Goods-to-Person Solutions and the Order Picking Challenge

Starting with the end in mind and choosing the right automated solution is crucial to achieving operational goals in a fulfillment center. The approach selected significantly impacts efficiency, accuracy, and overall productivity. The article discusses goods-to-operator solutions, their benefits and tradeoffs, and things to consider as you go about selecting the right fit for your business.

Discrete picking involves picking items for one order at a time. The method is straightforward and minimizes the risk of errors, as each picker focuses on a single order from start to finish. The benefit is less operational complexity, but labor intensity and costs can grow significantly with volumes and scale without the right types of automation.

As companies looked to enhance warehouse operations, many tried shifting away from discrete picking due to its challenges. According to *Inbound Logistics*, "Discrete picking is a labor-intensive and inefficient method for warehouses that deal with higher-volume or more complicated orders due to the time spent traveling between picking location."[2]

Some of the key discrete order picking challenges include the following:

1. **Labor Intensity:** Operators must walk long distances across pick faces, spending more time traveling than picking.

2. **Scalability Limits:** As order volumes grow, operations face volume choke points and diminishing efficiency, particularly during peak seasons.

3. **Cost Inefficiency**: The need for more floor space and higher variable costs due to labor operational expenses.

4. **On-Time In-Full (OTIF) - Accuracy Pressure**: Each order must be accurate, as errors lead to costly returns and diminished customer satisfaction.

5. **OTIF - Service Level Pressure**: Customer purchasing habits and expectations for faster deliveries are driving order processing windows down to two hours or less.

So, how do you get the benefit of discrete picking without driving up the complexity of a system?

Goods-to-person solutions. They optimize picking by reducing travel time and increasing picking speed. Ultimately, the choice of picking approach you use should align with your specific operational needs, order volume, and product variety to ensure that you meet your fulfillment goals effectively and efficiently. Read on to learn about tackling that.
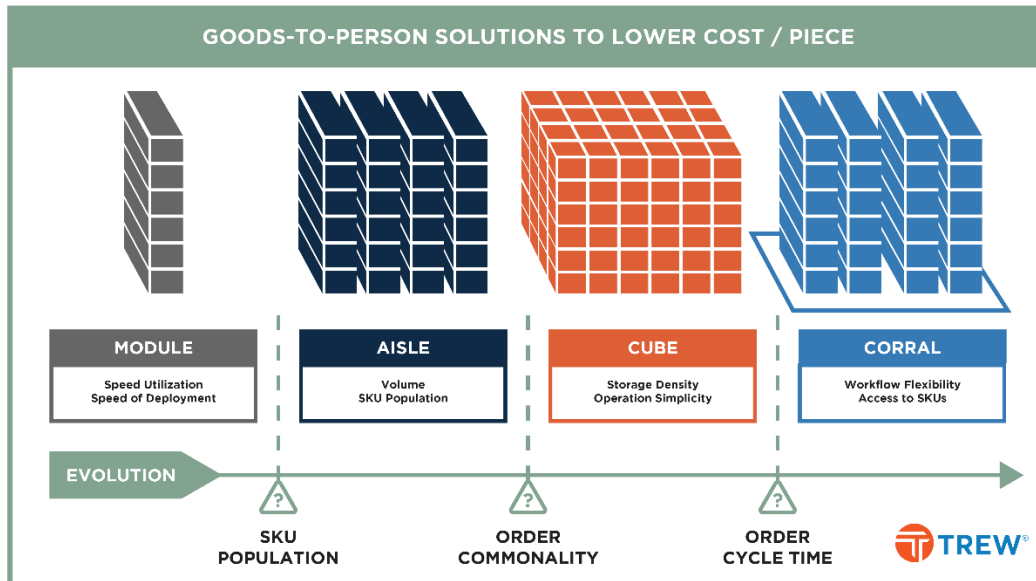
GOODS-TO-PERSON SOLUTIONS: TACKLING THE PROBLEM

