

Warehouse Management and Control Software





The principal objective of the Easy WMS warehouse management and control software is to control, coordinate and manage all the processes carried out in the warehouse, from the information received from the client's ERP to the control of each of the movements performed by the mechanical and electrical devices. The system is, in effect, the brain upon which the decisions and reactions depend.





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Mecalux, aware of the demanding requirements of the computer applications which are run in its installations, has set up a Software Development Centre staffed by a team of first-rate professionals with access to the best platforms for code and programming development.

All the development work carried out in the area of information systems for automated solutions meets the following requirements:

- **Software development** following the latest technological standards, using powerful and internationally recognised databases and programming languages.
- **Scalable system**, enabling the functions of the installations and the number of users to be increased without having to alter previous configurations.
- **Centralised configuration system**, making it possible to change and/or replace hardware elements without the risk of losing data and information.
- **Safe communication system** through the use of encoded transmission data, passwords, audits...
- **Hot database backup**, enabling continuous work by the machines without reducing the safety of the information.
- **Applications designed to be easily updatable** throughout the life of the product thanks to a system of compatible versions.
- **Accessibility over the Internet**, enabling remote connection in order to receive the help of the Mecalux support team when faced with situations which require the aid of expert technicians.



With the firm intention of providing a service and supervising the different installations correctly, Mecalux operates a support department which deals with telephone assistance and remote maintenance work. A team of professionals is available 7 days a week, 24 hours a day, 365 days a year, to carefully assist the operations in each warehouse and achieve the maximum possible performance.

As a result of the investment made in developing information technologies, Mecalux is able to offer a package of easily-installable software solutions which ensure optimal functioning right from outset.

This package of software solutions for logistics installations includes two essential tools:

- **Control software:** in charge of administrating the machines
- **Management software:** in charge of the installation work



With the aim of simplifying the parameters and start-up processes of the installations, Mecalux has developed a control software solution for programming totally standard computer bots based on internationally recognised technological platforms.

→ CONTROL SOFTWARE (Galileo)

Functions

The basic function of the control software (Galileo) designed by Mecalux is to manage the electromechanical devices of the installations which carry out the tasks of transporting and storing the goods, following the instructions received from the management software of the installation.

The control software performs the following tasks in order to develop these functions:

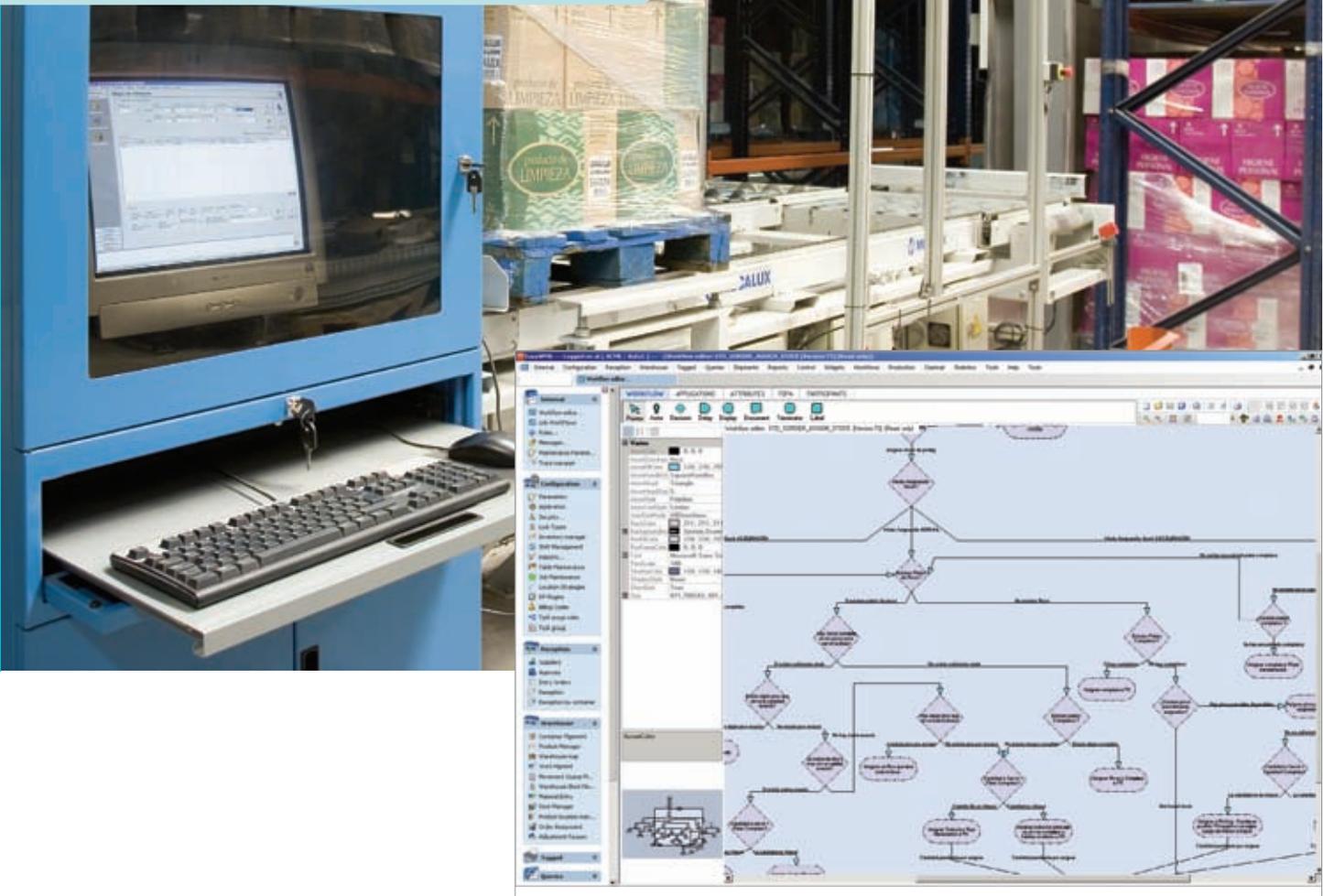
- **Displaying and auditing** the status of the different components of the installation, along with managing breakdowns and alarms.
- **Controlling the different electromechanical elements** of the installation, applying the optimal control algorithms in each case.
- **Coordination and communication** between the different control sub-systems and the top level of management (WMS).

