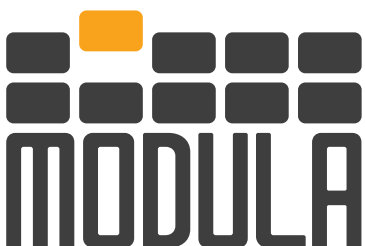


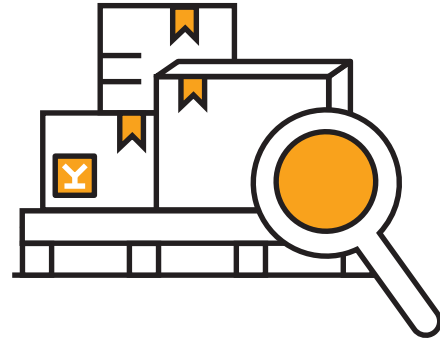
**PICKING:**  
the **HEART** of the  
**WAREHOUSE**



[modula.com](http://modula.com)

## THIS COURSE

will help you learn  
the **strategies, solutions**  
and **tools** for your picking.



## PICKING the HEART of the WAREHOUSE

**03** INTRODUCTION

**05** PICKING STRATEGIES

**10** PICKING SOLUTIONS

**18** PICKING AID SYSTEMS

## **PICKING:** THE HEART OF THE WAREHOUSE



When it comes to **logistics, integrated logistics and warehouse management**, we should mention picking, a typical function of **warehouse management**.

The term refers to the **loading or picking operations in all types of automatic warehouses or traditional shelving**.

Specifically, we mean the picking of individual items (generally packages, cartons or pieces) from a larger unit usually called the Loading Unit (packaging, pallets, bins, etc.), but it can simply indicate the operation of picking a product or a loading unit to prepare one or more shelf orders.

This operation can be automated through **technical computerized infrastructures** that pick carefully catalogued products.

Among all warehouse activities, picking is the one that must certainly be designed with greater care.

### WHY IS PICKING SO IMPORTANT?

- It **weighs heavily** on costs as it can affect up to 1% of turnover.
- IT IS a decisive factor for the **quality of the service**: accuracy, punctuality and speed of order processing depend on it.
- It uses up to **30% of resources**: personnel, vehicles, space.
- It involves many departments and resources:
  - *security*
  - *quality*
  - *warehouse*
  - *shipment*
  - *customer care*.
- IT IS closely related to **investments in technology**: think of vertical warehouses, robots, radiofrequency systems, handling systems.
- It involves high labour intensity in manual systems
- It involves high capital intensity in automatic systems.



In addition to having a **direct effect on the client**, the preparation of the order can also lead to either **economic losses** or help you **save**.

Indeed, it is one of those activities with the highest costs. That figure ranges from 40% to 60% of total expenses. But it increases if there are **errors in the shipments** and the client receives a product they did not request.

In these cases, the **yield costs** fall directly on the company, whether physical or virtual.



### HOW TO CHOOSE THE PICKING SYSTEM?

#### Let's start from the purpose:

achieve excellent levels of productivity, accuracy and safety, and make an efficient investment!

#### What should you evaluate?

- Number of codes in the warehouse.
- Quantity and volume in stock by code.
- Number of lines fulfilled by code and total of lines.
- Variability of flows.
- Profile of its probabilistic distribution.
- Number of pieces/line.
- Physical and management characteristics of the products to be picked (shape, stability, weight, volume, perishability, traceability).
- Lead-time required for order fulfilment.
- Pay back logic of investments.

## PICKING STRATEGIES

The profile and mix of the orders, the quantities and frequency of picking, the type of client to be served, the fulfilment lead-time, the organisation, the collection of deliveries and the space available in the shipping area, are all **factors that affect the order fulfilment criteria** and can be organised according to various strategies.



One **adequate picking strategy** will cover your business needs and avoid economic losses and delayed shipments.

