

Order Picking Methods and Systems: A Reference and Application Guide

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Order Picking is the process of receiving goods in a given unit size, retrieving them from storage and shipping them in a different unit size. Of critical importance in Order Picking is selecting the correct item in the correct quantities to the satisfaction of customer requirements.

Order Picking is a labor-intensive activity. It cannot be done in a hurried manner because mistakes are difficult to catch, costly to correct, and have a devastating effect on quality.

I. The Five Levels of Order Picking

In general, Order Picking can occur on one of five levels depending on the size of the unit that is being picked.

1. Pallet Picking – Retrieval of full pallets
2. Layer Picking – Retrieval of layers of cases
3. Case Picking – Retrieval of inner packs from cases
4. Split Case Picking – Retrieval of inner packs from cases
5. Broken Case Picking – Retrieval of individual, discrete items

II. Industry Trends Affecting Order Picking

Recent industry trends have changed the nature of order picking. Historically, it has been viewed as the task of breaking large unit sizes into smaller ones. However, in the modern warehouse order picking is seen as a way to *add value* by making goods quickly available to customers in the right quantities. Customers no longer have to maintain large amounts of inventory for their operations.

The trends that have caused this evolution in thinking about order picking are:

- **Consolidation.** Corporate mergers and acquisitions, coupled with the deregulation of the transportation industry, have resulted in fewer distribution centers serving larger customer bases. This causes more SKUs in increasingly larger volumes to move through warehouses and puts pressure on the distribution function to be efficient and cost effective.

- **Constant Flow.** Material that used to be ordered on a monthly, or even quarterly basis, is now required weekly or biweekly. Goods are often shipped directly to stores with the supplier providing inventory storage. Storage has evolved from long-term in nature to temporary. This puts a premium on the methods used to move material from storage to the customer.
- **Customer Attention.** Suppliers realize the importance of serving their customers needs. Successful suppliers have developed excellent relationships with their customers that are based on having goods available quickly and in the right quantities. Catering to specialized customer requirements is the norm in the modern warehouse and suppliers must have this capability in order to stay competitive.

III. Characteristics of Modern Order Picking Systems

The trends listed previously have caused modern order picking systems to develop and maintain similar characteristics. They are:

- Flexible – able to meet the variable needs of a large customer base.
- Cost effective – able to operate on a low cost-per-dollar-shipped basis.
- High quality – the right product is available at the right time for the customer.

STOCK PROFILING

Stock Profiling is a simple process used to obtain a detailed description of the goods in an inventory and their level of activity. This information can then be used to ensure that the stock is assigned a *storage type* and *location* that facilitates order picking.



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I. Stock Profile Information

1. Product Cube: Length, width, and height of an item.
2. Picking Unit: Full pallet, layer, split case, full case, etc.
3. Number of Items: Total number of items in a unit.
4. Weight: Maximum weight of an item as stored and picked.
5. Items per Order: The average number of items in a typical order.
6. Durability: Special handling considerations to ensure quality.

II. Stock Profile and Storage

From the Stock Profile, an appropriate type of storage can be determined. Examples of matching stock with proper storage are:

- Small Parts – shelving; carton flow rack; horizontal and vertical carousels; modular drawers; automated picking systems.
- Full Cases – shelving; carton or pallet flow rack; pallet rack; AS/RS.
- Full Pallets – floor; pallet rack; AS/RS.

III. Stock Profile and Order Picking Productivity

The data uncovered in the Stock Profile should be used to structure an order picking system that has high productivity as a hallmark. Some of the most common ways to implement productivity based on the profile are:

- Minimize Travel – Locate popular items in the nearest locations (e.g., end-of-aisle, near shipping conveyors, adjacent to other popular items).
- Maximize Access – Group fast movers where they are readily available. Put heavy, bulky and frequently needed items in the workers “Golden Zone” (at or near waist height). Minimize bending, stretching and reaching. Set carousel pick height at waist level.
- Balance Work Flow – Distribute fast movers over multiple pick lanes to spread the picking effort. This prevents a hectic pace for some workers while others are under-utilized. Balance is especially important when zone picking.

