Storage Solutions for Pallets
Storage Solutions for Palletised Products

Which is the Best Solution for your Installation?

There is no exact formula for determining the solution that is best suited to the needs of a company. However, there are factors that affect this choice. The ideal solution must answer the needs 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 is best suited to your needs.

This requires you to know the following information:

- The number of pallets to be stored
- The number of references
- The number of pallets per reference
- The space to be occupied
- The general operation (the flow of goods)
- The available maintenance systems or the possibility of replacing them
- The investment capabilities.
The contents of this catalogue are divided into two parts:

- Direct-access systems
- Compact 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 occupation of all storage locations, but decreases the use of the available surface. These solutions are best suited when there are many references and few pallets per reference.

Compact systems provide greater surface occupation and therefore maximum capacity, while losing accessibility to the pallets. However, some systems may offer low operational agility and have a lower effective capacity, that is, a larger number of empty sites. These systems are appropriate if there are few references and many pallets per reference.
Since in many cases it is necessary to separate products according to consumption criteria, the solution may be a combination of different storage systems.

The goods can be handled with conventional 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 costs and operational costs. This means that it is essential to implement the best solution with the shortest time to return on investment.

Mecalux offers the experience it has accumulated in over 50 years of creating storage solutions. Our technical and sales department will help you find the solution that is best suited to your needs.
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Conventional racks are characterised by providing direct access to all stored pallets. This is true for both static racks and those on mobile bases.

Conventional 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 installations where many references are handled with fewer pallets per reference, as well as when there is a large turnover of goods.
- These racks are appropriate for multi-customer warehouses, storing very different products and pallets of different sizes.
- They are also recommended whenever picking operations are carried out directly from the rack, or in installations used to store bulky products.
- They can also be used in small warehouses where products with great consumption rates do not represent an important number of pallets. When combined with other systems, they are perfect for storing products with low and medium turnover.
- Double depth 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. No image of this option is given in this document.
Conventional Pallet Racking with Reach Truck

✓ In addition to the advantages of conventional 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 for a given storage surface.

Conventional Pallet Racking with Narrow Aisle Turret truck

✓ Turret trucks are used to handle loads in installation with particularly high conventional racking, up to 15 m tall.

✓ These provide a substantial increase 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 increase efficiency and reduce labour costs, the truck can be replaced with an automated trilateral stacker crane.
Conventional Pallet Racking on Movirack Mobile Bases

- Racking is **compacted**, so that a single working aisle can be used to access several aisles.
- Can increase **storage capacity by 80% to 120%** compared to static racks, at the cost of a less agile operation.
- It is applicable for installations in which there is a **lower number of forklifts in operation**.
- It is best suited for storing **products with a low turnover** (C), as well as products that must remain static for some time or that are pending quality tests.
- It is ideal for small and medium-sized **cold chambers**, provided the warehouse is not 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.
Installing a Movirack System with a single access aisle (image 2.1) provides maximum capacity. However, installing two or more aisles (image 2.2) provides greater agility for handling pallets and in operations in the warehouse, at the cost of a lower capacity.
3 Conventional Pallet Racking with Automated Trilateral Stacker Crane

- The automation of the conventional warehouse eliminates the need for operators to place the pallets in the racks.
- This system also provides a considerable increase in productivity.
- Another of its advantages is cost reduction, at the same time as increased agility and safety in the installation.
- Although it is true that a financial investment is required, return on investment is quick.
If it is possible to install a warehouse with twice the length (image 3.2), the cost per stored pallet would be less, as the storage capacity increases with only a minor increase in the investment.
If a considerably long and high space is available, it is convenient to install an automated solution. This provides the same storage capacity as a conventional system, using less surface area and optimising the use of the height of the warehouse.

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

Depending on the flows of movement in the warehouse, single or double depth racks can be installed. 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 process of depositing and retrieving them.

Instead, double-depth racks (image 4.2) provide a considerable increase 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 references, while double-depth racks are best when there are several pallets with the same reference.