As mentioned earlier, warehouse picking is one of the most expensive operations. Reducing these expenses is essential for **avoiding economic losses** and to do so we will need to create a solid picking strategy.

### POSSIBLE PICKING STRATEGIES



#### 1. ORDER PICKING

by individual order with one operator



#### 2. PICKING SUMMARY

by item



#### 3. BATCH PICKING

by order batches



#### 4. PICKING ZONE

by individual / batch order / with multiple operators



## 1. ORDER PICKING: by individual order with one operator

Order Picking or Order Collection is used to **manage all requests from clients**.

- Order reception is not very predictable.
- There are many urgent orders (critical fulfilment lead-times).



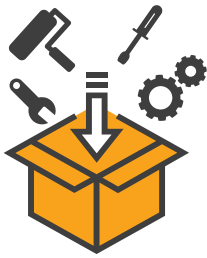
### CONSTRAINTS

- Consider input and output flows.
- Keep an eye on inventory to manage stocks and always know what is there and what isn't.
- Choose a flow logic which can be:
  - **LIFO** (Last In First Out), if you want to reduce your losses in the sale of products that have "ups and downs".
  - **FIFO** (First In First Out) if you want to avoid unsold merchandise and obsolescence and therefore a loss in terms of liquidity.
  - **FEFO** (First Ended, First out) if you have goods subject to easy deterioration or obsolescence.
- Assess the use of software and **barcodes** to have under control, in a very short time, the type and quantity of goods stored in the warehouse and reduce the time spent in stock replenishment.



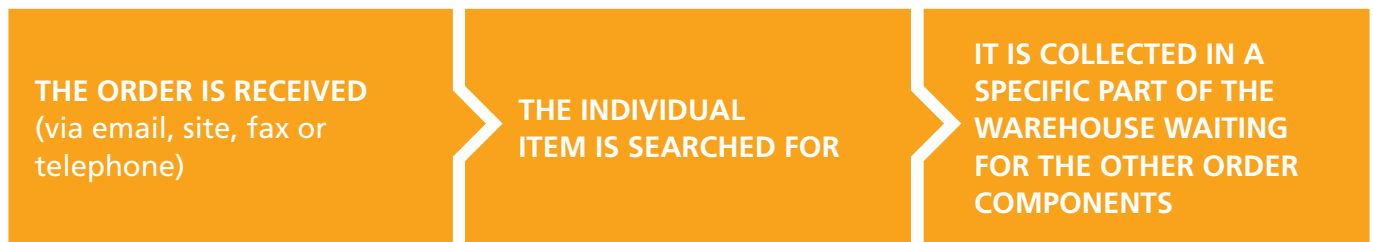
### RECOMMENDED IF:

- There are many lines per order.
- There are large quantities per line.
- There are orders with items with a low overlap index.
- Items are bulky.
- Items are heavy.



## 2. PICKING SUMMARY: by item

The operator processes one order at a time sequentially. This is the traditional method.



### RECOMMENDED IF:

- Orders are received regularly.
- Fulfilment lead-time is not critical.
- There are few lines per order.
- There are low quantities per order line with items with a high overlap index.
- There is a consolidation area of adequate size (compared to picking by order).



### 3. BATCH PICKING: by order batches

The expression **batch picking** refers to a **picking method** that consists in **simultaneously selecting** the total quantity of a specific SKU (Stock Keeping Unit) to **fulfil the orders of different clients**.



#### PERFECT IF:

- The products are easy to handle, easy to pick and of similar size.
- The orders to be managed are single item. In this case, the picking becomes faster.
- There is a significant sequencing of activities.
- There is a precise layout and you have studied the allocation of goods in order to facilitate the transit of operators.
- There is a warehouse management software to plan and control the operational phases related to batch picking.
- There is adequate space in the consolidation area.



#### ADVANTAGES

- Decreased number of stoppages.
- Decreased number of trips.
- Recovery of productivity.
- Better saturation of the product collection units.
- Trend towards zero errors, especially if a sorter is used downstream.