Architecture

The control system has been developed following the latest standards in hardware and software.

The application is divided into three levels:

- **Level of user services.** This level includes the application which deals with the user interface and is connected to the layer of warehouse services.



- **Level of warehouse services.** This level contains the objects distributed in order to cover the functions of the programme. Included here is all the logic of each specific package. It is installed with a system of redundancy to ensure a tolerable functioning in failsafe mode, whenever the hardware installed permits this.
- **Level of data services.** This level deals with the acquisition of data from the installation through direct communication with the PC or the PLC cards.

Communications

Thanks to this architecture, the control system forms a comprehensive application which can work both in a PC and PLC environment. In either case, the conveyor components and sensors distributed in the installation must be connected to a standard fieldbus (data transmission system), which permits all the administered components to be monitored.

The type of fieldbus used by Mecalux always corresponds to a world market standard, thus guaranteeing the availability of compatible products and components from other international manufacturers.

The communication between the control software and the management software is established natively by means of standard tables and database processing procedures.

Stations and routes are defined in the interface. A station is understood as those parts of the installation in which a route starts or ends. Stations are also those positions in the installation in which information on the goods which pass through is collected.

The routes are all the possible paths which connect the different stations together.



Easy WMS, the warehouse management software of Mecalux, has been developed to allow its implementation to be scalable in function of the logistics complexity of the installation. It is made up of six predetermined levels, which range from not permitting any personalization of the software to the possibility to make certain adaptations to the WMS.

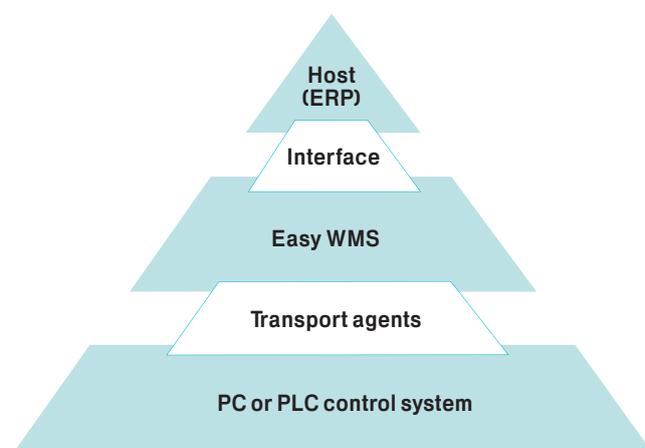
→ WAREHOUSE MANAGEMENT SOFTWARE (EasyWMS)