Conventional Pallet Racking with Stacker Cranes

- If a considerably **long and high space** is available, it is convenient to install an automated solution. This provides the same storage capacity as a conventional system, using **less surface area** and optimising the use of the height of the warehouse.

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- Another difference between the two options is that single racks are **best when there are many different references**, while double-depth racks are best when there are several pallets with the same reference.
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 conventional systems, a reduction in operating costs (maintenance units, personnel, etc.) is obtained quickly. As a result, return on investment is very quick.
Compact Systems

When it is necessary to maximise the use of the available space and store many pallets with the same reference, compacting systems are ideal.

Drive-in Pallet Racking

- This is the **simplest and least expensive** of all compacting systems. It consists of shelving with lanes inside, where pallets are placed on support rails.
- This system is perfect for storing **many pallets with the same reference** (products with high consumption) and when rotation is not a priority.
- The **storage capacity** is greater than in the conventional system, although more time is needed for each operation.

Forklifts must enter into 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 arrangements**, 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.

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

**In addition,** it is the most commonly used system for storing **many pallets per reference** and when the time for which the pallets are stored is not a priority criterion.
Push-Back Pallet Racking

- It is different from the Drive-in system in that each level can house a different reference. For this reason, it is useful when the products stored have medium consumption rates.

- This system allows shorter handling times, as the trucks 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.
However, if a roller push-back system is installed (image 6.2), the storage capacity can be increased further, as it is possible to have a depth of **up to six pallets** so that only two aisles are needed instead of the four aisles required in an installation with trolleys.
Pallet Shuttle System

This system 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 provided.

It is ideal in situations of **high turnover rates**, with massive entry and exit of the same product.

For distributions with a single block of racks and a single front aisle (image 7.1), a **greater storage capacity** is achieved, that is, a higher number of sites. In this case the **effective capacity** is **high** as there are several channels dedicated to a single reference. This makes it suitable for situations in which there are few references and **many pallets per reference**.

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

Installations with racking on both sides of a central working aisle (image 7.2) will have a higher number of channels. These will be less deep but allow **more channels per reference** as well as **increasing the effective capacity**.
Another possible arrangement 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 under FIFO, where pallets arrive at one end and leave at the opposite end.

In this case the same storage capacity as in the first option (7.1) is obtained, with the difference that as there are two aisles there is no interference between the trucks 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 with short stays and full loads).
Live Pallet Racking (Gravity Flow)

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

- There is a single reference in each load aisle, allowing excellent stock control.

- The available space is optimised, achieving maximum capacity. Aisles of more than 20 m depth 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 trucks deposit and retrieve the pallets in different aisles. The image shows a warehouse 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).
If live pallet racking is installed with a stacker crane in the central aisle, the full benefits of automation are provided, among which is a greater capacity compared to other compact 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.

It is ideal for products with high consumption rates, constant production and when turnover and cycles are essential. It can also be used as an intermediate buffer, located between production and dispatch.
Pallet Shuttle System with Stacker Cranes or Pallet Transfer Cars

- If a pallet shuttle system is installed with automated machines, all the advantages of full automation of the warehouse are obtained. Forklift trucks are eliminated, as well as the persons operating them; they are replaced by stacker cranes or shuttles.

- There is a single central aisle in which the pallet enters and exits, thereby optimising the space available and obtaining greater capacity.

- This solution is recommended when a considerable increase in productivity is desired, moving many pallets/hour.

- The choice between a stacker crane or a pallet transfer car will depend on the number of references, the number of pallets per reference or batch and the entry and exit movements.

- Comparing the two images (10.1 and 10.2) you can see that the capacity obtained in each of the solutions, in terms of number of pallets stored, is practically identical.
The essential difference between them is the number of pallets that a solution with pallets transfer cars can move compared to one with stacker cranes. In the examples shown here, the transfer system’s potential is five times greater. This means that the pallet shuttle and pallet transfer car combination on each level considerably increases the number of cycles.