## 4. PICKING ZONE: by individual order / with multiple operators

The Picking Zone is also known as “**pick and pass**”. Operators are assigned to a specific physical zone. It is particularly useful in department stores that manage a large number of SKUs.

The operator selects all the SKUs in a specific zone for each individual order that arrives. For orders with SKUs in multiple zones, these are filled by going through the required zones, often following a strategic series of movements through the warehouse.

Each operator is assigned to a designated area and this allows the selectors to acquire deep familiarity with the zones assigned to them and the SKUs stored.

The selection of zones has a series of advantages and disadvantages, which often depend on the size, payload and organisational style of the operation.



### DISADVANTAGES

- Only one scheduling period per shift, which means that there is a breakpoint for orders to be queued.
- Orders placed after a certain timing are not fulfilled until the next shift.
- Load balancing zones for job management can be difficult to manage.



### ADVANTAGES

- Ease of search of items.
- Optimal sequence of routes by cases (without the support of a WMS).
- Increased number of orders in the batch thanks to the limited work volume for each operator.
- Reduction in the order preparation time (if the picking takes place in parallel).
- Zone configuration according to different criteria (such as SKUs with fast or slow movement) or a zone dedicated to high security SKUs. This can increase collection speed and reduce errors.

## PICKING SOLUTIONS

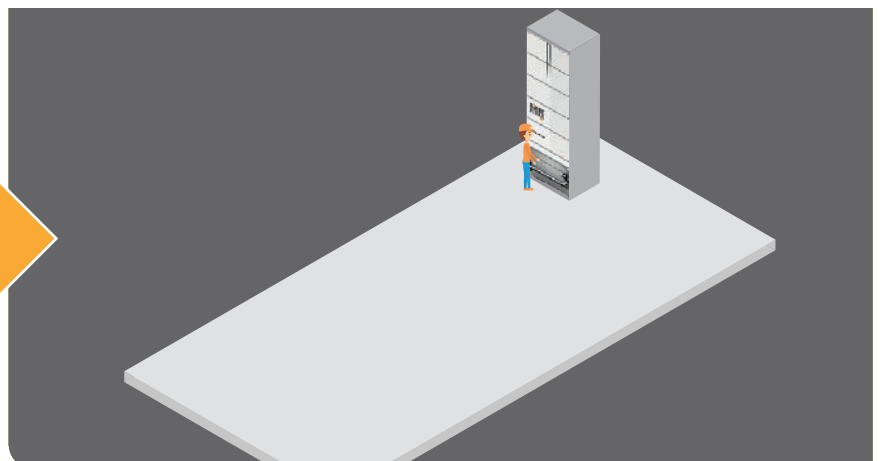
The picking approach is very important to optimise the warehouse and order preparation. In general, there are two macro approaches: **MAN TO GOODS** and **GOODS TO MAN**.

As you can easily guess from the expression itself, in the first case it is the **operator who moves between the shelves** or in the warehouse in search of what he has to pick, while **goods to man** means that the **operator's position is mostly fixed** and the goods are "brought" to him, reducing distances and making his activity more ergonomic and safer overall.

### 1. MAN TO GOODS



### 2. GOODS TO MAN



## 1. MAN TO GOODS

Here are some picking solutions that are applied in the **man to goods** approach.



### PICK TO PART

**This is the simplest and cheapest picking method.**

Usually it is the operator who, on board a suitable cart, moves inside the warehouse corridors and carries out the picking. It is the most widespread solution. If picking one order at a time, the products are then brought to a packaging station (and generally control station as well) where the shipping boxes are prepared (usually by hand), and documents and labels are printed for couriers.

If, on the other hand, a single item (or a limited series item) is picked, the products are brought to the packaging station, where it is also necessary to distribute the items to the various packages of the corresponding orders.



