#### PRIME robotics

Comparing Goods-to-Person and Person-to-Goods Autonomous Mobile Robots:

#### Which Type Works Best for Your Warehouse Application?

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#### Introduction

Autonomous mobile robots (AMRs) have become one of the leading warehouse automation investments. Statistics value the global AMR market at \$2.97 billion in 2022, with projections for a compound annual growth rate (CAGR) of 15.5% from 2023 to 2030.

In North America, manufacturers represent the leading deployment market. However, demand has surged for AMRs in e-commerce, logistics, and retail operations. As a flexible solution that requires minimal infrastructure modifications—compared to fixed equipment like conveyors, sortation, or automated storage and retrieval systems (AS/RS)—AMRs help companies bolster order fulfillment efficiency in the face of ongoing labor shortages. They also enhance agility and responsiveness to increasing customer expectations for faster deliveries and changing business and supply chain conditions.

Two types of AMRs are most frequently deployed in distribution or fulfillment operations: Goods-to-Person and Person-to-Goods. Although they may seem similar at first, the productivity and efficiency gains are very different. Goods-to-Person AMRs bring items to associates or robotic picking arms for order fulfillment, eliminating walk and search time. Conversely, Person-to-Goods AMRs support associates as they travel through the aisles, picking needed items like a shopper in the grocery store. This whitepaper compares the two styles to help operations determine which type works best in their application.

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#### Goods-to-Person and Person-to-Goods AMRs: The Similarities

Goods-to-Person AMRs (P2G-AMRs) and Person-to-Goods AMRs (P2G-AMRs) share many of the same safety and navigational features. Both sport onboard sensors and vision systems that allow them to travel safely and autonomously throughout an operation, navigating obstacles and avoiding collisions with their human colleagues.

Further, both integrate with overarching warehouse execution systems (WES) that assigns them tasks and directs their routing to specific destinations throughout their assignments along the shortest, most direct path. This enables both types of AMRs to significantly reduce the amount of time workers spend traveling to pick orders, an activity that can account for as much as 70% of an operation's labor costs. With AMRs, a previously conventional, paper-based, manual picking operation can complete more picks with fewer associates. The result is an overall increase in **picking accuracy of up to 99.9%**, a **boost in productivity** by as much as **300%**, and an **uptick in efficiency** by as much as **65%**.

Additionally, both G2P-AMRs and P2G-AMRs are flexible, scalable solutions. A small fleet can be easily expanded as needed with the induction of additional robots to accommodate peak volumes or seasonal spikes. Facilitating this flexibility, many suppliers offer leasing options as an alternative to a capital expenditure. These pricing structures further enhance the ability to use a base fleet of AMRs, and then add (or subtract) others on-demand.



The most significant differences between the two types of AMRs are in how they support picking applications and their overall load capacity.

#### Goods-to-Person AMRs Eliminate Associate Travel

As their name implies, G2P-AMRs transport goods to workers for picking. Instead of traveling up and down the aisles within a warehouse or distribution center looking for and selecting stock keeping units (SKUs) in either discrete or batch picking, associates remain in a static location. The AMR brings the required items to them for order fulfillment, improving productivity as much as six times over conventional picking methods. In some applications struggling to retain sufficient staffing, utilizing G2P-AMRs **reduced reliance on manual labor** by up to **50%**.

G2P-AMRs also support goods-to-robot picking applications, wherein a robotic picking arm (instead of an associate) selects the necessary items from the presented pallet or tote. Through sophisticated order management software, only orders that contain items whose dimensions and weight can be handled by the robotic arm route to those workstations. Other orders are handled by associates at different workstations. Implementing robotic picking arms in these situations can increase productivity by up to three times when compared to manual methodologies.

Depending on the application and other types of automated systems deployed within the operation, G2P-AMRs might transport:



Individual totes of products, often retrieved from an AS/RS, delivered to workstations for each picking;



Full pallet loads from the warehouse floor or AS/RS for case picks; or



Multi-tiered shelving units with different SKUs per level for case or each picking



G2P-AMRs effectively eliminate the need to walk and search for items stored on shelves.

Regardless of what they're moving, a fleet of G2P-AMRs effectively eliminates the need to walk and search for items stored on shelves. The robots bring their payloads to pick stations, work cells, or consolidation pods in a sequenced flow—allowing for efficient order picking, as the right items arrive at the right time.

These areas are frequently equipped with graphical displays or light-directed put walls indicating unique orders. To ensure **exceptionally high accuracy** in **excess of 99%**, the displays integrated at the order fulfillment station indicate how many of each unit the associate should pick to fill a specific order.