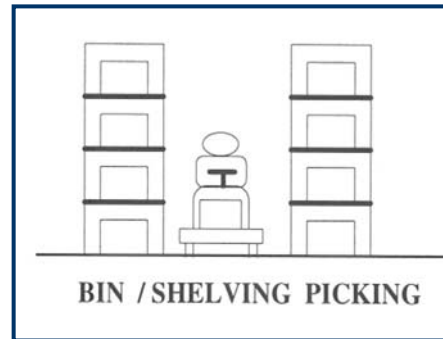
ORDER PICKING ALTERNATIVES

A number of order picking arrangements exist, each with their own utility depending on the needs identified in the stock profile. Some of the more common methods are shown below. Each method can be configured in several variations.

I. Bin/Shelving Picking

Bin/Shelving Picking is used for large or small items, usually of varying shapes, that are picked at low rates. Variations include:

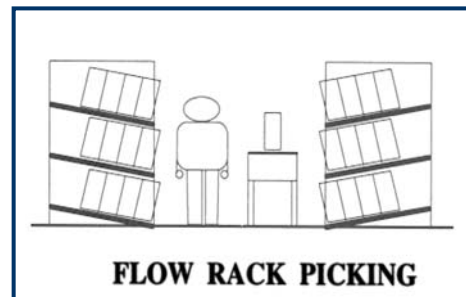
- Pick to Cart (shown)
- Pick to Conveyor
- Pick to Pallet Jack



II. Flow Rack Picking

Flow Rack Picking is best suited for items of uniform size, picked at low to medium rates. Rack replenishment is from the rear. Variations include:

- Case Picking to Conveyor (shown)
- Case Picking to Cart
- Case Picking by Lift Truck

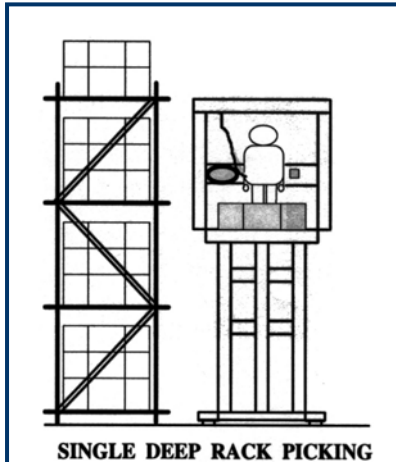


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III. Single Deep Rack Picking

Individual cases, layers or mixed items can be picked using the Single Deep Rack concept. This method is used for larger items that are picked at low to medium rates. Variations include:

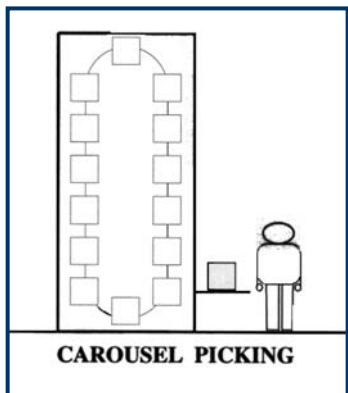
- Case/Layer Picking to Stockpicker (shown)
- Case/Layer Picking to Cart
- Pallet Picking by Lift Truck



IV. Carousel Picking

Best suited to small products, Carousel Picking is used for low-to medium-rate picking. Reduced walking time and multiple SKUs are the chief advantages, but bin size is limited. Variations include:

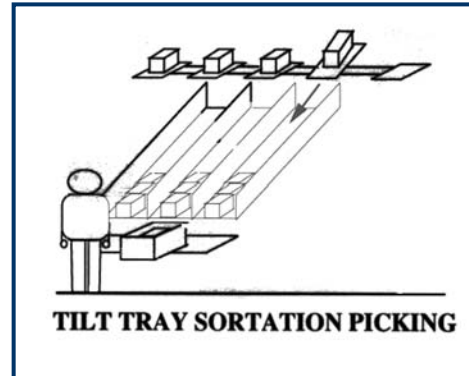
- Vertical Carousel Picking (shown)
- Horizontal Carousel Picking
- Vertical/Horizontal Picking to Conveyor
- Vertical/Horizontal Picking to Cart



V. Tilt Tray Sortation Picking

Small products of varying sizes can be picked at high rates and with high accuracy using Tilt Tray Sortation Picking. This method is often used for preparing packages for shipment. A previous picking operation must occur upstream to feed the Tilt Tray Conveyor. Variations include:

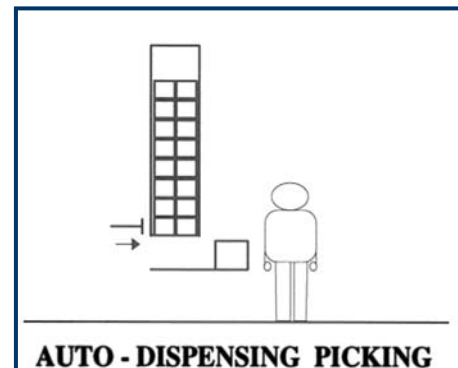
- Picking to Tray (shown)
- Picking to Conveyor



VI. Auto-Dispensing Picking

Auto-Dispensing Picking is used to provide picking of small, uniform, durable products at high rates. It is generally used only for high-volume applications and has a high initial investment. Variations include:

- Picking to Tray (shown)
- Picking to Conveyor



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VII. Picking Applications Comparison Chart

Each product is uniquely suited to a particular order picking alternative, as discovered in the stock profile. The following chart provides a comparison of the picking types and their characteristics for reference:

PICKING STYLE	PRODUCT TYPE	PICKING RATE	PICKING EFFORT	RELATIVE INITIAL COST
Bin Shelving	Large or small products with bulky shapes	20-60 Lines/hr (cart) 200-350 Lines/hr (belt)	Large number of workers: substantial walk/lift/carry	Low
Flow Rack	Large or small products; uniform size; in cases, cartons or on full pallets	20-60 Lines/hr (cart) 100-250 Lines/hr (carton on belt) 200-350 Lines/hr (belt)	Significant number of workers. Substantial walking with cart; less walking with belt	Low to Medium
Single Deep Rack	Large or heavy items, usually on pallets; cases or bulky items	10-30 Pallets/hr (truck) 20-50 Lines/hr (stock picker) 30-80 Lines/hr (pallet jack)	Large number of workers: substantial walk/lift/carry	Medium
Carousel	Small products in large numbers of SKUs	300-600 Lines/hr	Low labor, usually one operator. No walking	High
Pallet Picking	Palletized products	20-100 Lines/hr (carts)	Significant number of workers. Substantial walking with cart; less walking with belt	Medium

ORDER PICKING STRATEGIES

I. Pick Initiation

Order picking can be initiated in a number of ways. Two common methods are as follows:

1. Printed Pick Lists that identify the location and quantity of the items to be picked.
2. Pre-printed bar coded labels that are stuck on pick carts, trays, tubs, etc. When passed by a bar code reader, pick locations (and sometimes quantities) are displayed, or printed for picking.

II. Picking Strategies

Efficient picking can be accomplished by selecting the right picking strategy. Four widely used methods are described below:

1. **Strict Picking.** Strict Picking is a strategy where a picker completes one order at a time. The advantage of this method is that order integrity is maintained throughout the picking cycle - a completed order arrives in shipping, usually picked by a single worker. Additionally, no down stream sorting is needed. Strict picking works best when there are only a few line items to be picked for each order.

2. **Batch Picking.** In Batch Picking, a worker selects items for several orders simultaneously. A major advantage of this method is that the picker completes multiple orders in one tour of the warehouse. If orders are small, pickers may sort to a compartmentalized cart while picking. Otherwise, sortation is required downstream to consolidate orders.

3. **Zone Picking.** In Zone Picking, each worker is assigned to one particular zone. A cart will move through each zone with workers adding products from their particular area as specified in the pick list. With this method, travel distances are significantly reduced. (Travel is estimated to take up to 60% of a picker's time!) Unnecessary handling can occur when the cart is passed through a zone where no product is required for the order. In this case, a bypass may be used to skip the "no-pick" zones.

4. **Wave Picking.** As the name implies, orders are consolidated into waves of work. An advantage of this method is that waves can be created based on rules tailored to meet the needs of the moment. Some examples:

- Pressing orders can be filled first.
- The size and content of each wave can be modified.
- By a particular carrier, or even a given load.
- By a destination.

