How to Maximize Order Picking Efficiency

with Autonomous Mobile Picking

White Paper

BRIGHTPICK

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Executive Summary

Ecommerce has fundamentally transformed supply chain operations for retailers and grocers. Order picking has become one of the largest operating costs for online retailers, accounting for up to 50% of total warehouse costs. In addition, persistent labor shortages and high staff turnover add further strain to operations.

To mitigate these challenges, ecommerce retailers and 3PLs are increasingly turning to automation. Automation reduces labor needs and operating costs and provides other benefits such as reducing picking errors and increasing storage density. One type of automation becoming increasingly popular involves using autonomous mobile robots (AMRs) to transport goods around the warehouse.

The main AMR-based systems for order picking on the market today are directed picking, Goods-to-Person and Goods-to-Robot. More recently, autonomous mobile picking has emerged as a new commercially-viable solution. This white paper evaluates the relative efficiency of these systems by comparing how many human pickers and robots each system needs to achieve a throughput of 1,000 picks per hour.

Autonomous mobile picking is the clear winner, delivering the highest labor savings using the fewest number of robots. As warehouses look to cut picking costs and reduce labor needs, autonomous mobile picking will offer the highest ROI and lowest cost of any solution.

Efficiency of Existing Mobile Robot Picking Systems

There are three types of mobile robot picking systems on the market today: **directed picking**, **Goods-to-Person** and **Goods-to-Robot**.

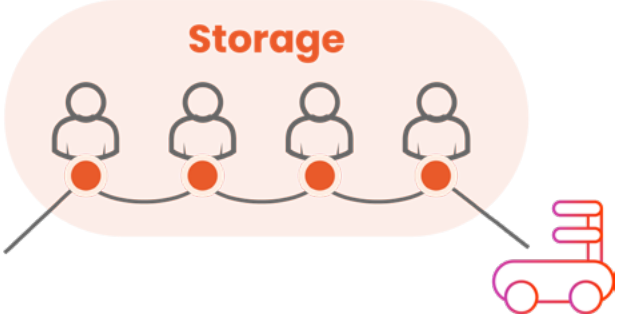
Directed Picking

In directed picking, humans remove items directly from the shelves and place them onto AMRs. The AMRs move around the warehouse from one pick location to the next until the order is fully picked. As a result, human pickers only need to concentrate on one warehouse zone (e.g. 1-2 aisles), which reduces foot travel and increases their productivity.

With the help of directed picking AMRs, human pickers typically achieve pick rates in the 100-150 picks per hour range[1]. On average one human picker requires 3.5 AMRs[1], which means each robot does 29-43 picks per hour (PPH).

The biggest drawback of directed picking systems is their high reliance on human pickers, who still walk from one shelf to another to retrieve and pick items. As such, directed picking delivers fewer labor savings than other systems, which hurts the overall ROI. In addition, directed picking AMRs do not automate putaway, and therefore require even more labor.

Assuming an average pick rate of 130 PPH per person and 37 PPH per AMR, a warehouse using directed picking AMRs would need 8 human pickers and 27 AMRs to achieve a throughput of 1,000 PPH.



Labor savings: **54%**[2]

Picks per AMR: **29-43 PPH**

[1]The ratio of humans-to-robots can vary based on the warehouse layout, size and throughput needs.
[2]Picking labor only; compared to a manual operation with 60 PPH per human picker.

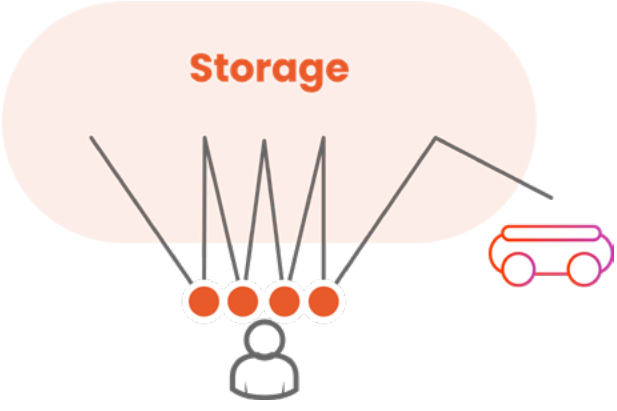
Goods-to-Person (G2P)

Goods-to-Person systems use AMRs to retrieve totes or racks from storage and transport them to centralized picking stations, where human pickers pick the items from the totes or racks. After all the items for the order are picked, the AMRs return the remaining items back into storage.

