

Tallest warehouse in Europe constructed: earthquake prone area in Turkey not an issue for Mecalux and its partner Hayat Kimya

Hayat Kimya is the leading chemical company in the Turkish and Eurasian market in the manufacture of cleaning and hygiene products. They entrusted Mecalux in the construction of a spectacular 12,500 m², 46 m tall automated logistics centre in the city of Izmit (Turkey).

Country: **Turkey** | Sector: **chemicals & cosmetics**



BENEFITS

- **High storage capacity:** 161,000 pallets, 800 x 1200 mm in size and each weighing a maximum of 700 kg can be warehoused, in a surface area of 12,500 m².
- **Production cost savings:** they have built four overpasses connecting the factories and the front of the warehouse. Each day an average of 6,500 pallets come into the warehouse, peaking at 400 pallets per hour.
- **Total control of the automated warehouse:** thanks to the Mecalux Easy WMS (Warehouse Management System), Hayat Kimya controls all the processes and operations that take place inside the warehouse, from the moment the product leaves packaging lines until it is delivered.
- **Remote support, remote maintenance:** Mecalux is available to give technical support to Hayat Kimya 24 hours a day, seven days a week.



They were supplied with a plan that included the warehouse management system Mecalux Easy WMS, responsible for managing all the centre's activities. The solution implemented for Hayat Kimya has become a global benchmark for automated clad-rack warehouses, showcasing Mecalux's professional fortitude and skill.

Who is Hayat Kimya?

Founded in 1937, Hayat Kimya is the leading chemical company in the Turkish, Asian and Middle Eastern market for cleaning and hygiene products.

At present, Hayat Kimya is the seventh largest manufacturer in Europe in its sector, having more than 5,200 employees and reaching all its consumers through an export network which covers 101 countries.

The needs of Hayat Kimya

The huge growth experienced by Hayat had obliged them to distribute goods between several warehouses located near different production centres, which involved high logistical costs that could increase over the years.

Faced with this situation and seeking to reduce production costs, Hayat Kimya decided to build a single warehouse with a minimum storage capacity of 150,000 pallets and in which to undertake picking functions.

In addition, and in order to save on transport costs, they thought of putting it in a space available in their largest facility, equal distance from three of their most important plants and near a fourth high production site.

In the two images on this page the warehouse's location in relation to the factories and to the connecting overpasses can be seen:

1. Logistics centre
2. Tissue factory 1
3. Tissue factory 2
4. Hygiene factory 1
5. Hygiene factory
6. Detergent factory
7. Tissue input overpass 2
8. Tissue input overpass 1
9. Hygiene input overpass

The solution

Taking into account the above premises and the data provided by Hayat Kimya, Mecalux worked from the outset in the design and construction of a warehouse with the following features:

» **Automated clad-rack warehouse** with a capacity for 161,000 pallets.

» **Four raised overpasses** above the lanes inside the facility that connect the factories and the main conveyor circuit.