If an intermediate solution is desired, a warehouse can be installed served by two or three stacker cranes (image10.3). In this case, the aisles are not so deep and the warehouse capacity is reduced, but the potential number of movements is doubled or tripled.
Comparison of the Different Storage Systems

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

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<td><img src="comparison_6.png" alt="Comparison" /></td>
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<td>Relative FIFO</td>
<td>FIFO</td>
<td>FIFO</td>
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<td>Specific retractable</td>
<td>Bilateral or trilateral stack</td>
<td>Stacker crane</td>
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<td>Retractable or counterbalance</td>
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<td>Stacker crane or pallet transfer car</td>
<td>Stacker crane</td>
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</table>
What is the Required Capacity of your Warehouse in Number of Pallets?

Simplified Chart for Selecting the Ideal Solution for Storing Palletised Goods

This chart shows the main information that must 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 reference and others. This will all depend on the logistics required for each installation.
Conventional or Any Compact System

How many references are in your warehouse?

Few

Compact Systems

Do you use FIFO system?

Yes

Live Pallet Racking

Automation required

Automated Live Pallet Racking

No

Push-Back, Pallet Shuttle, Drive-In

Push-back, Pallet Shuttle, Shallow Drive-In

Do you need to increase the number of references?

Yes

Push-Back, Pallet Shuttle, Shallow Drive-In

No

Relative FIFO

Do you need to increase the movement flow?

Yes

Push-Back, Pallet Shuttle

No

Reconsider Shallow Drive-In

Do you need to store with a depth of more than 4 or 6 pallets?

Yes

Pallet Shuttle

No

Drive-In

Pallet Shuttle with Stacker Crane

Pallet Shuttle with Pallet Transfer Car

Pallet Shuttle

Do you require massive entries and exits?

Yes

Consider the option of Live Pallet Racking

No

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

Yes

Pallet Shuttle

No

Push-Back
Easy WMS is a warehouse management system (WMS) developed and constantly updated by the Mecalux Software Solutions division, comprising more than 100 full time engineers.

Easy WMS ensures correct operation and control of installations, coordinating the movement of goods from origin to destination to achieve maximum efficiency. It also handles full warehouse operations to integrate with customer systems, because it has standard communication interfaces with the leading ERPs on the market.

To facilitate integration of the software in warehouses of every kind and size, Easy WMS has several modules that provide great flexibility and a high degree of customisation. It offers two types of architecture: cloud-based (SaaS) and on-premises.
Here are some of the benefits of automated warehouse management with Easy WMS:

1. Enhances productivity and lessens the number of operations.
2. Storage capacity improved by up to 40%; maximising the space occupied by goods in the warehouse.
3. Increases the speed of order preparation and dispatch.
4. Reduction of up to 99% of errors in the inbound and outbound processing of material.
5. Control and optimisation of stock.
6. Real-time inventory and traceability of goods.
7. Logistics cost reduction: optimises human resources and handling costs.
8. Multi-proprietor, multi-warehouse and multilingual functions.
9. Ability to adapt to new market requirements or trends, such as e-commerce.
10. Improved document management.

For more information, request the Easy WMS catalogue or contact the sales department to ask for a demonstration or obligation-free advice.
International Presence

Chicago Factory (US) 42,500 m²

Tijuana Factory (MEXICO) 30,000 m²

Matamoros Factory (MEXICO) 13,800 m²

Buenos Aires Factory (ARGENTINA) 21,000 m²

Sumter Factory (US) 23,200 m²

Gijón Factory (SPAIN) 53,000 m²

Palencia Factory (SPAIN) 23,500 m²

São Paulo Factory (BRAZIL) 27,000 m²

Pontiac Factory (US) 44,600 m²

Chicago Factory (US) 42,500 m²

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4 Technological Centres

(1) In Barcelona, a research and development centre for engineering projects and automated equipment.

(2) The development centre for warehouse products and management software is based in Gijón.

(3) The research centre for automated systems is based in Gliwice (Poland).

(4) Mecalux has another research and development centre for engineering projects in Chicago.