### PICK AND PACK

**With the pick&pack technique, the picking, checking off and packing operations are carried out simultaneously.**

Pick&pack involves the management of products from small to large quantities and involves **picking from the warehouse for the pick and packaging for the pack.**

### PICKING PHASE

Starting from a pick list containing all the details of the goods to be picked and the shipment to be carried out, the document is sent to the warehouse, where the goods must be picked from the position indicated in the list (shelf, level, sector, etc.).

**PACKING PHASE**

After the workers have checked the material a second time (the first time takes place as soon as it arrives at the warehouse) the product is ready to be packed with the appropriate material. Once the boxing and packing procedure is complete, the shipment material will be ready for weighing and subsequent shipment. This ends the **packing process**.

**What do you need for pick&pack?**

- A WMS that can aggregate orders (batch) in the most efficient way (by volume, by geographical destination, by overlap indexes of codes, etc.).
- A solid product database to govern the measurements and weight of the individual pieces picked, since the WMS decides a priori the number and type of packaging to be used.
- Use shipping packages standardized by format.
- If possible, carry out a weight check at the end of the order.

The system works well when there are no problems in product preparation sequences by the shape and fragility of the goods. At the end of these operations, there may be an automatic packaging line end with weight control, closure (taping, strapping, shrinking) and automatic labelling.



**PICK TO BOX OR ZONE PICKING**

This solution requires the picking area to be divided into several stations, each of which will have one or more operators active. The different picking stations are connected to each other by means of a conveyor on which the cartons slide into which the different pieces picked will be inserted. Each of these bins corresponds to a client order or part of it. The primary goal of this technique is to reduce the metres travelled by the operators by making them work in a limited area. These areas can be fixed or dynamic (they change according to the orders to be picked, managed by WMS).

**ADVANTAGES**

- Ease of item search
- Optimal sequence of routes.
- Increased number of orders in the batch thanks to the limited work volume for each operator.
- Reduction in the order preparation time (if the picking takes place in parallel).

**DISADVANTAGES**

- Consolidation activities downstream.
- Issues with job balancing between the various zones.
- Increase in the sorting area as the batch size increases.



### ■ MASSIVE SORTING OR PICK AND SORT

This method is combined with the concept of batch picking as each operator makes a massive picking of a specific item that corresponds to the requirement for that item for a specific client or destination. The sorting can then take place simultaneously with the picking or automatically through a machine of choice.

#### ADVANTAGES

- High operating capacity connected to automatic subdivision.

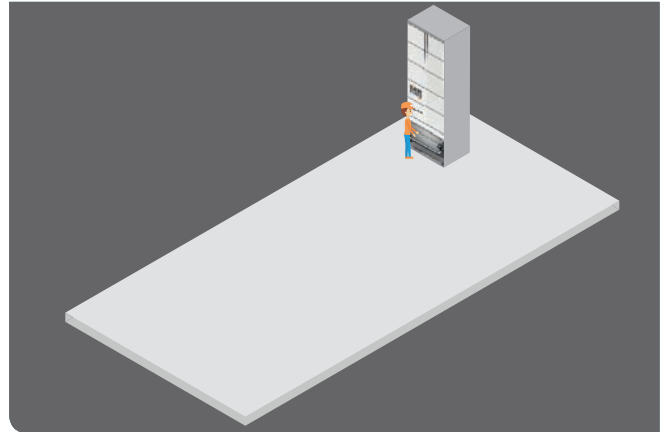
#### DISADVANTAGES

- High costs.
- Design complexity: collection dimensioning, flow balancing, structured management rules.
- Double handling in cases where the products picked must be ordered.
- Great attention in the presence of delicate products.
- Obligatory automatic recognition of packages.

## 2. GOODS TO MAN

The expression **goods to man** refers to a picking method in which the operator does not move, instead a machine transfers the goods to the picking station.

It is a dynamic, semi-automated or fully automated picking method. The picker remains stationary, avoiding wasting time moving from one lane to another or from one location to another. Work improves as well as the ergonomics of picking; in fact, picking usually takes place at man height. This method is often made possible by automated warehouse technology or robots.



