NuminaGroup

Warehouse Automation Experts

RDS™ Batchbot 2.0:

A Technical Comparison of Leading AMR-Based Order Picking Solutions

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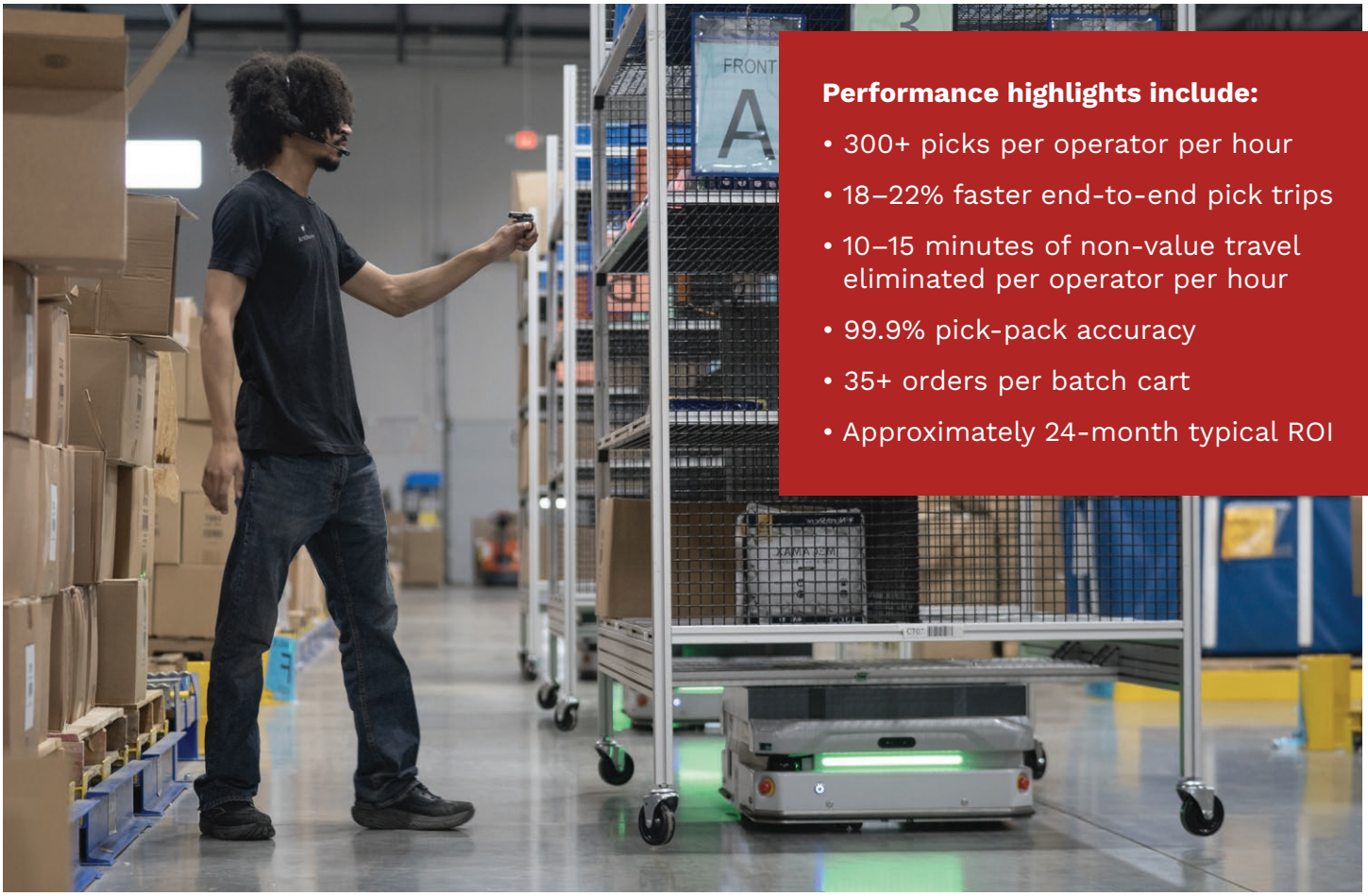