Upon completion of the pick, the robot transports the source tote, pallet, or shelf to the next location in need of that SKU. If no other workstations require that item, the G2P-AMR returns it to its designated highdensity storage location. Additionally, G2P-AMRs can be programmed to transport completed pallets or orders to the next process, including delivering them to stretch wrappers, packing stations, and outbound staging areas. In general, most G2P-AMRs feature heavier-duty, more robust construction that enables them to transport larger payloads particularly those that handle shelving or pallet loads. Their low-profile design frequently incorporates an integrated lifting mechanism. These characteristics allow them to lift and transport payloads in excess of two tons.

G2P-AMRs also support higher-density storage utilization. Whether they interface with a zone of tightly packed storage shelves or pallets or retrieve totes or pallets from an AS/RS, the robots travel in areas whose compressed layouts do not need to accommodate personnel. No aisles are required for workers with forklifts or pallet jacks to navigate through.

This can increase a facility's **space efficiency by an average** of 20%. Capable of working around the clock, G2P-AMRs can also be deployed to support different inventory handling processes within an operation. They can assist with receiving, putaway, forward-pick replenishment, staging, buffering, and consolidation of orders combining oversized items with smaller eaches.

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### Person-to-Goods AMRs Travel Alongside and Between Pickers

Also known as collaborative AMRs or cobots, P2G-AMRs could be called picking sherpas. That is, they carry picks made by associates stationed in designated zones or aisles.

P2G-AMRs travel from one picking zone to the next, accepting SKUs selected by associates, then transport those items to a consolidation or packing station. They often replace manually operated pallet jacks or picking carts. Because associates remain in the pick aisles while the robots handle the transport portion of the process, some of the travel time associated with conventional picking methodologies is reduced. Further, although deploying P2G-AMRs to facilitate order selection reduces time spent reviewing paper pick lists, it still requires continuous interaction between robots and associates—impacting overall time savings.

Some P2G-AMRs incorporate a graphical display showing what item is required and in what quantity. These robots may lead the associate to the pick location, significantly reducing search and travel time within the aisles. Others simply follow the picker along their travel path, collecting picks in a bin or on a small shelving unit, until all required items are selected. When that P2G-AMR subsequently departs, a new one takes its place.

Because they work alongside—and interact with—their human colleagues, P2G-AMRs are often more compact and lighter weight than G2P-AMRs. They generally carry much lighter payloads as well. P2G-AMRs also frequently incorporate a human-machine interface (HMI) that enables two-way communication between the robot and the picker, either via touchscreen or verbal commands. To implement them requires minimal modifications to an existing operation's layout or processes.

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## Summary

While both offer flexibility and scalability advantages over fixed automated solutions—and improve picking efficiency by reducing travel while enhancing order fulfillment accuracy—G2P-AMRs and P2G-AMRs are ideally suited for different applications.

P2G-AMRs are a good fit for operations seeking to transition away from conventional, paper-based picking but don't want to invest either time or capital in significant process changes or automated equipment. Implementing a fleet of these robots can allow the same number of picks to be completed by fewer associates, partially (but not completely) addressing labor challenges, as pickers are still necessary. However, they do not enhance storage density, nor do they completely eliminate travel and the associated time required for order fulfillment.

Conversely, G2P-AMRs significantly reduce labor requirements by eliminating the need for associates to travel to picks. By delivering the required SKUs to pickers stationed in designated order fulfillment areas, far fewer employees can fill the same (or more) number of orders significantly faster than conventional picking. Additionally, G2P-AMRs support greater storage efficiency through more effective use of floorspace with more densely packed shelving or pallets, or by enhancing an AS/RS solution.

Perhaps that's why G2P-AMRs led the autonomous mobile **robot technology market in investments** in 2022, representing **more than 48% of global share**.

To discover how G2P-AMRs can improve your operational productivity, efficiency, accuracy, and storage density while reducing your labor dependence, connect with Prime Robotics. Visit <u>primerobotics.com</u> or email <u>info@primerobotics.com</u> to speak with one of our warehousing and distribution efficiency experts.



#### About Prime Robotics

Prime Robotics is a global provider of intelligent endto-end automation solutions and autonomous mobile robots for the warehouse, distribution, e-commerce, and material handling industries. Prime's proven suite of robotic hardware and software solutions is designed and tailored to optimize the fulfillment ecosystem—providing greater efficiency, scalability, accuracy, and cost savings. Prime Robotics manufactures and supports its products from its headquarters in Denver, Colorado.

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