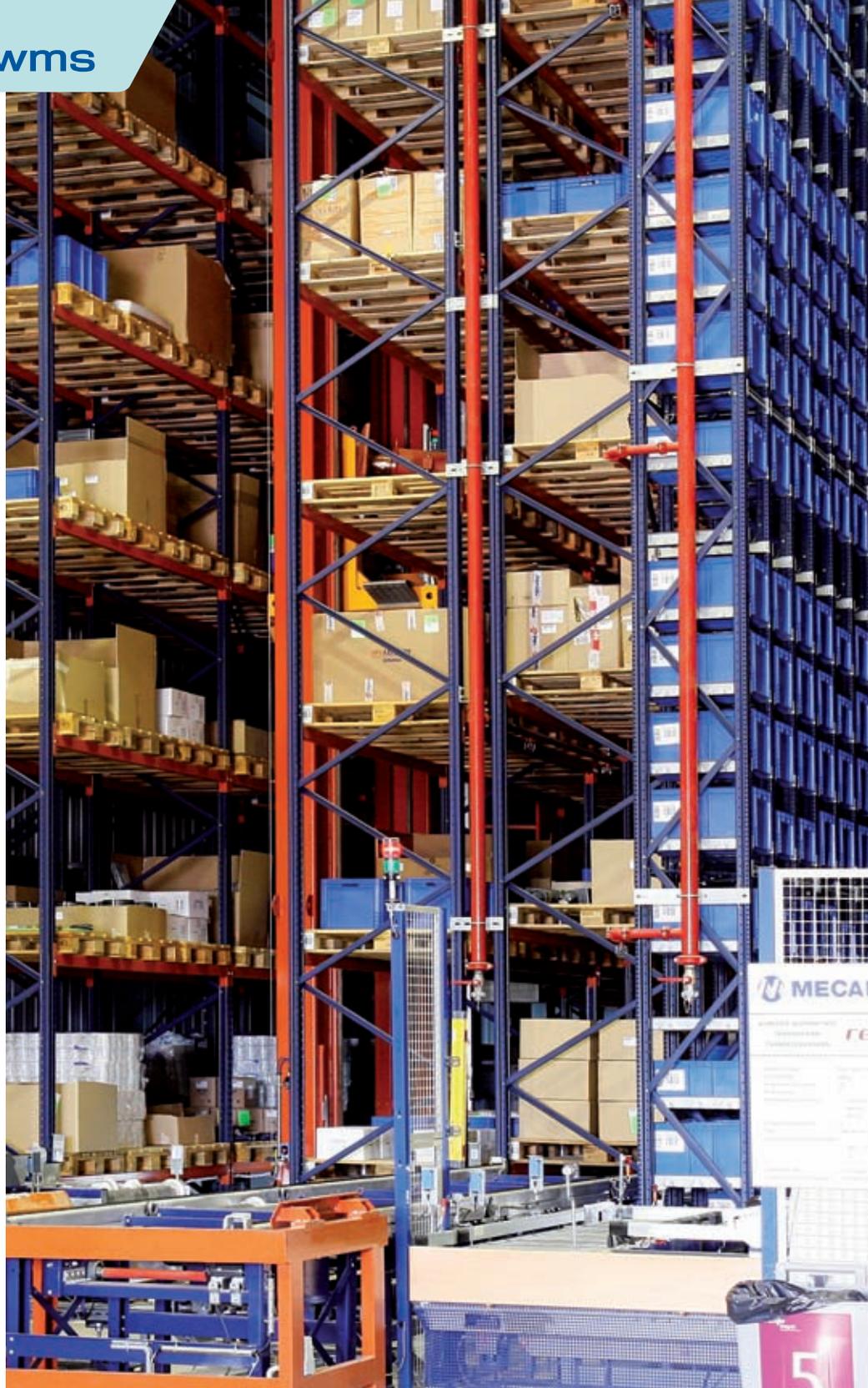
Functions of the EasyWMS

The management software, as the centre which integrates the storage and distribution systems, consists of a set of computer applications which interact between each other by means of permeability mechanisms and communication protocols. Together with the ERP (Enterprise Resource Planning) system, the WMS manages and governs all the operations which take place in the warehouse.

The pyramidal architecture of the WMS of Mecalux, organised in different management levels, is a way of limiting the responsibilities and competencies of a software package which coexists with any type of ERP. To this end, the incompatibilities of the Mecalux WMS are reduced to the maximum and the end result is optimized thanks to the versatility of the software.

In the hierarchical control and management structure, the WMS is located in the layer immediately below the global management system of the company (ERP) from which it receives direct orders for the operations to be carried out (entries expected, orders to be dispatched, etc.). At the same time, the WMS returns direct information on the result of the operations (quantity really received, stock level, incidents, etc.), avoiding intermediate layers of communication and reducing possible errors in data transmission.





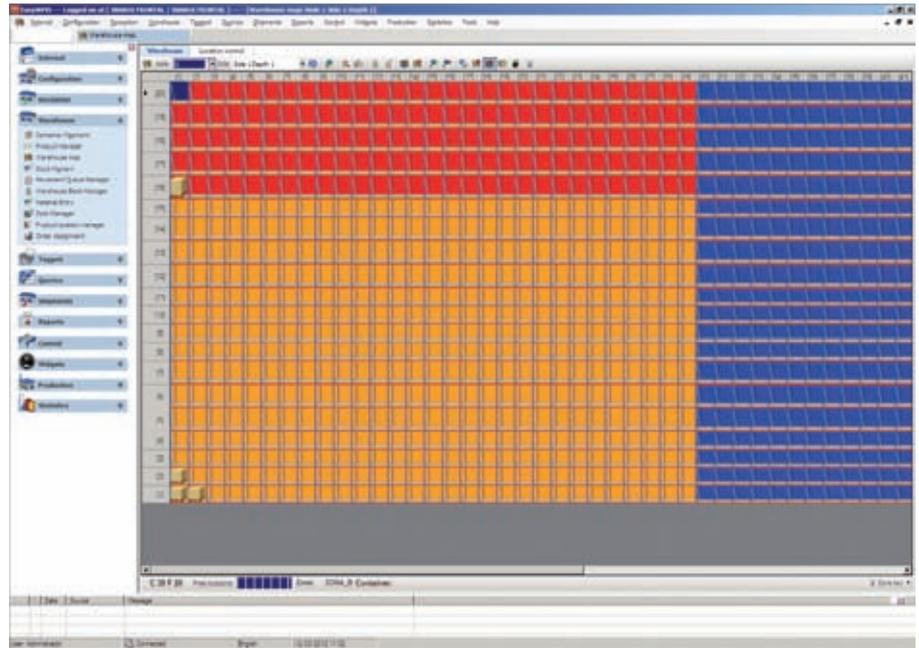
The levels of control of the warehouse's global functions and goods distribution areas depend directly on the WMS, freeing the client's ERP from the management of secondary tasks from the point of view of global management of the company.