### WHAT ARE THE TECHNOLOGIES FOR THE GOODS TO MAN METHOD?



#### CAROUSELS

Carousels are automatic storage systems that use a rotating carousel system to convey goods to the operators.

A carousel warehouse can be horizontal or vertical depending on the rotary movement and the system inside.

Usually in these warehouses the loading unit is the tray, which moves towards the storage/collection location at the start of the lane. The trays are often used in "multi-item", that is, multiple types of products are stored in the same tray.

After parametrization by the operator, the system is able to select products that differ visually in order to avoid picking errors downstream of the preparation chain. This strategy significantly reduces the travel times normally required when operating with traditional shelves.

#### ADVANTAGES

- Excellent management control.
- Good use of the height or length of the premises.
- Good use of the surface area.
- Excellent protection of stored goods.
- Easy access to the compartments.
- Possibility of guided picking.

#### DISADVANTAGES

- Low overall storage capacity.
- Costs are rather high.



### ■ STACKER CRANES/MINI-LOADS

This is a technology that integrates shelving and machinery in a single product, and usually uses bins or trays as loading units. It consists of a central corridor where a stacker crane/mini-load circulates and shelving on several sides where the loading units are located.

The shuttle (stacker crane or mini-load) moves in the rack warehouse autonomously and with a gripping arm grabs 1, 2 or 3 boxes. The conveyors bring the loading unit closer to the operator and, once the job is finished, return it to the stacker crane so that it can reposition it on the shelves again at the end of the picking. The whole system is coordinated by a management software that records the location of all the materials in the warehouse and updates the inventory in real time.

This solution is usually very suitable for light loads (trays), however it means that there are multiple bays and usually also multiple fork configurations.



### ■ SHUTTLES

Shuttles are transportation systems used **to connect several areas within an automatic storage system.**

The shuttle usually integrates with roller or chain conveyors and is used at the head of the automatic warehouses to sort the pallets entering the stacker cranes and vice versa, **or to feed multiple order picking stations.**

The shuttles can be straight or steered and can also be **used for transport routes in which there is the passage of forklifts** (track built into the ground).

The steering shuttles travel on a monorail circuit, which allows greater speed when cornering, thus maximising transport capacity.

Each corridor is served by several shuttles, up to a maximum that coincides with the number of delivery levels, while there is an elevator at the head, per shuttle or per loading unit.

This technology is often equipped with pick or put to light systems.



### AGV

An acronym that stands for “Automated Guided Vehicle”, these vehicles can be considered moving robotic forklifts, assigned to move, store, pick and load goods both inside the warehouse and in the loading/unloading areas.

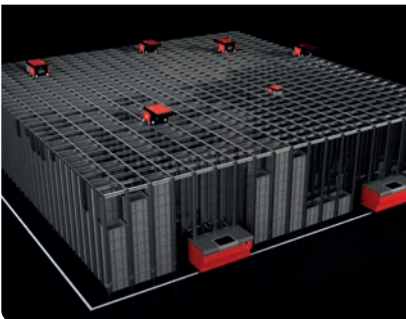
They perform all functions without having to be guided or remotely controlled by a person and, if desired, without interruptions even at night. This type of automated vehicle is recommended for the management and handling of loading units of various sizes, weights and types.

The most important specification is the **guidance system**.

Some vehicles move following electrical signals (wires under the floor) others following optical systems (coloured bands), others orient themselves with magnetic signals or receive coordinates via radiowaves or GPS, others are guided by laser beams, or by a mixed combination of several methods.

AGVs usually move on wheels or tracks, and in some solutions it is possible to change routes dynamically through the control and management software.

In addition, “hybrid” AGVs can both operate independently and allow manual checks if necessary.



### AUTOSTORE

AutoStore is a very **compact and innovative** automated storage system. It is based on a **robot that moves around the warehouse and works on the concept of goods to man or goods to robot**.