III. Picking Productivity Concepts

Picking productivity is key to an efficient operation. Some concepts that can help enhance productivity include:

1. **Stock Assignment by Activity.** Locate popular items where they are easily accessible. For example, an often picked item may be located at the end of an aisle to limit travel distances. Goods that are frequently requested together will be located in adjacent storage bins. Items that are infrequently required will be stored in a remote location. Another technique is to balance picking activity by distributing fast moving items over multiple pick lines. This minimizes situations where some workers are extremely busy while others are underutilized.



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- 2. Sequenced Picking.** When possible, picking can be sequenced by location. All orders requiring goods from a given area will have those items picked all at one time to reduce travel time. Sequenced picking can also be used to pick goods based on a given carrier which will minimize downstream sorting activity and reduce dock congestion.
- 3. Consolidated Picking.** Order fulfillment may cause a given destination to receive multiple packages that are sent in more than one shipment wasting time and shipping charges. By consolidated picking, orders can be sent in fewer packages and/or less shipments. This will minimize time, effort and materials needed in packing, as well as the cost associated with shipping and tracking multiple packages.
- 4. “Golden Zone” Picking.** Golden Zone picking is storing popular items in a location that is easily accessible to the picker. The golden zone is at, or near, waist level. It is the most comfortable and least stressful location for repetitive motion working. Goods that are less popular or light weight can be stored where reaching or stretching is involved.
- 5. Computer Control.** Computer control systems have been successfully used to help manage inventory as it relates to picking. The most widely known computerized picking system is called the Pick-to-Light system (see next section).

PICK-TO-LIGHT SYSTEMS

Although widely discussed in industry forums, Pick-to-Light can still be a confusing topic. Many people sense that the concept may be helpful to their operation, but are hesitant to investigate the technology. They are intimidated by the multitude of equipment options or are not sure how it can apply to their situation. This section is intended to describe Pick-to-Light in simple terms and offer suggestions for applying and implementing the technology.

Pick-to-Light (P-T-L) is a series of lights or displays, mounted at picking locations that are used to direct order picking. P-T-L lights and displays can be mounted on shelving, flow rack, pallet rack, coolers, carousels – any stable stand

or mounting surface. The lights are controlled by computerized software that is configured to meet the needs of a particular picking operation regardless of volume, the type of goods picked, or the number of pickers. In most cases, a PC will operate any P-T-L system efficiently.

There is no limit to the number of lights for a P-T-L installation. There are systems in existence with as few as 50 lights and as many as 10,000. Light and display combinations can be of different styles depending on the given application in each area of operation.

I. Pick-to-Light Benefits

Pick-to-Light has the capability to greatly improve picking productivity and accuracy, especially for systems that run at high rates. In addition, some of the benefits of P-T-L include:

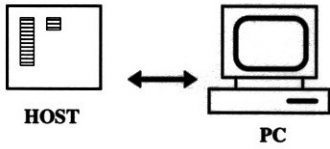
- Paperless order picking. No printed pick lists or pull tickets.
- Eliminates the time and effort wasted on “looking around.”
- Workers can pick hands free.
- Allows computer-controlled picking.
- Can be applied to replenishment.
- Improved pick productivity and accuracy.

II. Pick-to-Light Components & Operation

A Pick-to-Light system is available to meet the needs of virtually any picking function, regardless of complexity or application. As these systems continue to proliferate, more features become available. Examples of typical Pick-to-Light system components, and the way they operate, are shown in the diagram on the following page. Check with a reputable vendor to determine what is currently offered and how it may be applied to your particular situation.



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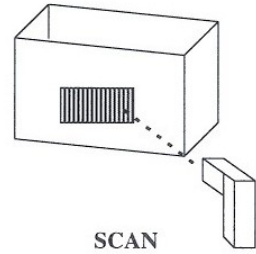


OPERATING SOFTWARE

Software, operating in a PC, directs the Pick-to-Light displays based on the order(s) being picked. The software can be linked to an inventory control system host or can be activated via keyboard.