Performance highlights include:

- 300+ picks per operator per hour
- 18–22% faster end-to-end pick trips
- 10–15 minutes of non-value travel eliminated per operator per hour
- 99.9% pick-pack accuracy
- 35+ orders per batch cart
- Approximately 24-month typical ROI

RDS™ Batchbot 2.0: A Technical Comparison of Leading AMR-Based Order Picking Solutions

How Batch Density, Intelligent Operator Guidance, and WES Orchestration Change the Throughput Math in Mixed-Case and Each-Picking Operations

Prepared for senior executives, warehouse operation managers, and engineering teams evaluating an investment in AMR-based warehouse order picking for mixed-case and each-picking operations in B2B, B2C, Omnichannel and 3PL order fulfillment operations.

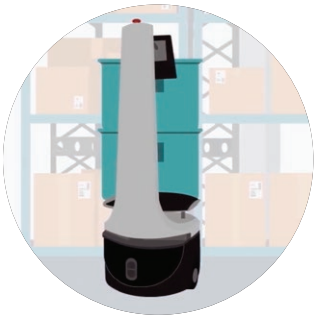
Executive Summary

Choosing an autonomous mobile robot (AMR) picking platform should be a performance-based decision, not a vendor name recognition exercise. Different warehouse operations running the same warehouse management system (WMS), with a similar labor pool and order profile, can get very different throughput outcomes depending on how orders are batch released, AMR load capacity, and the technology that guides operators efficiently through the travel and picking process. Actively orchestrating how AMRs and operators work together has a significant impact on the overall picking productivity of the solution.

This paper is written for senior executives, warehouse managers, and operations engineering teams evaluating the technical case for an AMR investment. It describes the key performance drivers in the market today, explains the specific design choices behind Numina Group's RDS™ Batchbot 2.0, and provides an evaluation framework that can be applied to any vendor under consideration.

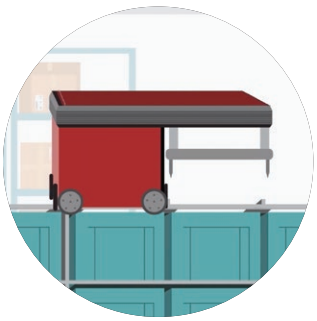
The AMR Decision: What Actually Drives Picking Performance

Most AMR picking platforms fall into one of three performance driver categories, and the category matters more to your throughput math than any single spec sheet number:

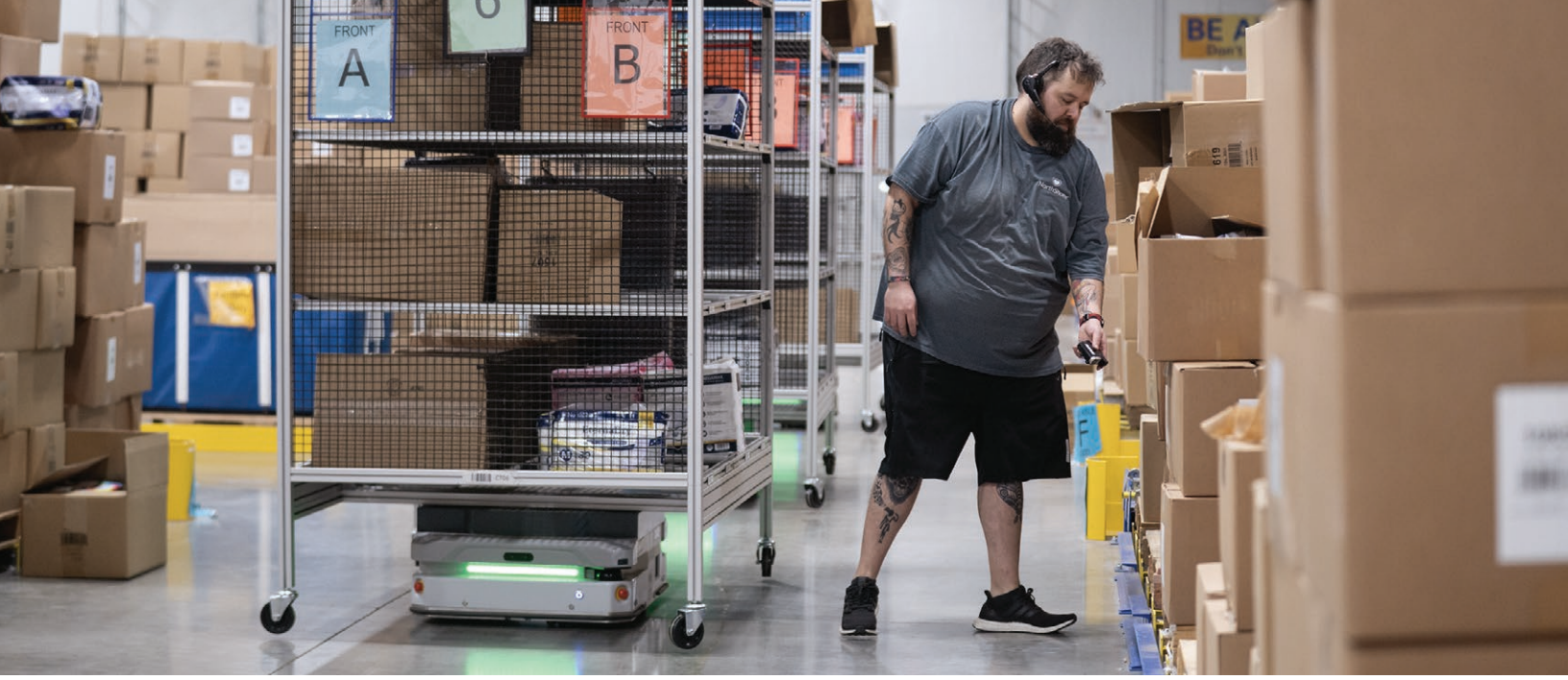


Tote-Based Person-to-Goods (PTG): PTG AMRs operate either in “Follow Me” mode where the operator travels along with the AMR from pick location to pick location, or “Stop and Wait” mode where the AMR waits at a pick location for the operator to arrive and execute the pick. Due to relatively lower load capacities (roughly 150 to 250 lbs.), each mission can handle only a limited number of active orders. PTG systems generally perform comparable to a manual pick cart with a 10- to 12-order capacity. Because they carry fewer orders per cart, they require larger AMR fleet and conduct more frequent pick trips.

Heavy-Payload PTG with Large-Capacity Batch Carts: The Numina Group RDS™ Batchbot 2.0 is an example of recent advancements in this category. The solution is built around industrial-capacity AMRs capable of carrying 1,100 to 6,600 lbs. and large-capacity, multi-order batch carts, enabling a single robot trip to serve 35-plus orders per mission versus just four to six open orders on smaller AMRs. This added efficiency leads to a reduced AMR fleet size, a smaller order-picking staff, and higher throughput rates.



Stationary Goods-to-Person (GTP): Cube storage shuttle-based GTP systems bring inventory to a fixed pick station rather than requiring operators to travel through warehouse picking zones. These systems can deliver high picking rates, but SKU velocity and inventory requirements drastically affect realized efficiency and cost. High velocity A-mover SKUs may require multiple totes within the storage infrastructure to maintain sufficient inventory at the pick stations, thereby increasing storage requirements, overall system footprint, replenishment frequency, and associated labor. For this reason, the highest-velocity SKUs may be more efficiently stored and picked outside the GTP system. By comparison, AMR-based order picking can provide greater flexibility across a wider range of SKU sizes, velocities, and storage conditions.