The WMS of Mecalux uses standard communication interfaces with the principal ERPs on the market developed with the aim of achieving the maximum level of security and stability.

The interfaces are programmed following two key principles:

- **The exchange of information between the WMS and the ERP must be independent** of their status. In consequence, the protocol must allow communications to be continued, when they are re-established, at the point where they were interrupted.
- **The dialogue between the systems must be re-established automatically** when any failed structure is restarted. That is, no manual work may be done.

With the aim of guaranteeing the optimal functioning of the interfaces and communication protocols, Mecalux runs a certification programme on a continual basis to check its professionals and its WMS by means of the most widely used ERPs available on the market.



Level system

The different operations of the warehouses and distribution systems of companies make it necessary to design different logistics solutions which integrate working systems, electromechanical equipment and relatively complex machines.

As a result of this variety of solutions, a different degree of complexity is achieved so as to be able to manage the entire operation in a comprehensive and exhaustive manner.

Aware of the huge versatility of possible solutions and with the intention of simplifying the adaptation and installation processes of the management software, Mecalux has developed a system of programming the WMS which permits its scalable implementation in function of the level of logistics complexity of the installation.

The Mecalux WMS considers six predetermined levels as standard:

- **Level 1:** pre-built package
- **Level 2:** conventional warehouse with closed management
- **Level 3:** basic automated warehouse
- **Level 4:** management system with individual adaptations
- **Level 5:** complex management system
- **Level 6:** special or unique systems

The differentiation of the implementation levels of the Mecalux WMS seeks to reduce the risks and working times. The aim is to ensure the adaptation of the software to the specific needs of each installation in a standard fashion, without having to execute implementation tasks in each installation from zero.

It is important to understand that the Mecalux WMS is the same in all levels and that, therefore, moving from one level to another is simple. Logically, each predetermined level of the WMS involves being able to incorporate functions of a higher level and more complex needs of integration of working systems and technology.

From the customised analysis of each installation, the level of implementation necessary is determined so that the global solution can function correctly.



→ LEVEL 1

Pre-built package

A pre-built package is understood as the solution formed by the storage and goods conveyance equipment which acts as closed system and has a limited interaction with the rest of the logistics equipment of the company.

The In a Box and vertical tray warehouse systems, etc. are examples of pre-built logistics solutions which are easy to implement in much reduced execution times.

Therefore, the WMS which governs these systems requires a quick and straightforward installation, especially in terms of the parameterization and start-up process

The pre-built package level of the WMS of Mecalux is characterised by the following aspects:

- **Fixed configuration** of the system with respect to processes and functions incorporated, along with reports and statistics which are delivered with the system.
- **Exchange interfaces with the host system** through text files following the standard protocol of Mecalux.
- **Control of specific areas of the warehouse and general ERP integration** of the company through the text files mentioned in the previous point.
- Pros include **expiry date control, FIFO management, LIFO**, etc.
- Capable of **managing receptions, preparations and dispatches**.
- **Software parameterized** from the office rather than place of implementation. This reduces risks in the start-up.
- **Scalability**, allowing more complex functions or customised features to be added in the future by contracting a higher level of the system.



→ LEVEL 2

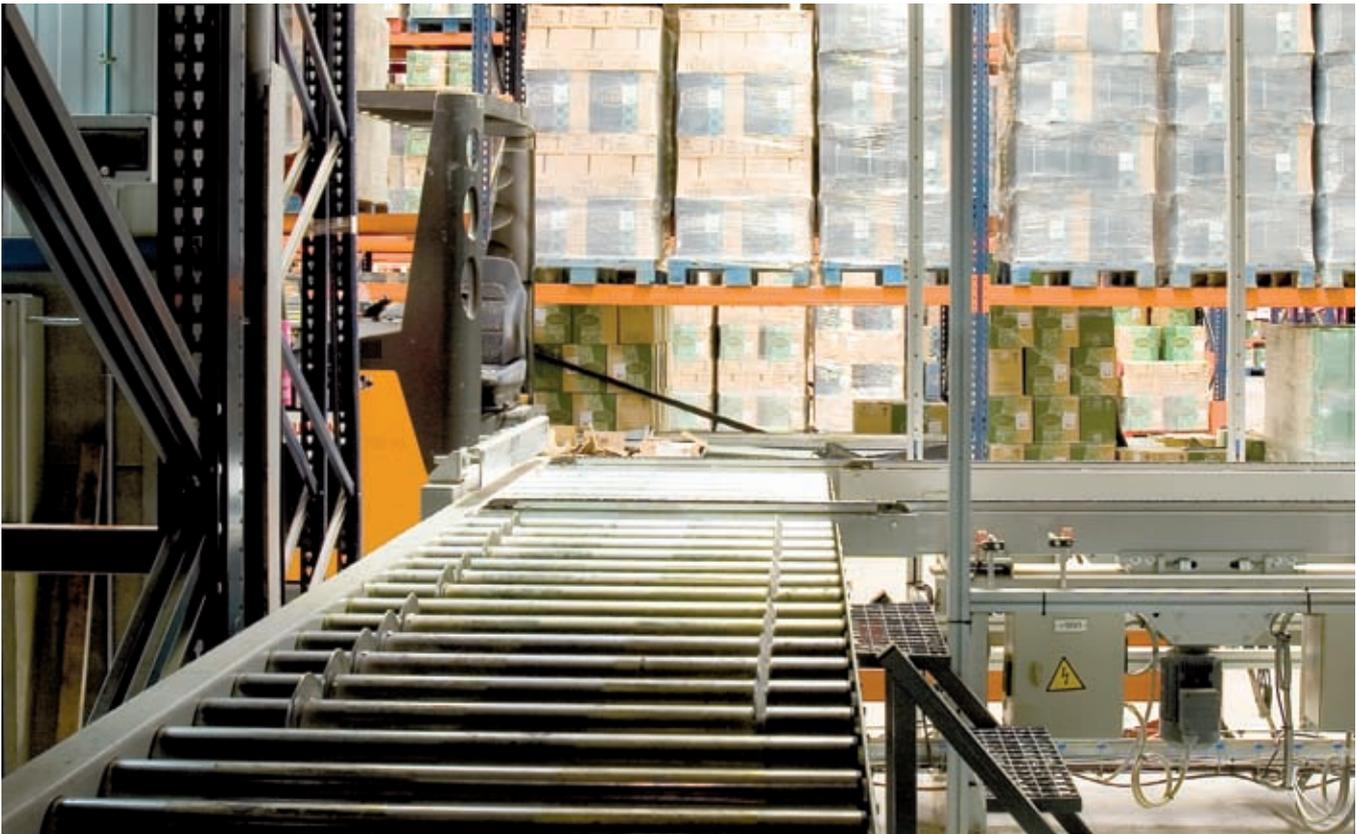
Conventional warehouse (manual) with closed management