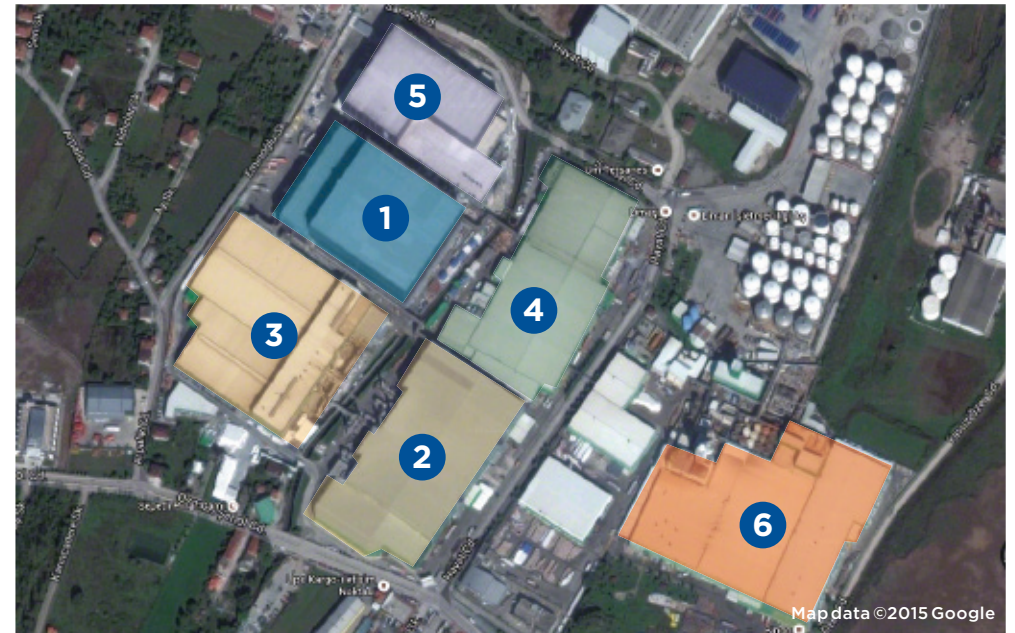
» **A ground floor** dedicated almost exclusively to dispatches, with the exception of two multipurpose docks and a dock fitted with an automated unloading system intended for the receipt of merchandise from other factories.

» **First floor** used exclusively for offices and other services.

» **Second floor** reserved entirely for picking.

» On the **third floor** is where all inputs take place in the warehouse from the factories that are located in the complex, as well as the outputs intended for picking areas.

» Wide **manoeuvring area** and loading/unloading of trucks, with 21 docks.





The final solution was the construction of a huge 12.500 m² logistics centre, with a 46 m tall, clad-rack warehouse, readied to house up to 161,000 pallets

The warehouse

The size of the warehouse is 120 m long x 105 m wide and 46 m tall, with a total capacity that exceeds 161,000 pallets that are 800 x 1200 mm in size and weigh a maximum 700 kg each.

The construction system is self-supporting, that is to say the racks, in addition to storing goods, have additional structures on which sheet clad panels are attached to that make up the building. This forms a complete unit that is the warehouse.

The racks must support their own weight, the pallets stored, the wind pressure, handling equipment, the seismic activity on the basis of the coefficient indicated at the construction site and the weight of snow that conforms to the regulations.

The Hayat Kimya warehouse consists of 15 aisles with double-depth racks placed on both sides and is 24 load levels high. In each aisle a 45 m high stacker crane was set up that is responsible for the movements within the warehouse, from the reception area to product locations. Each stacker crane is equipped with a double cradle that allows two pallets

to be moved at a time and with single-mast construction, something unusual for a warehouse of this height. The maintenance of the stacker cranes is carried out on the side that coincides with the conveyor circuit.

It is interesting to point out that in each of the 24 load levels that integrate rack bays, three pallets in the first position and three other pallets in the second are stored. This is very difficult to achieve in a tall warehouse which is located, as explained below, in an area with such a high rate of seismic activity.

The warehouse itself is an enclosed box in which all passages between the inside and the outside connection floor are done through airlocks that help maintain the atmosphere required by the fire protection system.

This system (inerting) works by reducing the oxygen in the interior's air, to an atmospheric level of 14%, at which point combustion is no longer possible. A piece of equipment controls the oxygen levels in the air and adds nitrogen until reaching the percentage that has been previously programmed.

**Major construction challenge:
its location**

The city of Izmit is located at the beginning of the Northern Anatolian fault line, which runs along the upper zone of the peninsula and which makes up the greater part of Turkey's territory. This stretch, parallel to the Black Sea, also coincides with the fault line that crosses the Sea of Marmara and the Bosphorus Strait.

To build a warehouse of these dimensions in a place with such a high rate of earthquakes, with a height of more than 45 m and with stacker cranes prepared to move two pallets at a time and operate in double-depth racks, was a challenge never before surpassed by Mecalux. Furthermore, the warehouse was built in an area exposed to the wind and where snowfall, although not frequent, can be abundant when it does occur.

With all these constraints, only one company with the experience and quality of Mecalux was able to build a warehouse on this scale.