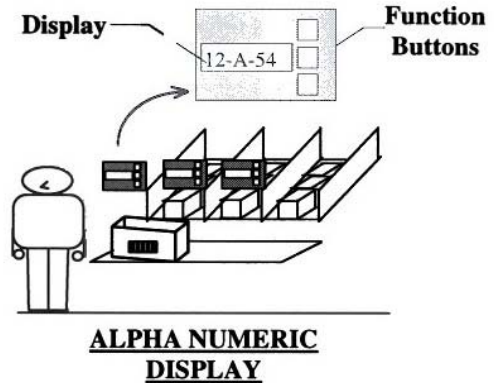
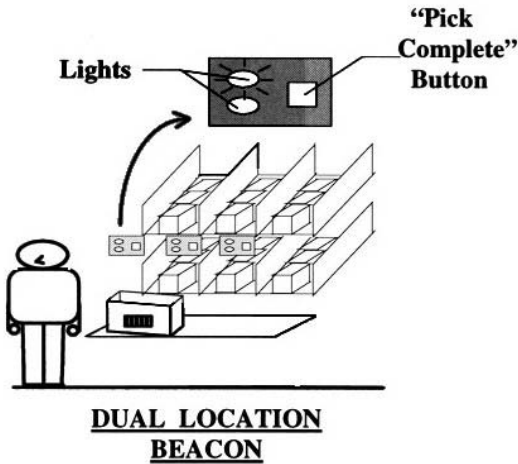
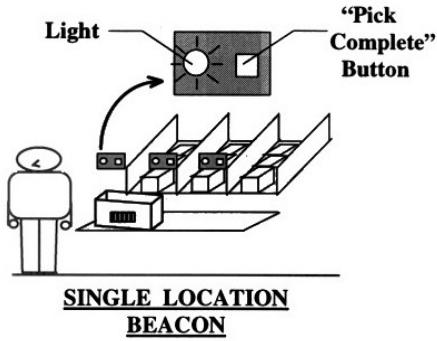
SYSTEM PROMPT

A prompt, typically a bar code scanned at the pick location, is used to identify the order to be picked.



DISPLAY ACTIVATION

The software interprets the scanned code and activates a display that directs the picking activity for that order. The display can take a number of forms, depending on the needs of the picking system.



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III. Pick-to-Light Applications

Pick-to-Light can be applied in several ways depending on the needs of the individual picking operation. While there can be many variations, some of the more common applications are described in the chart below.

APPLICATION	PRODUCT TYPES	PICK-to-LIGHT DISPLAY TYPE
1. <i>Pick Modules</i> (Case Flow Rack, Pallet, or a Combination)	Wave or batch picked products with fixed or variable locations.	A single light module for loose items at dedicated locations. If variable locations, products are placed in pre-determined slots.
2. <i>Pallet</i> (Full Pallets or Gaylords)	Cases or bulk piece items. Large order quantities of fast movers or case order only items.	A single light module for loose items at dedicated locations.
3. <i>Shelving</i>	Broken case or slow movers. Low-volume SKUs. Orders with high product mix found at dedicated locations.	A single light module for loose items at dedicated locations.
4. <i>Case Flow Rack</i>	High-to-medium volume broken case picking. Low volume full-case picking.	A single light module for items at dedicated locations.
5. <i>Carousels</i> (Horizontal or Vertical)	Medium to slow moving items at high volume.	A light tree is located on the pick face, one display per shelf. Display lights as products are brought forward by the carousel.

IV. Pick-to-Light Selection Criteria

Pick-to-Light systems can greatly improve a picking operation, but represent a sizeable investment in time and capital. When determining if a P-T-L System is right for your warehouse, consider the following selection criteria:

1. **Project Scope.** Examine each potential application and what you hope to gain by applying the technology, whether that is reduced labor, higher productivity, or some other benefit. Determine whether the system is site or application specific and if it is cost justified. Also determine whether P-T-L is appropriate versus other available technologies.
2. **Implementation Candidates.** Some likely areas where Pick-to-Light can be considered are as follows:

- Medium/high velocity, low-cost items.
- Low-volume, high-cost items.
- Cyclical or seasonal peaks.
- Minimized training in a high-turnover environment.

3. **Preliminary Steps.** Once the requirements and objectives are clear, it is time to select vendors for pre-qualification. Make sure that you are comfortable with their capabilities and ethics. Award the work to the one that you feel will give you the best value - not just the lowest price. A system that does not work as intended is no bargain, no matter how attractive the initial price.

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