In this level of complexity, it is necessary to control the operations of a closed logistics system, but at the same time it can form a larger operational set.

In this case, the Mecalux WMS enables a conventional warehouse to be managed and the operations of a configuration to be added to it. This level makes it possible to work with radio frequency devices. The configuration facilitates the general functioning and total control of the warehouse.

The characteristics of the second level of the Mecalux WMS are:

- **Fixed configuration of the system**, with respect to processes and functionalities which are incorporated, along with reports and statistics which are delivered with the system.
- **Interfaces of exchange with the host system** through text files following the standard protocol of Mecalux.
- **Ideal system for manual warehouses** of a medium type with standard needs.
- **Simple parameterizations** carried out in the office in function of operational demands.
- **Scalability**, allowing more complex functions or customisations to be installed by contracting a higher level of the system.



→ LEVEL 3

Basic automated warehouse

The functional configuration of level 3 of the WMS seeks to control all the operations of an automated warehouse with a simple distribution of the loads in aisles, managed by stacker cranes or miniloads and automated conveyance, irrespective as to whether the loads are on pallets or in boxes.

This level is implemented in those installations where the operational complexity is medium. That is, typical functions of the distribution at a high level are not necessary (de-palletising, stackability, etc.), although a high performance operation is required.

The main characteristics of the third level of the Mecalux WMS are:

- **Fixed configuration of the system with respect to processes and functionalities incorporated**, along with the reports and statistics which are delivered with the system.
- **Interfaces of exchange with the host system through text files** following the standard protocol of Mecalux.
- **Expandable configuration** in function of the growth of the warehouse.
- It is designed to function by means of the **management of maximum and minimum flows in the automated warehouse. It regulates and manages the logistics storage flows.**
- It facilitates the **management** of equilibrium and balancing in areas with automated **devices** (transport and storage).
- **Parameterization** is carried out following the needs of the logistics operations.
- **Scalability**, allowing more complex functions or customisations to be installed by contracting a higher level of the system.



→ LEVEL 4

Management system with customisations

This is the first level in which the product adapts to the client in order to carry out simple modifications. Level 4 of the implementation of the WMS incorporates the basic functions of a warehouse with specific characteristics, so it requires functional studies and in-depth knowledge about the warehouse on the part of Mecalux prior to its start-up. This knowledge makes it easier to implement the system and facilitates the start-up and functionality of the whole warehouse.

This level is particularly designed to be implemented in high performance warehouses, in which the loads are handled by stacker cranes or by miniloads and followed up by picking management.

Its main characteristics are:

- Management system capable of administering all the **procedures generated needed for storage.**
- **Management and differentiation of materials**, management of maximum and minimum flows, batch control, expiry dates control and traceability management, equilibrium and balancing of loads, alternative routes.
- **Advanced picking management:** grouping of orders, dispatches and routes.
- **System can be parametised** and adapted to storage and picking needs.
- **Scalability**, allowing more complex functions or customisations to be installed by contracting a higher level of the system.
- Enables **interaction between the automated elements and conventional elements.**
- Implements all the general needs of a **combined warehouse.**
- Functionality in accordance with requirements and **possibility of combining management systems for conventional warehouses** (RFID, RF).



→ LEVEL 5

Complex management system

Level 5 of complexity of the Mecalux WMS is an extension of level 4.

The number of functions is increased in most installations through the incorporation of wide-ranging forms of picking management. This level is typical of those installations which include some of the following operations:

- **Sorting the goods during conveyance.**
- **Stackability management** in picking.
- **Automated de-palletising/ palletising.**
- **Automated loading/unloading of lorries.**

In all these cases, it is important to ensure that there exists a seamless communication interface between the different electromechanical systems and the WMS. In addition, the software must manage as optimally as possible the machinery of the logistics systems.

