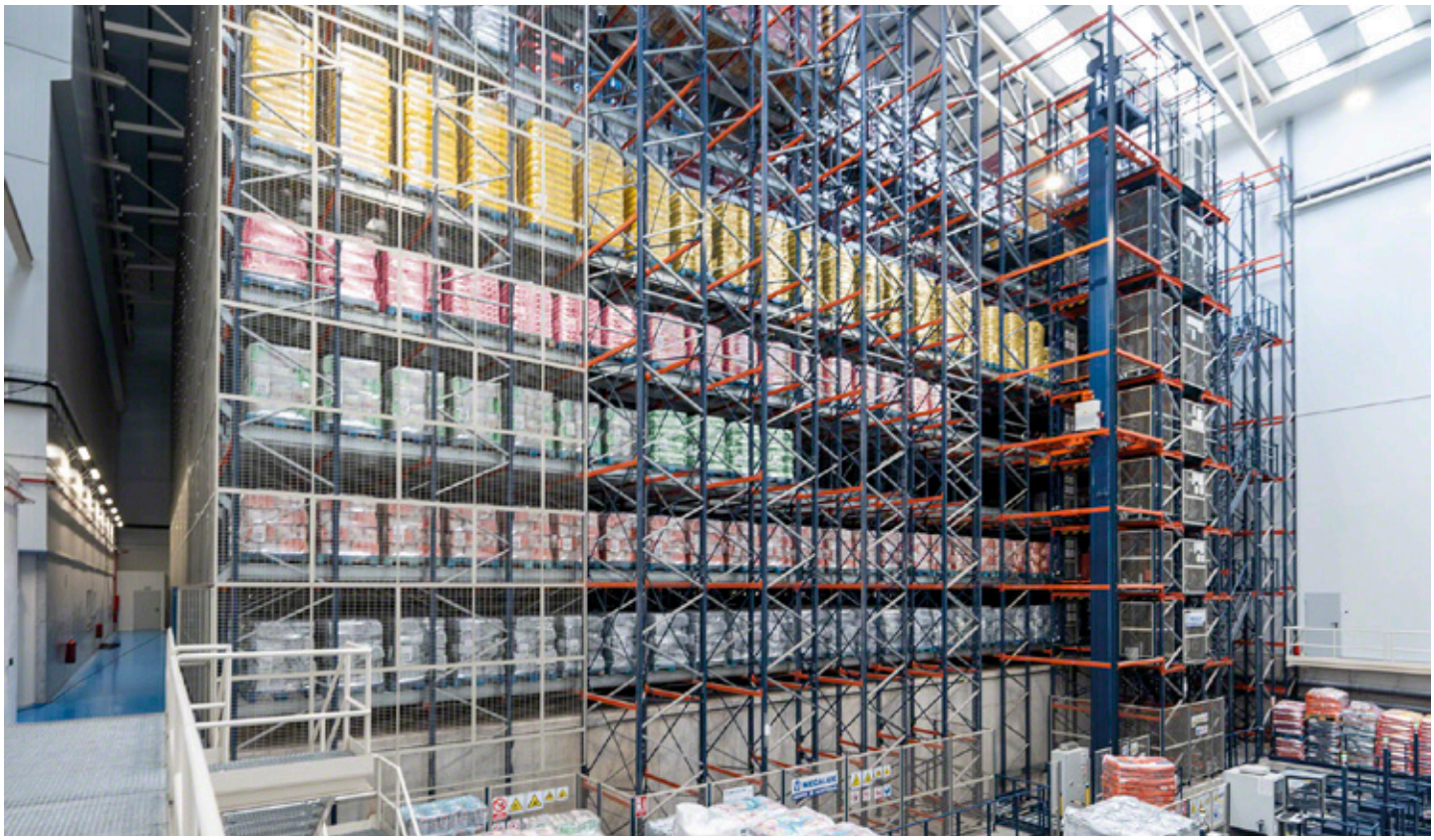
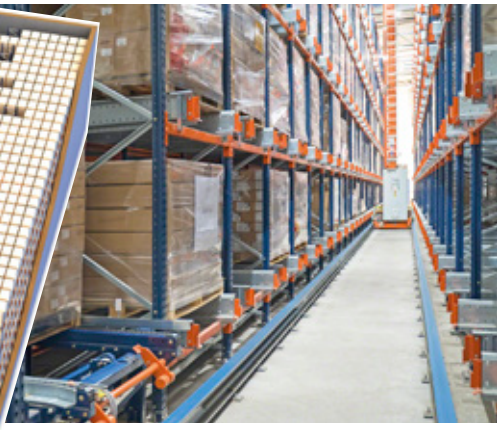


Image 10.2



- ✔ The essential difference between them is the number of pallets that a solution with transfer cars can move compared to one with stacker cranes. In the examples shown here, the transfer car system's potential is five times greater. This means that the Pallet Shuttle and transfer car combination on each level **considerably increases the number of cycles**.