By its particularities, this logistics centre could not be built with the traditional cold-formed profiles. Nor was it possible to do so with a structure of standard hot rolled profiles, due to the accuracy of assembly that this facility required was extremely high.

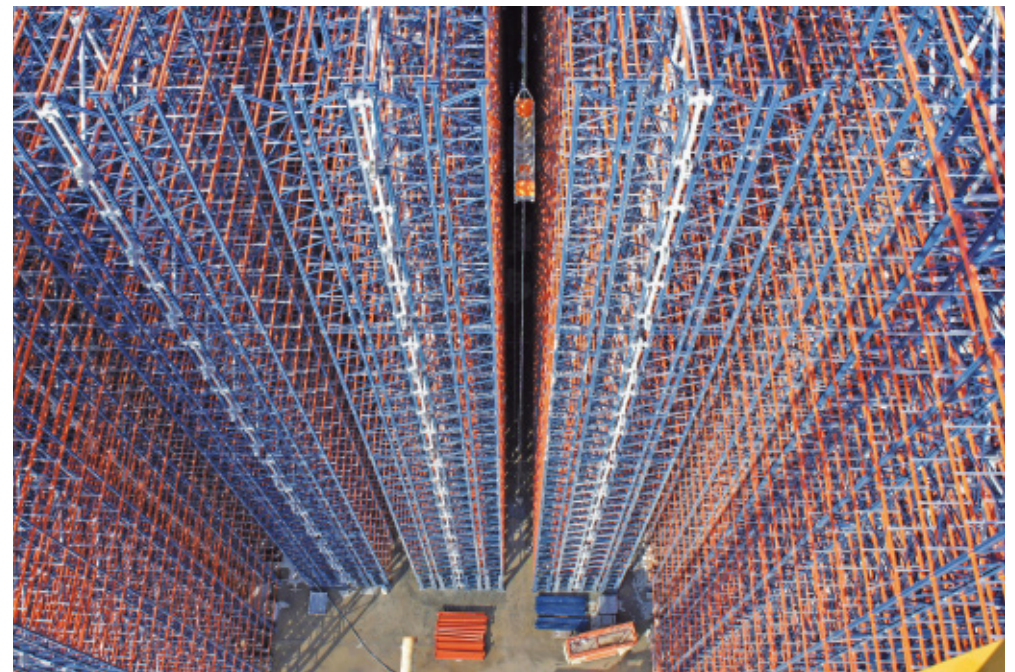
The solution provided by Mecalux's technical team was to combine the two constructive options. The first to conform all racks, and the second to complete the construction of a vertical reticulate structure coupled to the racks.

The objective was to absorb all the horizontal dynamic forces, mainly those of a longitudinal direction, which is the least rigid part

of the racks. The weight of this additional structure was more than 1,900 t (for the whole structure 10,000 t was used).

Both the dimensions and mode of operation, as the building's location, represented a challenge for Mecalux's Structural Engineering department that had to deal with some extreme determinants.

The main difficulty Mecalux faced was the existence of a major earthquake zone right where Hayat Kimya wanted to build its upcoming central warehouse





Upper floor: inputs

All warehouse inputs from the factories that are located on-premises take place on the third floor of Hayat Kimya's logistics centre. The accumulative automatic roller conveyors have been set up in the four overpasses connecting the warehouse to the factories.

All the factories have a conveyor circuit that is tasked with the input of the pallets into the system after checking both its size and its weight. Only then will they ensure that the pallets that arrive to the warehouse do so in good condition.

In each overpass two lifts were placed, one in each factory's entry points and another at the end of each overpass, allowing goods to be lifted to transport height and subsequently to the third floor. At the same time, this floor has a triple electrified mon-orail circuit running both the external and internal movements of the warehouse.

On the third floor, alongside inputs, out-puts of goods that are lowered to the designated picking floor are also done via the lifts.