All of this requires exhaustive work prior to the start-up in order to reduce the execution time as far as possible.

→ LEVEL 6

Special or unique systems

On occasions specific systems for unique solutions are required. In these cases, Mecalux carries out a complete study of the operational demands.

Following a structure of modular functional analysis, an operating system is created which takes into account all the situations needed so that the warehouse designed meets all the requirements for which it was intended.

Applications are varied and very different types of installations are possible, including:

- **Management of high performance sorters.**
- **Automated car parks.**
- **Airport management.**

Functions of the system

Now the six predetermined levels for the Mecalux WMS have been defined along with their application in function of the complexity of the installation, it is important to look at the specific functions which can be performed with each of these.

The following tables have been designed to describe with precision these functions and the levels in which they are applied. As a result of the detailed observation of the matrixes, it can be seen that the software cannot be personalised in

levels 1 to 3, while levels 4 and 5 accept adaptations of the WMS, basically those which affect the communication mechanisms with ERP (Enterprise Resource Planning) and certain operational processes. The functions are detailed based on the following central operational blocks:

- **Receptions** (material entries, planning of unloading, returns...).
- **Dispatch** (material exits, picking management, goods dispatch...).

- **Control** (control of loading gauge, reservations of material, dynamic management of turnover...).
- **Tools** (report designer, generic queries, consolidations...).
- **Communications with host** or external systems.

→ RECEPTION	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Entry orders The system allows the entry orders to be received by a communication interface. These entry orders are the equivalent to purchasing orders or forecasts for material entries (returns, third-party entries). They can contain data on the specific containers which are to be placed in the system (ASN) or solely data on quantities of material by reference type.	●	●	●	●	●
Unloading planning - The system allows unloading to be planned in time bands. - The system enables compliance reports with graphics to be printed in order to clearly see the degree of compliance with the delivery by the haulier or supplier.	●	●	●	●	●
Receptions - Possibility of creating any quantity of receptions associated with an entry order. In this way, it is possible to receive goods in multiple shipments. - Possibility of carrying out receptions without previous entry order. - Possibility of receiving more material than specified in the entry order.	●	●	●	●	●
Receptions with RF Possibility of carrying out reception by means of a radio frequency terminal at the operator level. The options of the administrator of the reception must be done from a fixed station.	●	●	●	●	●
Capture of logistics data - Confirmation of the information of the delivery note in order to prevent errors. - Creation of new articles if they do not exist in the system. - Possibility to create new presentations and palletised goods. - Batch control, series number or expiry dates during the reception for articles with these required logistics attributes. - Control of temperature and weight during the reception for articles with these required logistics attributes. - Control of owner of the goods.	●	●	●	●	●
Reception documents - Printing reception reports. - Printing differences report to show possible disparity between the material received and that expected.	●	●	●	●	●
Labelled with barcode - Printing container labels. - Printing EAN 13 or EAN 128 labels for internal use. - Can manage almost all the label printers on the market.	●	●	●	●	●



● YES ● NO

LEVEL 1 LEVEL 2 LEVEL 3 LEVEL 4 LEVEL 5

Finalising reception

- Possibility of blocking the stock, or part of the stock in multi-reference pallets.
- Possibility of blocking containers
- Closing receptions.
- Cancellation of receptions (partial closure).
- Closure of entry orders (and hence of the receptions associated with this order)

● ● ● ● ●

Production entries

- Recognition of production containers by EAN128.
- Cross-docking of containers for sending directly to dispatches.
- Size control of container (height, control of spaces, control of runners).
- Managing the entries sent to reconditioning stations.
- Possibility of sending a stock registration message to the host at the entry.

● ● ● ● ●

Search for location

Location through system of rules. The rules can be made for the application of the following criteria:

- Search by area and dimensional characteristics.
- By product and/or presentation.
- By supplier.
- By owner.
- By product turnover.
- By status of the material.
- By weight.
- By dangerousness of the product.
- By container type.

● ● ● ● ●

Returns

- Manual registration of returns.
- Registration of returns associated with an entry order.
- Handling of containers and their location according to the rules established.

● ● ● ● ●

Communications with host

- Automatic message sent to the host with the received material.
- Automatic message sent to the host with the located material.