Numina's proprietary "Meet Me" mode combines multiple optimization parameters to satisfy Batchbot 2.0's design goal of cost effectiveness and high unit pick rates. High-capacity AMRs allow for increased order volumes per trip, and wasted operator travel time is significantly reduced by dynamically selecting operators closest to the next AMR pick stop. Using a multivariable machine-learning algorithm, the WES software continuously performs advanced order batching, and releases optimized batches of order in real time, while orchestrating operator and AMR movement to optimize overall efficiency. The sections below highlight how Batchbot 2.0 is engineered to consistently deliver higher picking productivity.

Successfully Evaluating an AMR Picking Investment

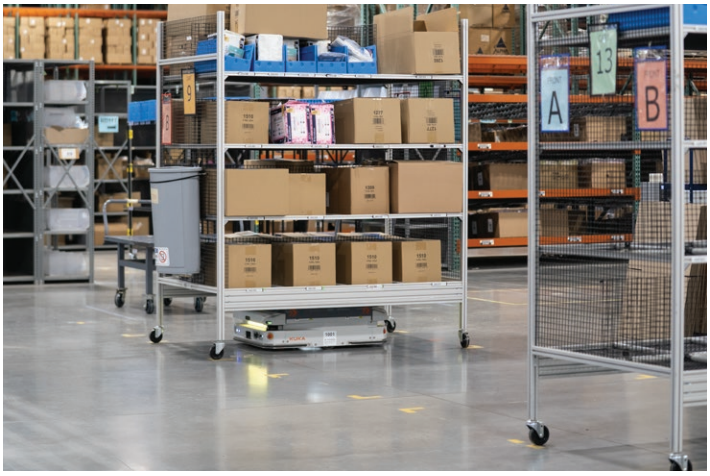
The table below outlines the leading AMR-based order picking solutions active in the market today. It utilizes figures directly published by each vendor. The table is deliberately conservative. In certain cases, vendors have only published relative productivity claims (i.e. "2x faster," "10% year-over-year gains"). In those instances, the relative claim has only been noted and not converted into an absolute metric.

Solution Type	Representative Platforms	Published Capacity	Guidance Interface	Best-Fit Profile
Lightweight PTG collaborative robots	Locus Robotics (Origin), 6 River Systems (Chuck)	Locus Vector: up to 600 lb. payload on one model. 6 River Chuck: up to 200 lb. payload, multi-level tote workspace. Neither vendor publishes an absolute picks-per-hour figure; both market relative productivity gains (e.g., "2-3x," "10%+ year over year").	On-robot touchscreen, wearable display and keypad touch screen inputs put-to-light with barcode scan	Broad e-commerce, apparel, general 3PL, moderate SKU velocity
Heavy-payload PTG batch cart	**RDS™ Batchbot 2.0 (Numina Group)**	**Over 35 orders per batch cart, payloads exceeding 3,000 lbs. 300+ picks/hour per operator; 275-300 lines/hour each-picking; 18-22% faster end-to-end pick trip vs. legacy AMR platforms at a validated site.**	**Voice-directed + hands-free scan**	**High split-case, medical, multi-line DTC, B2B/ B2C omnichannel**
Stationary GTP	AutoStore and similar cube/ shuttle tote to person ASRS platforms	AutoStore RelayPort: published at up to 650 bins per hour (a tote presentation throughput figure, not a per-operator pick rate).	Put-to-light, fixed workstation	Struggles if SKU velocity is not 80/20 or 70/30, small parts, minimal footprint.

Sources: locusrobotics.com, materialhandling247.com (Locus Vector); robotics247.com (6 River Systems Chuck); autostoresystem.com (AutoStore RelayPort); numinagroup.com and validated customer deployments (RDS™ Batchbot 2.0).