- ✔ If an intermediate solution is required, this storage system can be served by two or three stacker cranes (image10.3). In this case, the aisles are not as deep, and the warehouse capacity is reduced. However, the **potential number of movements is doubled or tripled**.



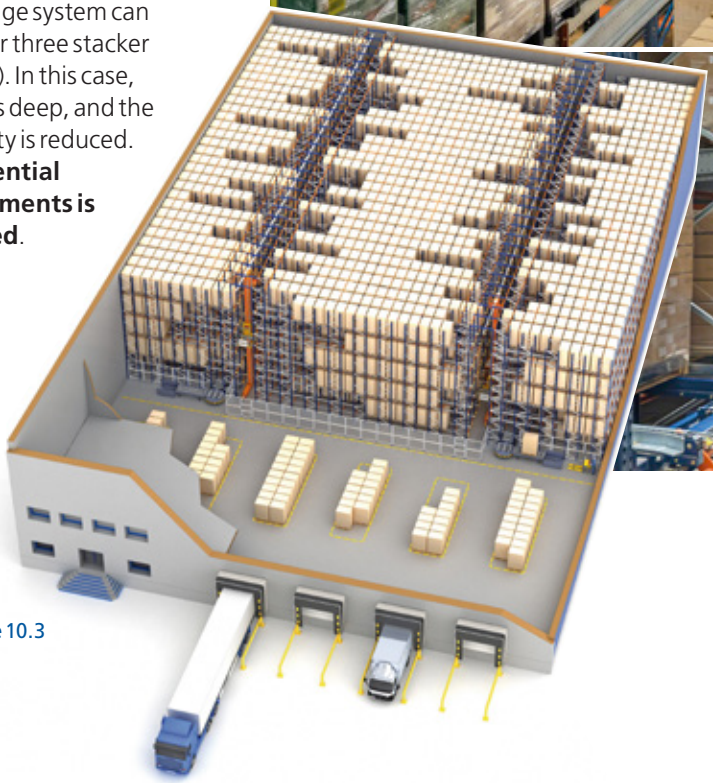
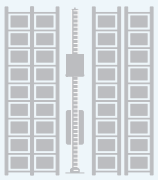