● ● ● ● ●



● YES ● NO

→ DISPATCHES	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Dispatch orders The system allows the dispatch orders to be received by communication interface. These orders are the equivalent to sale orders or forecasts for exits of material. They can contain data on the specific containers which are going to be sent out or solely data on quantities of material by reference type accompanied by the necessary logistics data.	●	●	●	●	●
Dispatch planning The system enables compliance reports with graphics to be printed in order to clearly see the degree of compliance.	●	●	●	●	●
Replacements - Automated replacement in the picking location. - Manual replacement. - Manual replacement by radio frequency.	●	●	●	●	●
Material exit Material exit with the following steps: - Management of shipment routes (transport). - Management of exits of complete pallets. - Management of exits of complete pallets ordering the order by lines.	●	●	●	●	●
Picking management - Picking in conventional position. Management of different presentations of the article. - Stackability management. - Management of client container and management of return of the client container to the warehouse (prior preparation).	●	●	●	●	●
Picking and dispatches by radio frequency Performing picking with radio frequency terminals.	●	●	●	●	●
Pick to light / Put to light Management of PTL devices in order to carry out picking process.	●	●	●	●	●
Sending goods - Lorry loading by RF. - Management of dispatch routes.	●	●	●	●	●
Documentation of the dispatch - Delivery notes by order or by grouping of orders. - Report on differences between material ordered and that actually served. - Report on material by container (packing list). - Report on composition of a consolidated dispatch to be able to manually break it up into orders. - List of containers, references and orders loaded in a lorry.	●	●	●	●	●
Labelling of goods - Labelling of containers with EAN128. - Labelling of boxes.	●	●	●	●	●
Communications with host - Automatic message sent to the host of the material dispatched per order. - Automatic message of material loaded in lorry.	●	●	●	●	●



Possibility of scanning the EAN of the article so that the system shows the data of the product.

● YES ● NO

→ TOOLS	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
<p>Report designer The system is delivered with a report designer in the application itself. This allows the IT personnel of the client to adapt the reports to their needs or to create new reports.</p>	●	●	●	●	●
<p>Barcode labels designer The system is delivered with a label designer. This allows the IT personnel of the client to adapt the label formats to their own needs.</p>	●	●	●	●	●
<p>Generic queries The system is equipped with generic plug-ins of queries and reports which enable the client to create new options of menus with queries and reports created by its own IT personnel.</p>	●	●	●	●	●
<p>Radio frequency: free movement Possibility of carrying out manual movements and for the system to register them.</p>	●	●	●	●	●
<p>Radio frequency: semi-automated movement Possibility of carrying out manual loading and for the system to find a location automatically.</p>	●	●	●	●	●
<p>Radio frequency: query of data of article through EAN of product Possibility of scanning the EAN of the article so that the system shows the data of the product.</p>	●	●	●	●	●
<p>Radio frequency: consolidating reception Possibility of consolidating two received containers into a single one.</p>	●	●	●	●	●
<p>Radio frequency: consolidating location Possibility of consolidating two positioned containers into a single one.</p>	●	●	●	●	●



● YES ● NO

→ CONTROL	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5
Stations Possibility of managing blockages and basic changes of functioning in the stations of the system.	●	●	●	●	●
Control of loading gauge errors - Visual representation of the loading gauge errors. - Possibility of solving problems of label reading by scanner breakdown through a screen. - Printing reports and statistics of loading gauge errors.	●	●	●	●	●
Manual stock reservations The system enables stock reservations to be performed manually with the following criteria: - Associating certain stock with a client. This stock will only be used to serve the specified client. - Associating certain stock with an exit order. This stock will only be used to serve this order.	●	●	●	●	●
Dynamic management of turnover The system includes the utilities needed in the user interface to calculate the turnover of a product between two dates. With this calculation, and in comparison with the configured turnover, the administrator can change the turnover of the products selected to that suggested or to another one	●	●	●	●	●
Automated reorganisation Containers can be reorganised in the aisles in a time frame or in dead times of the system.	●	●	●	●	●
Management of 'lost & found' location The system has a virtual location which it uses to manage stock with problems. When the containers leave the system, they are sent to this location, which enables them to be manually un-registered or recovered.	●	●	●	●	●
Recounts The system permits recounts to be launched according to the following characteristics: - Owner - Product - Container - Batch - Serial number - Aisle - Area - Interval of coordinates	●	●	●	●	●
Consolidation of material The system permits consolidation orders which allow material to be collected together according to the following criteria: - Product - Owner - Batch - Serial number - Expiry date - Area - Aisle - Interval of coordinates	●	●	●	●	●



● YES ● NO

→ COMMUNICATIONS WITH HOST OR EXTERNAL SYSTEM LEVEL 1 LEVEL 2 LEVEL 3 LEVEL 4 LEVEL 5

<p>Communication: flat text files</p> <p>The system enables communications to be carried out with the host system through the file exchange protocol defined as a standard by Mecalux and without any modification or adaptation. The communication channels supported are:</p> <ul style="list-style-type: none"> - Files shared in the Mecalux system. - Exchange by FTP server. - Exchange by MQ-Series queue system. 	●	●	●	●	●
<p>Communications: flat text files</p> <p>Format is defined by the client. The communication channels supported are:</p> <ul style="list-style-type: none"> - Files shared in the Mecalux system. - Exchange by FTP server. - Exchange by MQ-Series queue system. 	●	●	●	●	●
<p>Communications with SAP by IDOC</p> <p>Communication is done by IDOC</p>	●	●	●	●	●
<p>Communications with external systems</p> <p>Communication with LGV, vertical warehouses, carrousels, etc.</p>	●	●	●	●	●



Some of the functions described in the tables showing the different levels require highly specific technological solutions. These include: pick to light / put to light, functions included within the dispatches area, and the use of radio frequency in the operations of the installation.

→ PTL AND RADIO FREQUENCY

Pick to light / Put to light

Architecture

The system is formed by devices known as tags which are connected to a controller. This controller is connected by an Ethernet network to a PC which manages these tags.