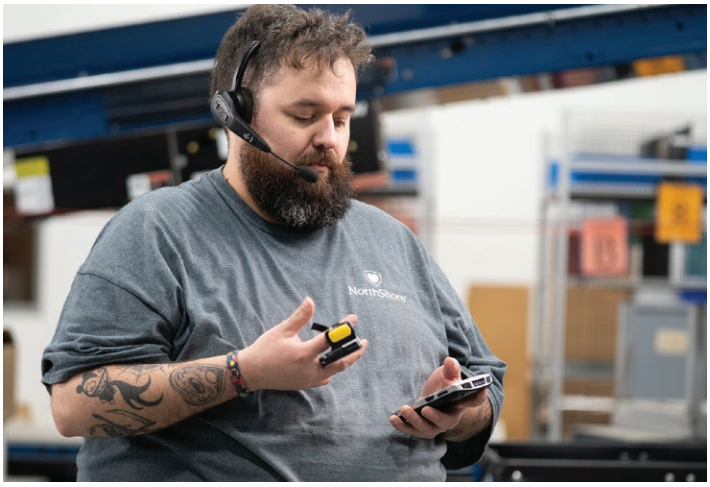
Inside Batchbot 2.0's Differentiated Performance

Batch Density: Fewer Robot Trips, More Picks Per Trip



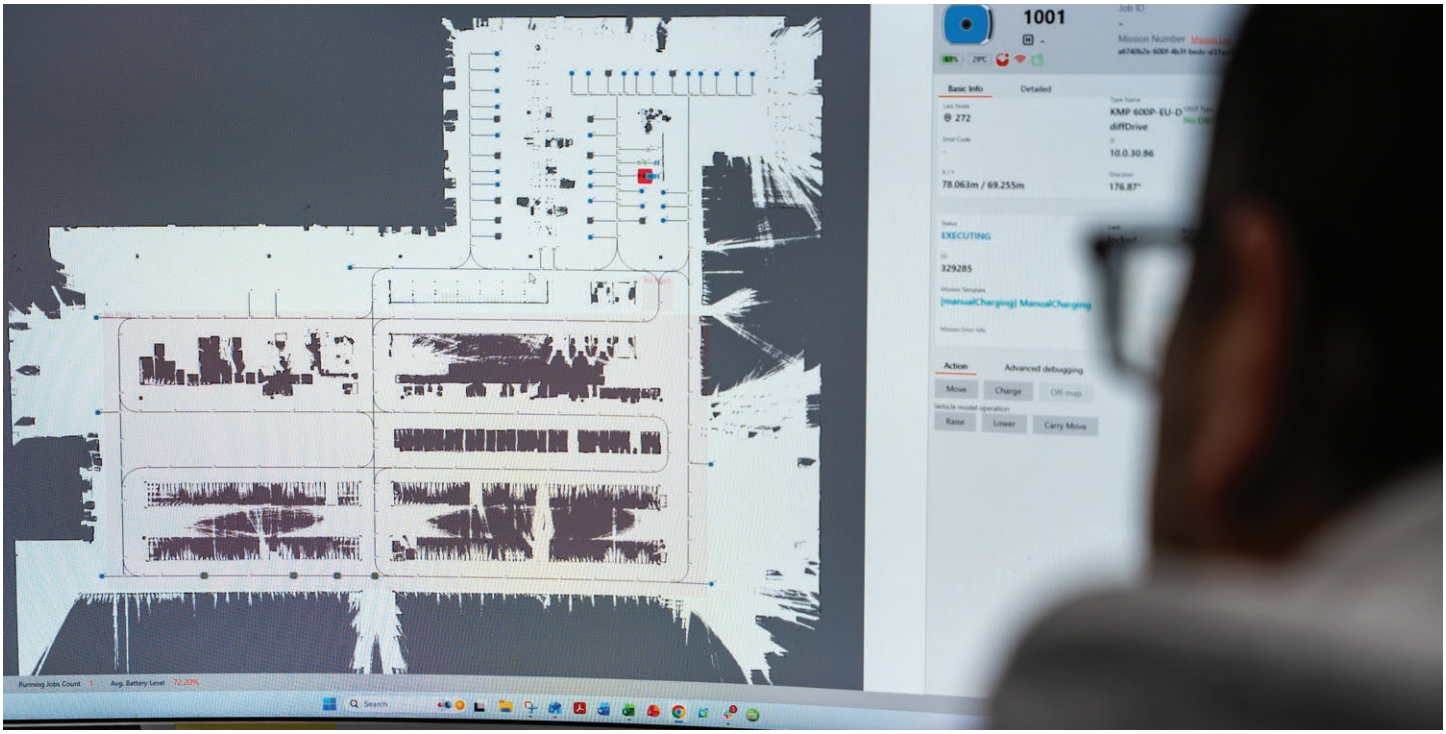
Lightweight collaborative AMRs typically carry a small number of orders per mission, which means the robot itself becomes the bottleneck as order volume grows. More orders mean more robots (and cost). Eventually, system layouts can become constrained as multiple robots attempt to visit the same locations, causing congestion, wasting labor, restricting picking throughput, and managing priority orders nearly impossible.