Plant intended for the picking operations

The second floor of Hayat Kimya's warehouse has been reserved for picking functions, dividing it into two areas:

Zone A: 18 live channels, each three pallets deep, are grouped into four blocks. Each block is serviced by a shuttle that automatically feeds the channels with the goods from the lifts.

This area is intended for A type products (high demand).

Zone B: 174 pallet racking bays with 2 or 4 levels for pallets, including the ground floor,

grouped into four double and two single rack alignments.

It has a total capacity of 500 pallets for picking placed directly on the floor and 1,050 reserve pallets on upper levels. This second area is allocated for the picking of B type products (medium demand).

In addition, the same racks were set up for levels of live box picking to give access to C type products (low demand).

The feeding of the pallet racks is performed using front loading reach trucks that take the pallets from the warehouse in a specific exit, where one of the lifts has previously deposited the pallets destined for this zone.

Picking is done manually by the operators, aided by order fulfilment machines and a computer terminal that works via radio frequency.

When the orders are completed, they are taken to the baling area and, via two lifts, are sent to the ground floor to be dispatched





Lower floor: dispatches

All outputs designated for the dispatch area are carried out on the ground floor by electrified monorails. These automated transport units take the pallets from the conveyor output inside the warehouse, and the lifts that descend from the picking floor, and classify them into preloads.

The preloads are composed of 17 triple-channel groupings, which have a capacity to deep-store 11 pallets.

Each triple-channel group has a total capacity of 33 pallets each that correspond to an order, route or an out-sourced means of transport (truck or sea container). This request is prepared before loading the truck to avoid waiting time in goods being dispatched from the warehouse.

Depending on the means of transport used, and the agreements with company's individual customers, the merchandise is shipped on pallets (usually by truck) or in single, stacked boxes (sea container). For loading trucks generally light, front-loading forklifts are used, since they are very agile and thus the most suitable.

Every day an average of 7,000 pallets leave the warehouse, in other words, more than 200 truckloads

The dispatch area has 17 docks only for loading, allowing the preparation of 17 transport vehicles at a time.

Automatic unloading

In addition, on the lower floor merchandise inputs from the detergent factory (located 2 km away) is also done.

The inputs take place on the ground floor via three reception docks, one of which is readied to automatically run unloading.

From here, the pallets pass, one by one, through the checkpoint and continue via the electrified monorails to the input stations located inside the warehouse that is found on this floor.





Electrified monorails and airlocks

All movements from the stations to the inside of the warehouse, both on the third floor and on the ground floor, are carried out by autonomous shuttles hung from electrified monorail that works at a speed of 100 meters per minute.

There are more than 900 meters of electrified monorail and 55 autonomous shuttles in the entire installation that are able to move more than 850 pallets per hour

The warehouse should be as airtight as possible to avoid the entry of air currents with a higher percentage of oxygen. This means that all the merchandise that enters and exits via the electrified monorails passes through a sealed area with double doors or airlocks that can never be opened at the same time.

These spots are often bottlenecks in an unattended facility – consequently in this case,

which work via electrified monorails and where there are also very high flow rates – it was necessary to design several accesses with triple inner shuttle capacity. In other words, the shuttles of the electrified monorails pass three at a time.

Easy WMS: the nerve centre of the logistics centre

All the operations of the logistics centre are governed by the warehouse management system Mecalux Easy WMS and its Galileo control software; tasked with controlling the computers that run the transport and the storage of goods tasks.

Easy WMS is also responsible for:

- » **Management of goods input** from its reception at the docks.
- » **Locate pallets in the warehouse** using rules previously parameterised, under the

criteria of streamlining and maximum productivity.

- » **Manages the stock and the warehouse layout** (what and where the goods are).
- » **Manages the warehouse outputs** to the picking and/or dispatch areas.
- » **Manages and controls the picking operations through radio frequency terminals**, guiding the operator in the tasks to be performed and the order to follow to optimise routes.
- » **Allows the checking of the status of different parts of the logistics centre**, and the various equipment that operate in it, via query and reporting tools.

The Easy WMS (Warehouse Management System) is in permanent and bi-directional connection with Hayat Kimya's SAP ERP system.