The AutoStore system consists of **four main components**: a **three-dimensional storage grid**, **storage bins** that contain all the products, a **team of robots** that retrieve the bins, and **doors** that act as an interface between the operator and the AutoStore system.

The system has low maintenance requirements and **each robot can reach any bin in the system**, allowing individual robots to be removed in the event of maintenance without stopping the system. Products that move quickly are pushed upwards on the grid, speeding up picking times.

The storage bins inside the AutoStore are stacked vertically up to 6 metres high, saving a lot of space. **The architecture of the system is flexible**: it can be built around pillars and in irregular shapes to maximise the space available inside a warehouse and robots can be upgraded at any time.





**MODULA**

These are **vertical automatic warehouses with trays** that function as **storage towers** in which to insert goods and products which are then picked only as needed.

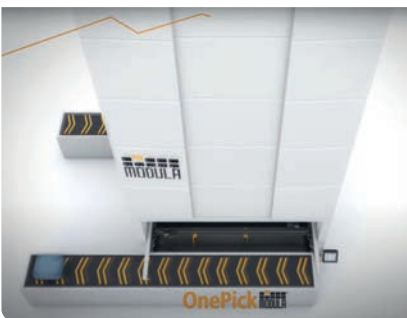
They work via an **internal elevator that moves centrally** with respect to two rows of trays spaced inside the machine.

The elevator **moves vertically and then picks up the tray requested and brings it to man height in the picking area: the so-called operator bay.**

From here it is possible to access the tray which is divided into more or less large compartments depending on the goods stored.

The automatic vertical warehouses come in a great variety of dimensions: **in terms of height they range from 2-3 metres up to 16 metres, capacity can reach 80,000 kg, the size of the tray and depth can vary greatly.**

In the most advanced companies, the warehouses are integrated with the company management systems (SAP, Oracle, S400, etc.) through a management software called WMS (Warehouse Management Software) that allows you to automatically connect and share all the operations carried out and update inventory, stocks and supplies in real time.



**100% AUTOMATIC PICKING**

There are still not many fully automatic picking systems, but research on robotic systems and artificial intelligence is proceeding very quickly and some solutions are starting to arise.

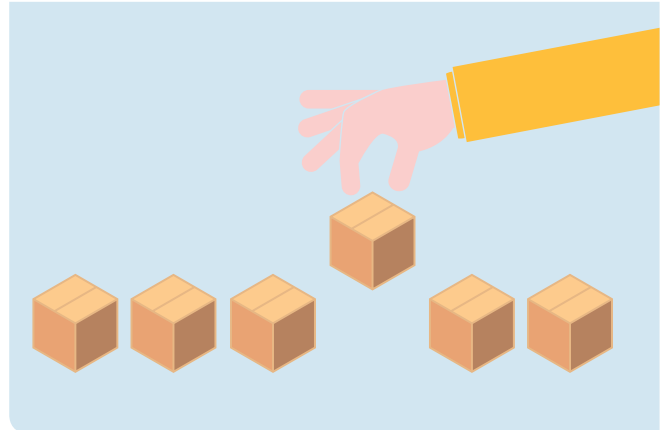
100% Automatic picking usually requires integration between different technologies, including almost always robotic grippers or anthropomorphic robots that pick the material, for example, from an automatic warehouse and move it via roller conveyors or automatic storage handling systems to a collection or storage station.

The integration between automatic warehouses and robots is already widespread and represents a valid solution in departments where the human presence is not recommended.

## PICKING AID SYSTEMS

To improve efficiency and speed up picking operations, it is possible to invest in structures and devices designed to make picking dynamic. This is the case of **visual or vocal devices** placed in each location which indicate from which positions the product can be picked and in what quantities.

They are important to help the operator bring together the product units necessary to set up each order and increase operational efficiency.



### POSSIBLE PICKING AID SYSTEMS



1. PICK TO LIGHT OR PUT TO LIGHT



2. VOICE PICKING



3. VIEW PICKING



## 1. PICK TO LIGHT OR PUT TO LIGHT

Speaking of visual picking aids, **pick to light** is used to improve picking accuracy by operators. It allows identifying the picking/deposit location by means of a light signal and reports the quantity to be picked/deposited using a display combined with the picking/storage chamber.