Batchbot 2.0 takes a more efficient approach to order picking. It uses industrial heavy-payload AMRs engineered to carry 10x payloads, enabling them to transport a fully loaded batch cart containing over 35 orders. The cart can handle a mix of full-case and split-case orders on a single picking trip or support a mixed-case pick-to-pallet application greatly expanding the versatility and use case of the application. The single largest lever for generating more picks per trip and creating an optimized batch-order pick process is the **density of picks per stop.** A high-capacity AMR, carrying dozens of orders that share pick-stop SKU affinity, can equal or surpass the output of a small robot in a fraction of the time, using less picking trips.



Multimodal Voice-Directed Picking with Hands-Free Scan Validation

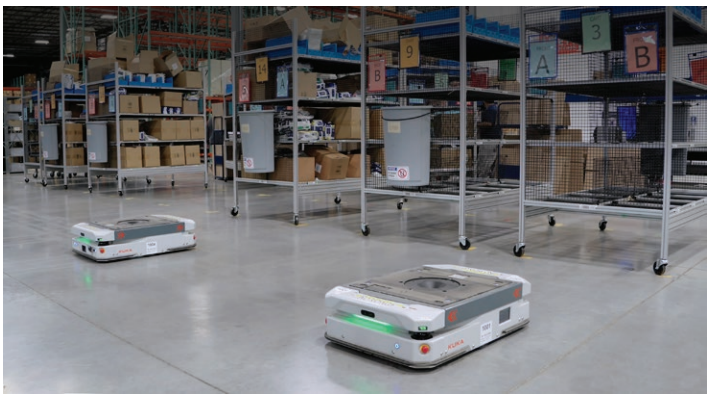
Many AMR platforms direct picking through an on-robot touchscreen, which requires the operator to look, read, and touch-confirm each pick and put to tote. This is a slower, less accurate picking process. Batchbot 2.0 pairs the robot with Numina's RDS™ Victory Voice Suite, combining mobile wearable computers, voice headsets, and hands-free barcode scanning into an efficient application. The software proactively directs the closest available operator to each AMR pick-stop location using an advanced version of "Meet Me" mode logic. The operator stays focused on picking in a step-by-step, intuitive hands-free operation. Voice-command instructions and scan-confirmed pick-and-put validation have proven to be faster and more accurate than stopping to read and tap a screen. Combining RDS™ voice picking with barcode scan validation results in pick-and-put order accuracy of 99.9%, while keeping the operator in a continuous, efficient picking rhythm eliminating constant stopping and starting. New workers can be trained in less than an hour, making operator turnover and employee replacement a much more efficient and timely process.