Such systems eliminate human foot travel entirely by using AMRs to retrieve and transport all the items from storage. This increases pick rates per person to 150-400 PPH (theoretical pick rates can be higher but in practice there is idle time between AMRs arriving at the picking station). Typically there are 8-12 AMRs per picking station in a Goods-to-Person system.

Goods-to-Person AMRs are less productive than directed picking AMRs because they need to travel back and forth to a centralized picking station for each pick. This significantly increases travel distances, lengthens cycle times and reduces throughput per robot. As a result, AMRs in Goods-to-Person systems typically achieve 18-30 picks per hour[3]. This means Goods-to-Person systems require more AMRs, which increases costs, slows down the picking process and causes congestion in the warehouse during peak hours.

Assuming an average pick rate of 250 PPH per person and 25 PPH per AMR, a warehouse using a Goods-to-Person system would need 4 human pickers and 40 AMRs to achieve a throughput of 1,000 picks per hour.



Labor savings: **76%**[4]

Picks per AMR: **18-30 PPH**

[3] Assuming 1.5 picks per order line.

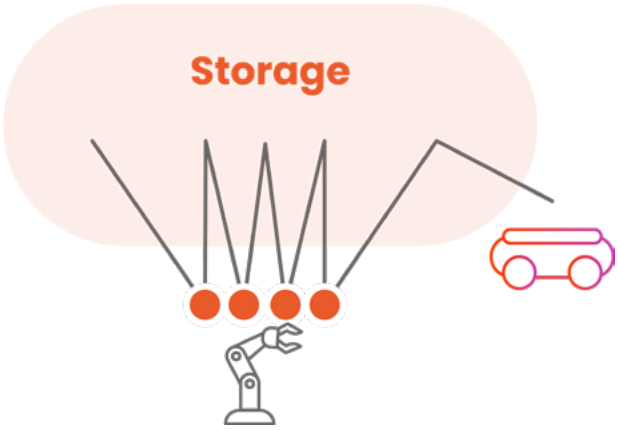
[4] Picking labor only; compared to a manual operation with 60 PPH per human picker.

Goods-to-Robot (G2R)

Goods-to-Robot systems are similar to Goods-to-Person, except the human picker is replaced by a robotic picker in the centralized picking stations. Recent advancements in machine vision and AI have broadened the range of robotically pickable items to include a large range of ecommerce and grocery items. This reduces human picking needs to zero (assuming all items are robotically pickable).

The issue is that, like in G2P systems, Goods-to-Robot systems require AMRs to travel back and forth between each pick, which negatively affects throughput and speed.

Assuming an average pick rate of 250 PPH per robotic picker and 25 PPH per AMR, a warehouse using a Goods-to-Robot system would need 4 robotic pickers and 40 AMRs to achieve a throughput of 1,000 picks per hour.