There are two different names for this system depending on whether the activity to be performed is picking or depositing. Usually, however, the operations are carried out by the hardware itself.

If **picking** is taking place and the goods to be picked up are illuminated by a light, this is called **pick to light**.

If the **sorting** of goods is taking place and the location where to store the goods is illuminated by a light, this is called **put to light**.

The system consists of devices such as **displays and lights that can show numbers**, which indicate to the operator both the position from which to pick the product, and the exact quantity of items needed to set up an order. The systems connect directly to the warehouse management software, through which they are coordinated.

In the area where the picking or deposit operation is to be carried out, usually the front part has a **numeric display with buttons** for the operator.

The WMS software to which the displays are connected is activated (with a colour and with a signal) and indicates to the operator where to pick or deposit the goods, specifying the quantity of items to be taken and grouped together.

Once the picking of the units indicated has been completed, the operator presses a button to confirm, a message reaches the WMS which detects the end of the operation and the software turns off the light on the display.

The sensors and displays can **feature various colours**, to which a different function is assigned in order to facilitate the picking and preparation of orders and guide the operator.

When **preparing a new order**, the lights come back on automatically.

The **advantages** of this system are clear: in addition to **speeding up picking**, it allows operators to **manage multiple orders simultaneously**, significantly reducing the possibility of making mistakes in preparing them.

Put to light is strongly recommended in batch picking actions and can also operate on the move with a picking cart by placing the light indicators directly on the cart.



## 2. VOICE PICKING

This system works through a **technology that sends simple and clear voice commands to the operator, guides him in the route to follow and in the picking activities.**

The operation of voice picking is linked to computer terminals, which must synthesise and recognise human voices in order to transform them into information.

Each operator has a terminal equipped with earphones and a microphone.

There is a constant conversion of the computer code into synthetic voice instructions, and a flow of information is created: a real dialogue-exchange between the system and the picking operator via this two-way communication.

The device provides and receives instructions and responses from an operator (thanks to the multi-modal feedback system), thus increasing flexibility in carrying out the picking activities.

**Voice picking can be integrated with company ERP systems and with WMS software.**

**Voice picking is useful if you want your hands free or to use gloves or make data entries at the same time as handling.**

It is effective for identifying goods or trays when codes are not readable automatically, it is capable of recording operations and is environmentally friendly as it limits the use of paper.

The only limitation with respect to voice picking may be the fact that it is less comfortable for the operator who has to deal with the system.



### 3. VIEW PICKING

Like picking by voice, view picking uses technological tools, in particular visors called “**smart glasses**” which are **placed like glasses in front of the operator and serve to automatically scan the codes framed by the visor.**

With their glasses on, pickers find the fastest route to reach the products and can directly read the barcodes or QR codes.

Information passes through these smart glasses which read and report the data.

The operator can continue to work undisturbed, hands-free and receive real-time information on the glasses, and have the status of his order always in view.

Pick-by-vision or view picking uses Augmented Reality technology, so it is possible to display the relevant data superimposed on the reality beneath it. This allows you to quickly locate individual objects on over a million products in stock.

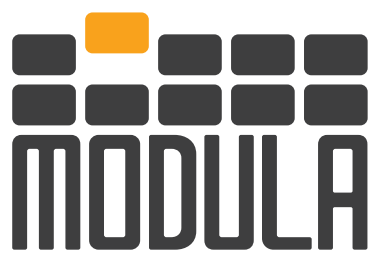
Like put to light and voice picking, this system requires a warehouse management software interface.

- Fewer picking errors and improved productivity.
- A user-friendly and very intuitive technology.



#### ADVANTAGES

- Drastic reduction of picker learning and training times.
- No more manual scanners and paper picking lists.



[modula.com](http://modula.com)