Image 10.3

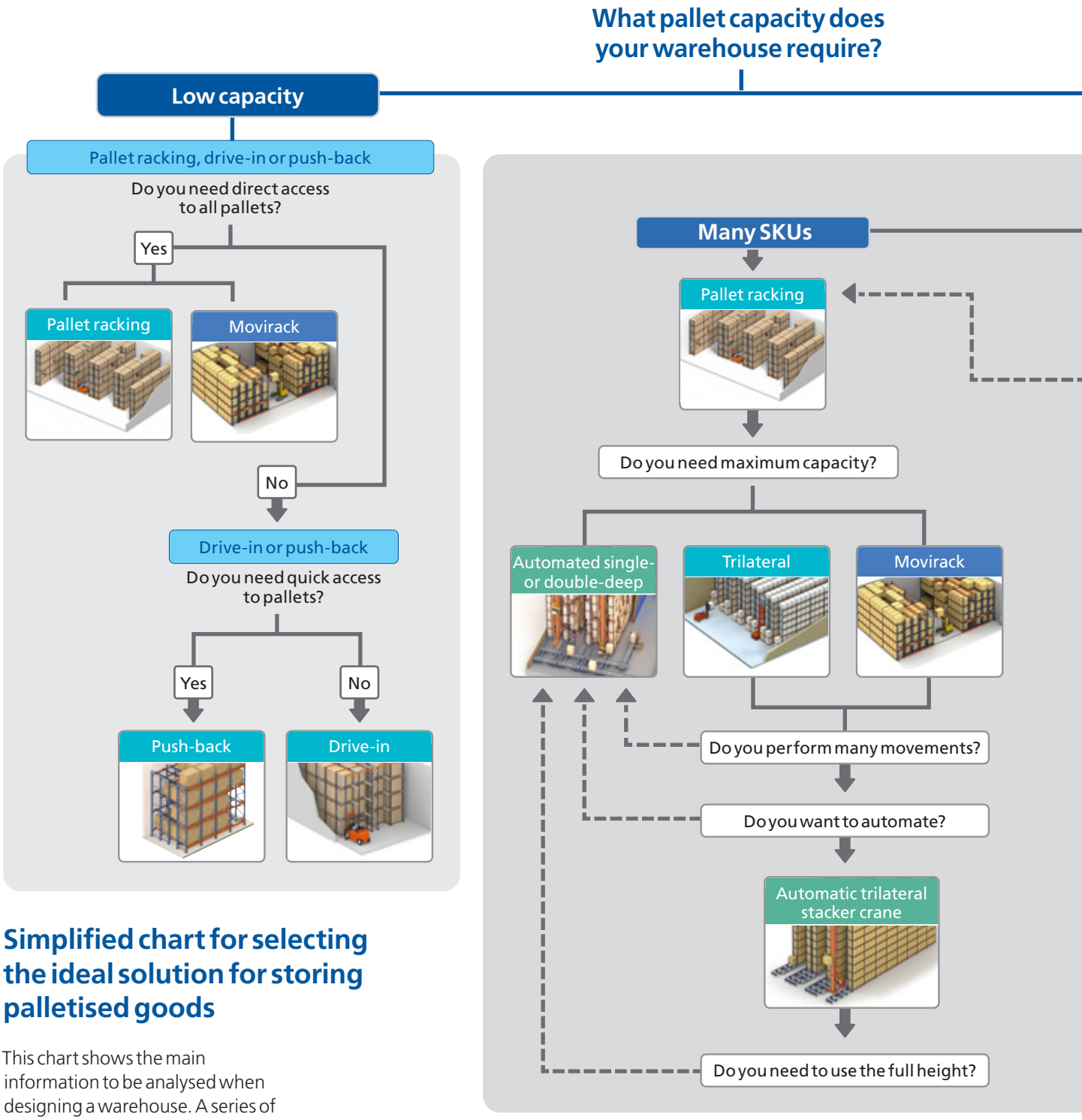
Comparison of the different storage systems

The following table shows a schematic comparison between the different pallet storage solutions and the factors that have a greater influence.

	Direct-access racking systems						
							
	Adjustable pallet racking	Adjustable pallet racking on mobile bases	Double-deep adjustable pallet racking	Adjustable pallet racking with narrow aisle	Automated adjustable pallet racking	Automated double-deep adjustable pallet racking	
Maximum use of surface area							
Maximum use of volume							
Access to any pallet							
Speed of access/ agility (movements per hour)							
Stock turnover	FIFO	FIFO	Relative FIFO	FIFO	FIFO	Relative FIFO	
Maximum height (m)	< 10 m	< 10 m	< 8 m	< 14 m	< 45 m	< 45 m	
Aisle width (m)	2.20/3.50 m	3.00/3.50 m	3.00 m	1.55/1.80 m	1.55 m	1.55 m	
Initial investment							
Handling equipment (forklift)	Stacker, reach or counterbalanced	Reach or counterbalanced	Specific reach	Bilateral or trilateral stacker crane	Stacker crane	Stacker crane	




	High-density racking systems						
	Drive-in pallet racking	Push-back with trolleys	Push-back with rollers	Pallet Shuttle	Live pallet racking with rollers	Automated Pallet Shuttle	Automated live pallet racking with rollers
	LIFO	LIFO	LIFO	LIFO/FIFO	FIFO	LIFO	FIFO
	< 10 m	< 7.5 m	< 7.5 m	< 10-15 m	< 14 m	< 40 m	< 40 m
	3.00/3.50 m	3.00/3.50 m	3.00/3.50 m	3.00/3.50 m	1.80/3.50 m	1.55 m	1.55 m
	Reach or counterbalanced	Reach or counterbalanced	Reach or counterbalanced	Reach, counterbalanced or trilateral	Reach, counterbalanced or trilateral	Stacker crane or transfer car	Stacker crane



Simplified chart for selecting the ideal solution for storing palletised goods

This chart shows the main information to be analysed when designing a warehouse. A series of questions on the storage capacity, movement flows and access to goods is used to arrive at a specific solution. For the solution to be optimal, it is necessary to follow all the steps carefully until the appropriate system is reached. If a solution is selected after discarding another, part of the optimisation may be lost.