To mitigate discrete order picking challenges, warehouse leaders are turning to goods-to-person (G2P) automation. These storage-dense ASRS systems bring SKUs directly to the picker, significantly reducing walking time, improving accuracy, and optimizing space.
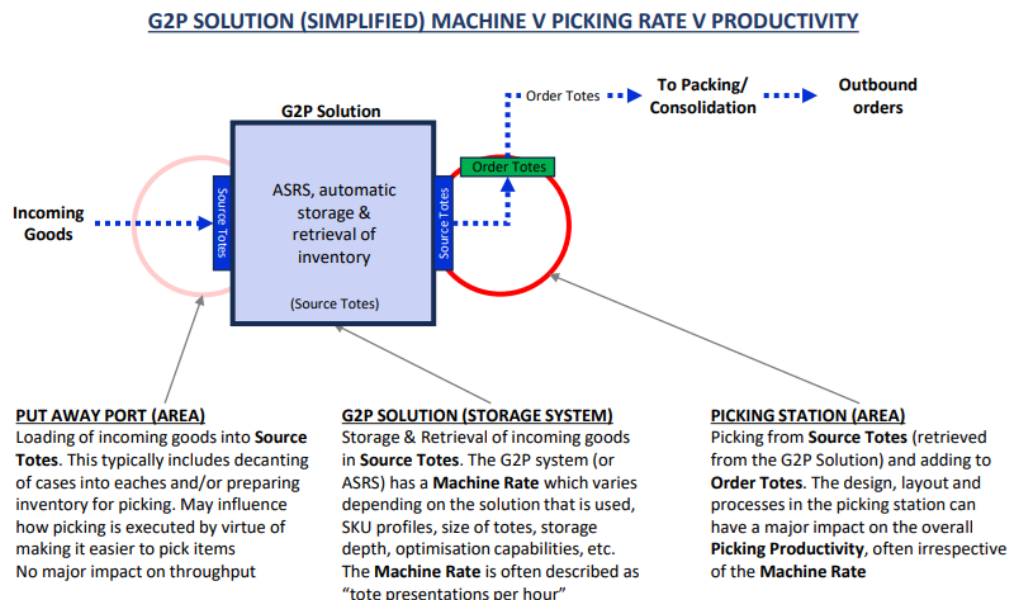
Source: STIQ | Market Report: Goods-To-Person Ecommerce Fulfilment Robotics 2024

There are four unique categories of G2P automation – module-based, aisle-based, cube-based, and corral-based. Each has their own fit within distribution / fulfillment operations. STIQ Ltd says, "Each of these [categories has] advantages and disadvantages, some are high flexible, others are cheaper whereas others are more suitable for large SKUs and some work better than specific picking strategies."[3] So, not all approaches are created equal, though they all enable lower cost per piece.

GOODS-TO-PERSON SOLUTIONS TO LOWER COST / PIECE

MODULE	AISLE	CUBE	CORRAL
Speed Utilization Speed of Deployment	Volume SKU Population	Storage Density Operation Simplicity	Workflow Flexibility Access to SKUs

EVOLUTION →

SKU POPULATION   ORDER COMMONALITY   ORDER CYCLE TIME

Goods-to-Person Module Types

Module-Based

The "Module" G2P is a self-contained subsystem. Multiple modules can be connected via conveyor to pass the orders to the modules where the SKU resides. Module-based systems offer a great replacement for low velocity pick modules.

Key Features:

- o **Design**: Operates within a single aisle using a robotic shuttle or similar with point-to-point retrieval and delivery of totes directly to a workstation.

- o **Throughput**: Dedicated robots enable fast and efficient tote retrieval and delivery, achieving moderate throughput rates.
- o **Energy Efficiency:** The robots operate without complex lifting mechanisms, reducing energy consumption compared to multi-aisle systems.

Advantages:

- o **Deployment:** Being a self-contained system**,** a single module can be quickly deployed and integrated into an existing operation.

- o **Space Utilization:** Saves valuable space compared to traditional pick modules.

- **Maintenance**: With fewer moving parts and less complex conveyor, a module-based system has lower maintenance requirements.

Fit:

- **Brownfield:** Existing operations needing to introduce picking efficiencies with minimal space.

- **Low Velocity SKUs:** Operations with small to moderate C & D SKU populations.

- **Kitting:** Operations that are building kits.

- **Mid-Sized Warehouses**: An ideal solution for operations with medium order volumes that need high throughput but cannot justify the cost of more complex automation systems.

Aisle-Based

The "Aisle" based G2P consists of shuttles operating in designated aisles and levels within each aisle to retrieve totes or cartons from shelving. The shuttles move horizontally, bringing loads to the end of an aisle where a lift is used to bring them to a conveyor system which transports them to workstations.

Aisle-based systems offer higher order volumes, and larger SKU populations over that of a module.

Key Features:

- **Design**: Multi-aisle configuration with integrated lifts at the front of every aisle.