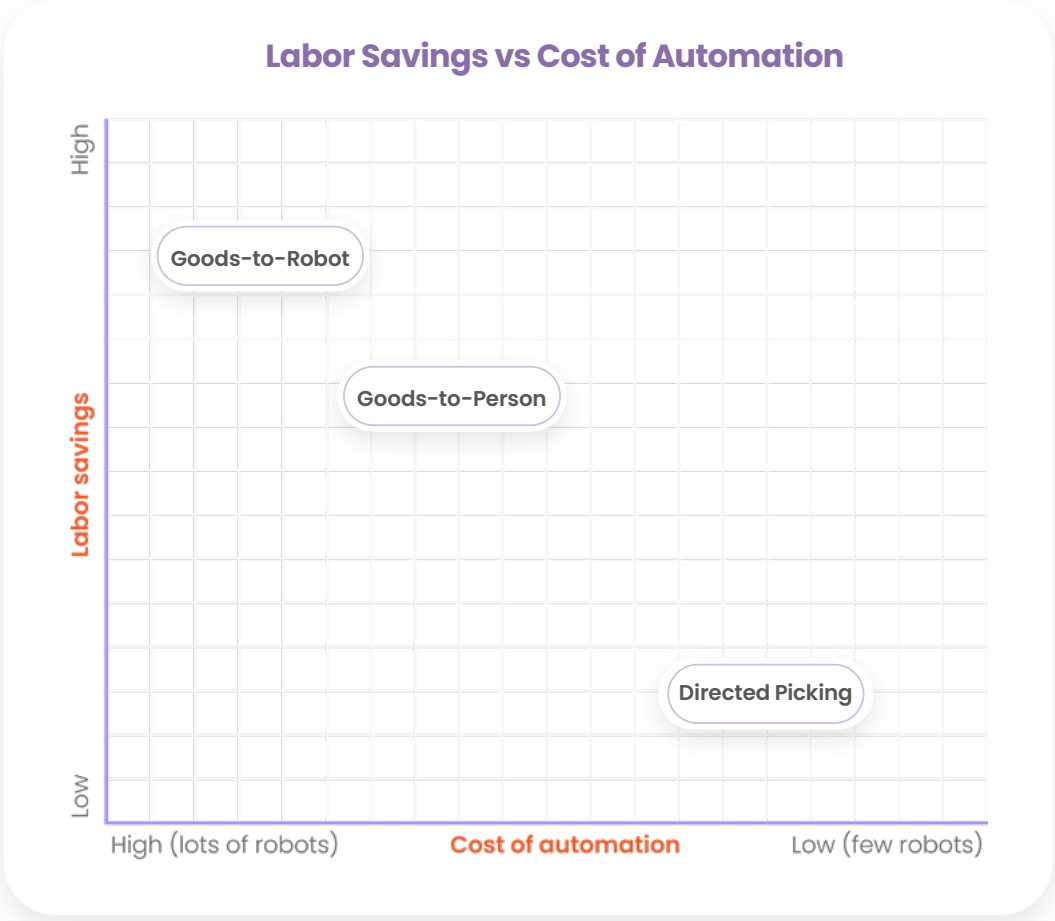


Labor savings: **100%**[5]

Picks per AMR: **18-30 PPH**

[5] Assuming all items are robotically pickable.

Existing mobile robot picking systems that use fewer humans typically require more robots and vice versa. Directed picking systems deliver fewer labor savings than G2P/G2R, however they use fewer robots which lowers their cost. On the other hand, G2P/G2R systems deliver high labor savings but require more robots and hence have a higher cost.



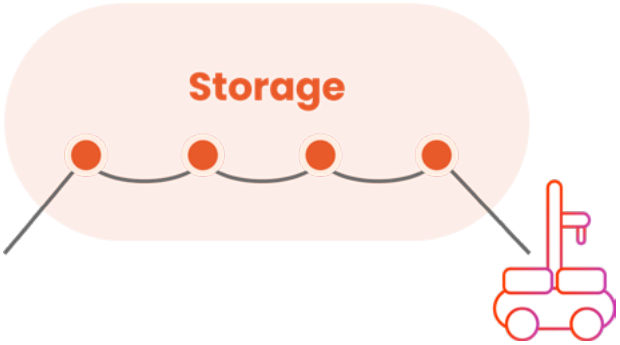
Which mobile robot picking system is more efficient and cost-effective comes down to the relative cost of human labor versus robots. For example, greater labor savings may justify more expensive G2P/G2R systems in high-wage countries; on the other hand, directed picking systems, which require more people but use fewer AMRs, may achieve a better ROI in low-wage countries[6].

[6] There are many other benefits to automation outside of cost savings and labor reduction, including higher picking accuracy, improved work conditions and lower staff turnover.

Why Autonomous Mobile Picking Delivers the Highest Efficiency

Autonomous mobile picking involves robots autonomously moving around the warehouse and robotically picking and consolidating items directly inside the aisles. Much like a human with a cart, these robots move around the warehouse and consolidate orders by picking items directly.

Autonomous mobile picking systems offer the greatest throughput using the least labor and fewest robots. In contrast to G2P/G2R systems, autonomous mobile picking robots pick directly inside the aisles and do not travel back and forth to centralized picking stations. Because they robotically pick the items themselves, they also do not rely on human pickers inside the aisles, unlike in directed picking systems. As a result, autonomous mobile picking robots typically achieve 30-60 PPH per AMR, higher than any other system, while completely eliminating labor.