Keep in mind that many of the concepts shown in the table are relative and must be evaluated with other factors, such as business volume, number of pallets per SKU and others. This will all depend on the logistics operations required in each warehouse.

- Pallet racking solutions
- Semi-automated solutions
- Automated solutions

High capacity

Adjustable or high-density system

How many SKUs are in your warehouse?

Few SKUs

High-density systems

Do you use the FIFO system?

Yes

Live pallet racking

Automation required

Automated live pallet racking

No

Push-back, Pallet Shuttle, drive-in

Relative FIFO

Push-back, Pallet Shuttle, shallow drive-in

Do you need to increase the number of SKUs?

Yes

Push-back, Pallet Shuttle, shallow drive-in

Do you need to increase workflows?

Yes

Push-back, Pallet Shuttle

Do you want to store more than 4 to 6 pallets deep?

Yes

Pallet Shuttle

Do you require mass entries and exits?

No

Consider the option of live pallet racking

Yes

Drive-In

Pallet Shuttle

Do you need high movement flows and/ or can your warehouse be automated?

Yes

Pallet Shuttle with stacker crane

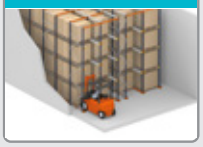
Pallet Shuttle with transfer car

No

Pallet Shuttle

No

Drive-in



No

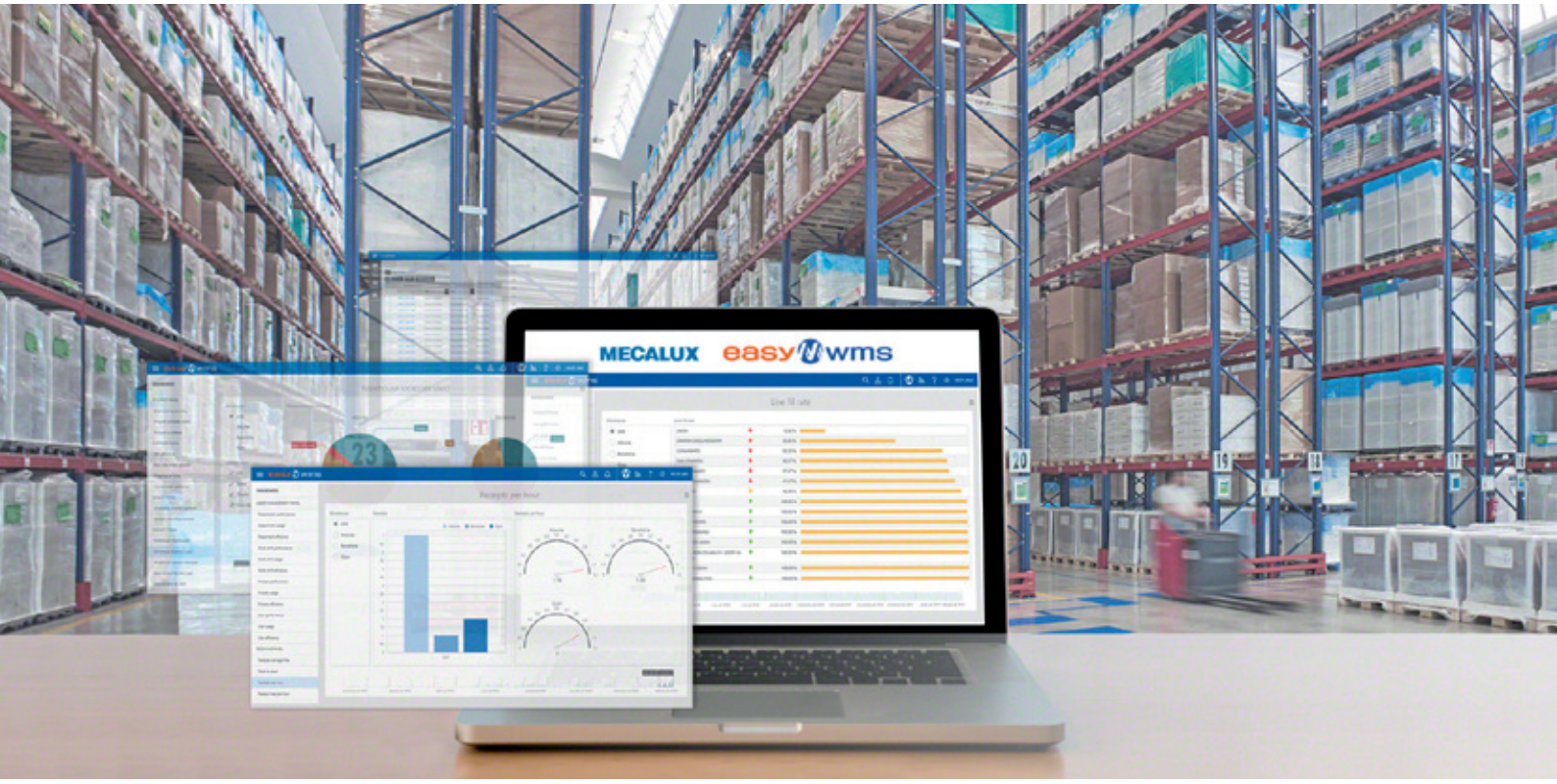
Reconsider shallow drive-in

No

Push-back

Easy WMS warehouse management system

The brain of the facility



Easy WMS is a powerful, versatile, scalable and flexible software program that can manage a manually operated warehouse (paper- or radiofrequency-device-run), a mixed facility or a large automated warehouse with the same efficiency.

Use it to streamline physical product flows and document management, from warehouse inputs to dispatches, for guaranteed, full end-to-end traceability.

Advantages

> Real-time stock control
> Lower logistics costs
> Increased storage capacity
> Reduced handling tasks
> Error elimination
> Accurate, high-speed picking
> Adaptation to new e-commerce needs
> Management of omnichannel operations
> Fast ROI (in 12-18 months)

Mecalux works with leading suppliers that attest to the quality, reliability and technical level of the Easy WMS platform:

ORACLE Partner | SAP Partner | Microsoft Partner | ZEBRA TECHNOLOGIES SEE MORE. DO MORE.

Interconnected solutions for your supply chain

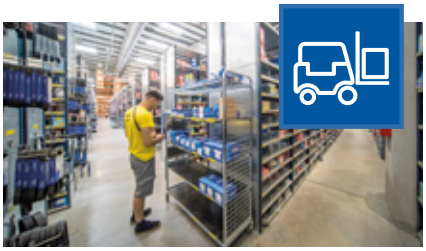
Multi Carrier Shipping Software
Automates product packaging, labelling and shipping. Coordinates direct communication between the warehouse and the various transport agencies.

Store Fulfillment