- **Integrated Lifts**: Vertical lifts move totes or cartons from the levels of each aisle to the conveyor system.

- **Conveyor**: A conveyor subsystem is used to collect totes from the lifts and move them to the workstation in the appropriate sequence that matches up with the orders being processed.

Advantages:

- **Throughput:** High throughput due to simultaneous operations across devices.

- **SKU Diversity:** Suitable for large SKU populations and diverse SKU characteristics.

- **Configurable**: While typically more justifiable at taller heights, shuttle systems can be configured for varying warehouse layouts.

- **Space Utilization**: These systems are capable of heights well above 40' thus providing dense storage in a smaller comparable footprint.

Fit:

- **High Volumes:** Operations with very high order volumes.

- **Large SKU Populations:** Operations with a very large SKU set.

Cube-Based

The "Cube" based G2P consists of a dense grid of stacked bins with robots that predominantly move on top of the grid and extend mechanisms from the robot to acquire a tote from the stack. The G2P workstations (ports) are located within the perimeter of the grid structure.

Cube based systems bring about an operational simplicity achieved by eliminating the complex conveyor of the aisle-based solutions with the capability of every bot being able to pick for orders at any port.

Key Features:

- o **Design**: A grid-based storage system.

- o **Stacked Bins**: Bins containing product are stacked on top of each other in columns.

- o **Pick Ports**: G2P workstations, commonly referred to as "ports" are located within the outer edge of the grid structure. Bins are sequenced down shafts and onto short conveyor beds feeding the ports.

Advantages:

- o **Storage Density:** With totes being stacked on top of each other, this solution provides very dense storage even though typically limited to approximately 20' in total system height.

- o **Expandability:** Cube systems are easily expanded to accommodate volume and SKU growth.

- o **Configurable**: While referred to as a "cube" the grid structures are not limited to a square. This allows them to be designed around facility structures and yet optimize the system.

Fit:

- o **Order Volumes:** Operations with moderate to high order volumes.

- o **SKU Populations:** Operations with moderate SKU populations or smaller products where multiple SKUs can be kept within the same compartmentalized bin.

Corral-Based

The "Corral" based system is typically aisles with bins stored 1 to 3 positions deep. The robot can either be one that climbs the racks to access the bins, or it can be an AMR with a mast capable of inserting/extracting bins and then carrying them on its mast. The corral-based solutions take the principles of the "Cube" and introduce an additional layer of flexibility and accessibility.

Key Features:

o **Decoupled Processes**: The workstations are not part of the ASRS, and they are not connected to the storage using conveyor.

o **Automation:** This is where solutions within this category can differ. Robots may do the retrievals and transporting to the workstation or they may hand off the retrieved bin to another robot for the transporting.

o **Storage**: Depending on the system, the storage gets closer to traditional racking with more typical fire suppression approaches.

Advantages:

o **Scalability**: Corral-based systems connect multiple aisles providing for nearly infinite aisle capability, allowing for scalability and higher SKU capacities.

o **Mobility:** Using robots to decouple the storage/retrieval from the bin transportation allows the system more flexibility to manage flows to workstations and reduce congestion.

o **Accessibility**: Other than having 2 or 3 bins deep storage, these systems offer accessibility by any robot to retrieve any tote for any workstation.

o **Redundancy**: Ensures high system uptime, as multiple robots can operate simultaneously within a single aisle or across multiple aisles.

FINDING THE RIGHT SOLUTION

As automation technologies continue to evolve, choosing the right solution requires careful consideration of order profiles, SKU velocity, and scalability needs. Then it comes down to minimizing the operational sensitivities of the approach and striking a balance between cost, performance, and futureproofing.

G2P Type	Storage Density	Throughput	Scalability	SKU Population
Module	Med	Med	Med	Low to Med
Aisle	High	Very High	Med	Very High
Cube	High	High	High	High
Corral	Moderately High	High	Very High	Very High

Goods-to-Person Module Type Summary

"No one solution fits all. But the right solutions are always nimble and able to adjust to changes in SKUs, order profiles, customers, and operations,"[1] says MMH. Evaluate a few key factors if you are looking for the right solution for your operations.

1. Understand your needs
2. Scalability
3. Flexibility
4. Cost versus performance

Ready for Goods-to-Person Discrete Picking?