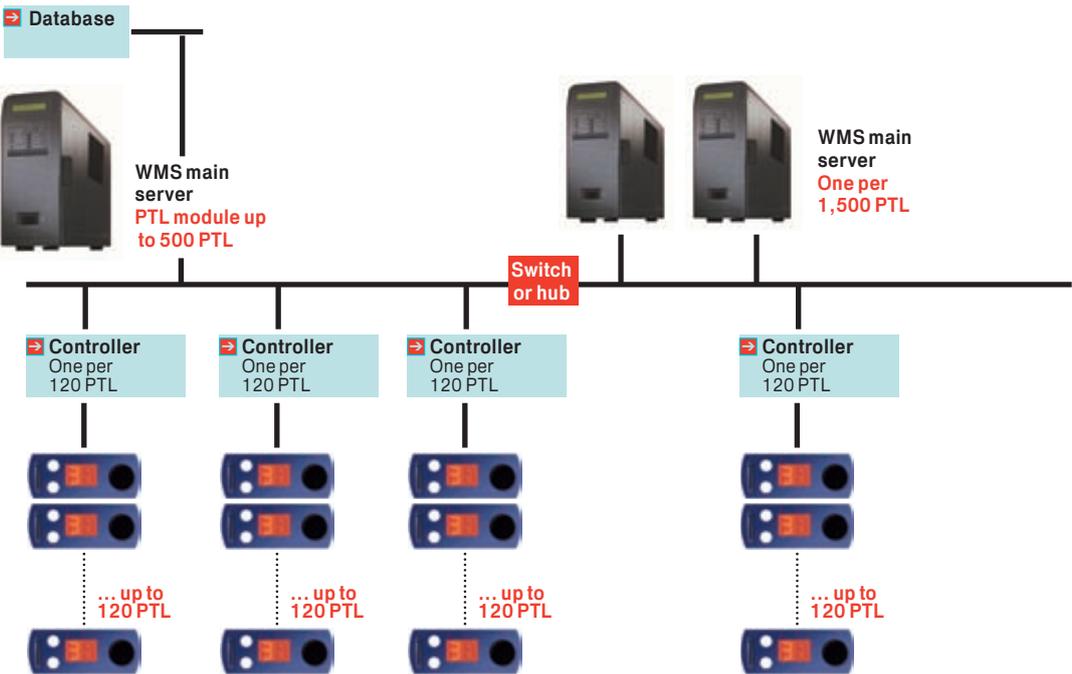
The system works approximately as shown in this diagram:

Pick to light operation

This system basically consists of a series of display devices which are connected to an industrial PC in which the application is located. The extraction orders are sent from the WMS to the displays fitted in the racking so the operator knows at all times the quantity of units to be extracted and the position where they are located.

Once the job is finished, the operator must validate the order by pressing a button on the side of the display panel, or correct the stock, if there is not enough material.

The system eliminates paper-based lists and can be fitted with any type of racking.





Put to light operation

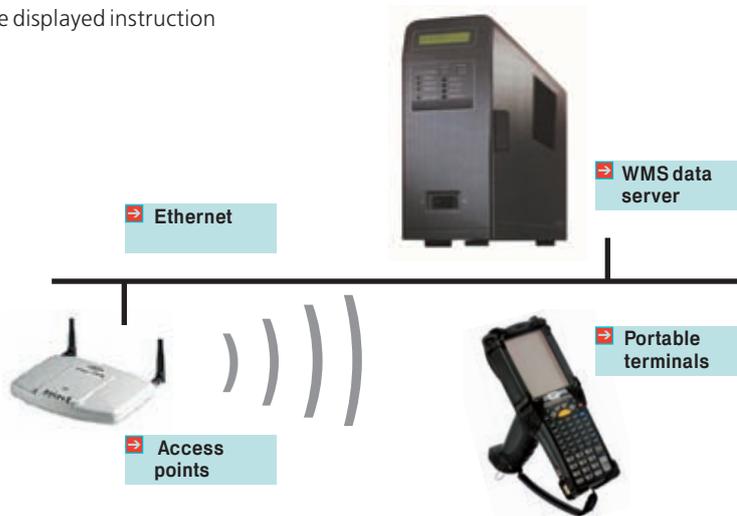
This operation is the opposite of the pick to light system. That is, the articles are taken in batches from the warehouse, and are transported to the position of the operator. As soon as the goods are collected, the operator must scan one of the articles or identify the cart in which the material is delivered.

All the locations where the scanned articles are to be deposited automatically appear on the illuminated display, indicating the quantity to be deposited in each position. The operator places the article where instructed, and presses on the display to confirm the action. As soon as this is done, the displayed instruction disappears.

Radio frequency (RF)

The radio frequency devices are connected directly to Mecalux's WMS data server, as if it were a conventional Ethernet connection. This allows all the terminals to be integrated in the management network, enabling the operation to be performed by radio frequency from different terminal models at the same time.

The architecture of the radio frequency system integrated in the Mecalux WMS can be represented in the following diagram:



Module for integrating external systems

On certain occasions, the logistics solution developed as result of the client's needs requires the integration of specific closed systems which have not been manufactured or supplied by Mecalux.

With the clear intention of not limiting this type of installation, the Mecalux WMS incorporates a special module which enables interaction with these products. These include:

- Loading/Unloading of lorries.
- Automated guided vehicles.
- Sorters.
- Others.



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