Synchronises inventory and workflows to ensure optimal stock management between the central warehouse and the network of brick-and-mortar shops.

Marketplaces & Ecommerce Platforms Integration
Synchronises the stock in the warehouse with the online catalogue in real time.
Easy WMS automatically connects to the main digital sales platforms and marketplaces, e.g., **Amazon, eBay** and **PrestaShop.**

WMS for Manufacturing
Facilitates traceability in manufacturing processes. Guarantees the continuous supply of raw materials to the production lines.

Supply Chain Analytics Software
Analyses the thousands of pieces of data generated daily in a warehouse, allowing managers to make strategic decisions based on the real throughput of operations.



3PL Warehouse Managemment Software
Manages billing between a 3PL and its customers. A dedicated access platform provides information on stock condition and how to place orders or request customised shipments.

Yard Management System
Supervises the movement of vehicles in the yard at the warehouse or distribution centre. Optimises loading dock operations to improve vehicle flow and avoid bottlenecks with inbound and outbound goods.

Labor Management System (LMS)
Maximises operational productivity. It objectively measures operator throughput, detecting opportunities for improvement for the company.

Warehouse de Slotting Software
Optimises slotting management in the warehouse. It determines the optimal slotting for each SKU based on a set of predetermined rules and criteria (historic, current and future demand).

Easy WMS in the cloud

- **Lower initial investment** since in-house servers are not needed.
- Faster, simpler **implementation**.
- Easier, more affordable **technical support and maintenance**. Total security with Microsoft Azure.
- Software **version up-to-date** at all times.
- **Maximum availability** to guarantee business continuity.
- **Fees adapted** to the needs of each business.

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International presence

7 Technological centres

BARCELONA (Spain)
Research centre for engineering projects and automatic equipment.

GIJÓN (Spain) - 2 centres
Development centre for racking and another dedicated to warehouse management software.

SALAMANCA (Spain)
Centre for warehouse management software development.

BADAJOZ (Spain)
Centre for warehouse management software development.

CHICAGO (USA)
R&D centre for racking and structures.

GLIWICE (Poland)
R&D centre for automated systems and equipment.

Sales network

Production centres

7 technological centres

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