Discrete order picking remains one of the most challenging warehouse processes, but advancements in G2P solutions are reshaping the landscape. All four categories of G2P (module, aisle, cube, and corral) offer compelling options for warehouses looking to reduce labor costs, improve accuracy, and increase throughput. Consider these solutions from OPEX.[4]

OPEX® Perfect Pick®

Perfect Pick® is a module-based solution that is designed to simplify order fulfillment operations with increased, throughput, reliability, and cost-effectiveness. Its configurability allows customizations based on specific warehouse operation needs varying from space, warehouse layouts, and order volumes. Wireless and self-charging iBOTs navigate the system to find, retrieve, and deliver totes to an operator working at a pick station. Totes are available in different sizes and can be subdivided or designed to hold cartons and boxes or switched out for trays.

Image Courtesy of OPEX – Perfect Pick

Single Aisle Attributes	Perfect Pick®	Perfect Pick HD®
Length (ft)	19.4 to 204.9	
Height (ft)	14.5 ft to 32.5	
Width (ft)	9	14
iBOTs	Up to 30	
iBOT Payload (lbs)	80	
Storage Locations*	6,114	12,228
Tote Cell Configuration	Up to 24 per Tote	
Storage (ft³)	15,019	30,038
Storage (ft²)	1,968	2,869
* based on 8" tote		

OPEX® Infinity®

Infinity® is a cube-based solution (cASRS) that is engineered for flexibility and scalability in throughput and storage. Designed to simplify order fulfilment automation, the Infinity® allows warehouse operations to run at peak performance. iBOTs self-charge as they travel through Infinity's racking structure, so you don't need to worry about charging batteries or removing them from the system to recharge. The racking structure can be built based on the needs of your operation and facility, where parts of the system can be different heights, and columns and poles can be worked around while accommodating fire suppression systems. Its totes can be divided into smaller cells and are available in different heights for various SKUs. The totes are interlocking and stored triple-deep to make the most of a compact space.
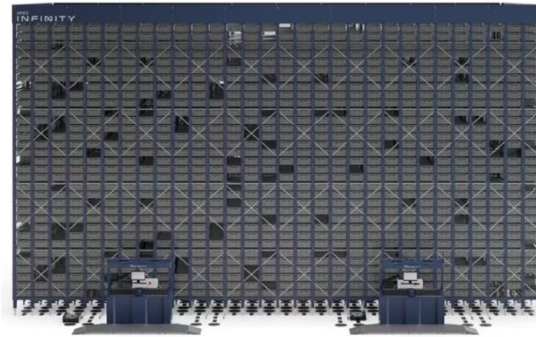

Image Courtesy of OPEX – Infinity

Attributes	Infinity®
Storage Height (ft)	9 - 32.5, High Seismic Area Supported
Presentation Ports	Decoupled Single or Double Ports
Storage Density	Triple or Double Deep
iBOT Payload (lbs)	90
Tote Dimensions (in : w x l x h)	20 x 30 x h h = 8, 10, 12, 14
Tote Cell Configuration	Up to 24 per Tote
Workstations	Automated, Manual, Pick-to-Cart

Learn More About OPEX®

Want Batch Picking as an Alternate?

While discrete order picking is ideal for some operations, introducing batch picking with put walls is a great way to gain efficiency. This is an operation where SKUs are batch picked and transported to an order consolidation area where an operator puts individual items to a multi-line order.

How To Get Started?

Are you ready to start your automation journey and wonder how to get started and what might fit your operation?

Reach out to a qualified automation provider that can assess your operation, evaluate your current mechanization, and deliver performance improvement with data driven solutions that produce results.

References

1. Sweeney, S. | An Insight Look at Picking Technologies | Modern Materials Handling

2. Inbound Logistics | Order Picking | Inbound Logistics

3. Andersson, T. (2024). *Market Report: Goods-to-Person Ecommerce Fulfilment Robotics 2024.* [STIQ Ltd]. https://www.styleintelligence.com/a/downloads/-/71423cd1475fdd07/4a338a39d0e8c6e5

4. OPEX - learn more at https://www.opex.com

About TREW

TREW provides automated material handling solutions for integrators and end users, including Warehouse Execution Systems (WES), Warehouse Control Systems (WCS), PLC- and server-based machine controls, motorized driven roller (MDR) conveyor and services such as concepting, engineering, technical support, parts, field service and training. Serving the North American retail, warehouse, distribution, manufacturing and ecommerce industries, TREW's experienced staff and broad network of integrator partners enable uncommonly smart solutions scalable to any material handling needs.