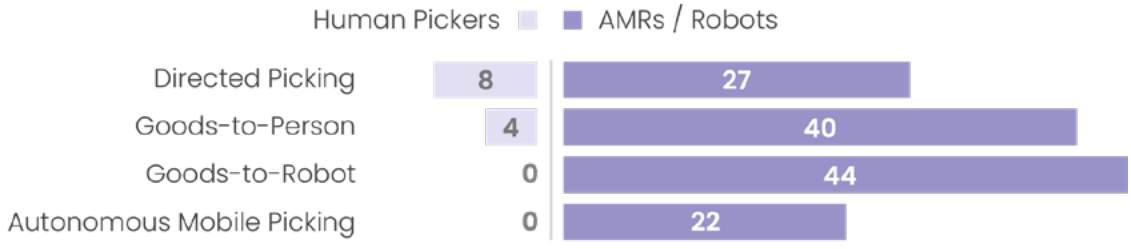


Labor savings: **100%**[7]

Picks per AMR: **30-60 PPH**

Assuming an average pick rate of 45 PPH per robot, a warehouse using autonomous mobile picking robots would need just 22 AMRs and no human pickers to do 1,000 picks per hour.

Human pickers and robots needed to do 1,000 picks per hour[8]



[7] Assuming all items are robotically pickable.
[8] Based on average pick rates.

There are numerous benefits to autonomous mobile picking robots compared to other mobile robot technologies, including:

- Lower costs and higher ROI as fewer robots are needed
- Higher throughput as robots do not need to constantly travel back and forth between each pick
- Less congestion as there are fewer robots traveling around the warehouse
- Higher labor savings as both travel and picking are automated
- Higher picking accuracy as robotic picking eliminates human picking errors

Inadequate Autonomous Mobile Picking Solutions of the Past

If autonomous mobile picking robots are so efficient, why haven't they become more widespread?

A few companies attempted to develop early prototypes, yet none succeeded in delivering one to market. They proved to be too inaccurate, bulky, expensive, and drastically slowed down replenishment. The issue was they tried to pick items directly from shelves, meaning items had to be perfectly organized on the shelf to be robotically pickable. Any misalignment would lead to items tumbling off the shelf, resulting in high error rates and poor reliability. Meanwhile, the need to meticulously place each item on the shelf resulted in low storage density and a highly manual and slow replenishment process. These limitations meant that, until now, autonomous mobile picking has not been a viable solution for warehouses.

Autonomous Mobile Picking Robots That Work

Brightpick Autopicker is the world's first commercially-available autonomous mobile picking robot for ecommerce and grocery order fulfillment. It is the only warehouse robot capable of both picking and consolidating orders in the aisles. Brightpick Autopicker is like a human with a cart, autonomously picking and consolidating orders as it moves through the warehouse aisles.

Brightpick Autopicker can reliably pick groceries, cosmetics, personal care products, electronics, pharmaceuticals, apparel and more with 99.9% accuracy. It is fully patented and powered by proprietary machine vision and AI technology. Its advanced AI algorithms have been trained on more than 250 million picks to date and use machine learning to improve with each pick.

Conclusion

It is clear that companies selling online can benefit from automating their order picking. Autonomous mobile picking delivers the highest labor savings with the fewest number of robots. As warehouses look to cut picking costs and reduce labor needs, autonomous mobile picking robots will offer the highest ROI and lowest cost of any solution.

About Brightpick

Brightpick offers the world's most efficient warehouse automation solution for ecommerce and grocery order fulfillment. The company's end-to-end robotic solution autonomously picks, consolidates and dispatches orders in large, small and micro fulfillment centers. The Brightpick solution takes less than a month to deploy, enables warehouses to reduce their picking labor by 95%, and cuts costs for order fulfillment by half. Brightpick, headquartered near Cincinnati, OH, is part of Photoneo Brightpick Group, which has more than 300 employees and 5000 technology installations across the US, Europe and Asia. Photoneo Brightpick Group's customers include leading companies such as General Motors, Volkswagen and KUKA. For more information, visit **www.brightpick.ai**.