WES Orchestration, Not Just WMS Task Assignment and Management

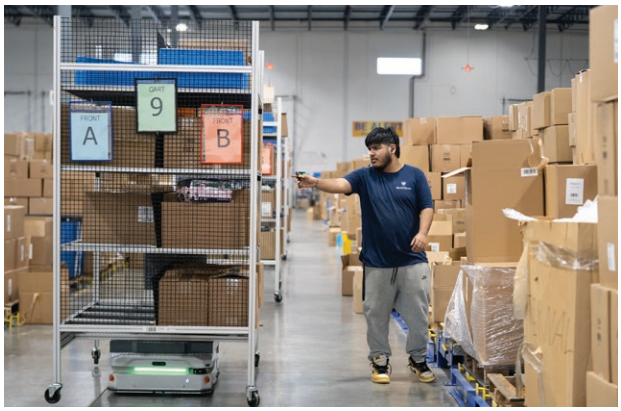
A warehouse management system (WMS) tells an operator what to pick. A warehouse execution system (WES) integrates optimization by selecting the best orders for batch-order release. Numina's RDS™ utilizes proprietary order-release orchestration logic and WES wave-picking guidance to dynamically calculate, select, and assign orders to a batch cart based on SKU affinity, creating the highest pick density per stop, along the shortest travel path. The distinction matters at scale: a WMS-only environment queues work in the order it arrives, while Numina's RDS™ actively selects from the available pool of orders, and systematically enforces release of high-priority orders. The more orders available, the greater the efficiency of the AMR batch-pick mission, which minimizes operator walk time and reduces the number of stops required to complete each batch of orders.

Autonomous Transport to Pack and Ship



When batch-cart order assignment is complete, Batchbot 2.0 automatically assigns an available AMR to pick up a cart and begin travelling along the order picking path. In parallel, the closest operator to each pick is selected and directed to meet the AMR and perform the required picks using Victory Voice. At completion of the last pick, the AMR is routed to packing where it drops the cart at an empty station along the pack-automation conveyor line. Because the AMRs can decouple and are completely independent of the cart and/or pallet, productive utilization is greatly increased compared to robots with integrated carts that need to be manually unloaded before they can begin their next mission. The ability to immediately drop the completed orders and return to active picking eliminates expensive and inefficient captive time spent in the packing area. More productive utilization means a smaller AMR fleet size, and a lower initial and ongoing investment. Little to no operator cart-pushing and staging is required after drop-off, significantly improving worker ergonomics. Batchbot AMR carts commonly weigh around 800 lbs. fully loaded; automatically decoupling carts and AMRs reduces safety risks and eliminates a major source of operator fatigue.

Additional Considerations: Ergonomics, Safety, and Workforce Retention



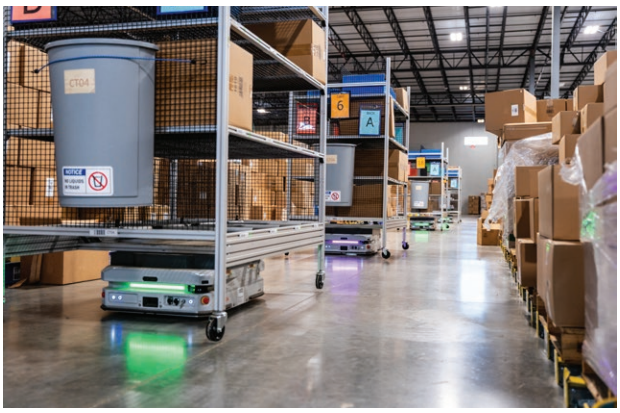
Time studies demonstrate that eliminating manual cart-pushing and fork trucks from mixed-case and each-picking applications, reduces wasted forklift drive time, and eliminates frequent climb-on/climb-off cycles, resulting in 20 to 25 more minutes spent picking per hour per operator. Operations using Batchbot 2.0 report not only 50-100% gains in picking productivity, but also higher employee retention because it is easier to retain staff in a less physically strenuous job and tight labor markets where warehouse turnover is a persistent cost, not just a productivity metric.

Additional Considerations: Brownfield and Greenfield Flexibility

Batchbot 2.0 is designed to be deployed inside new (greenfield) sites, as well as existing (brownfield) facilities without requiring new construction. Removing facility redesign costs from an AMR order-picking implementation decision, along with the associated impact on ROI calculations, can play a significant role in the technical evaluation process.

Additional Considerations: Modular, Scalable Deployment and Financing

Deployments typically start at 7 to 10 AMRs, and the fleet size scales as volume grows, so a facility can validate initial ROI before committing to a larger rollout. Numina structures purchasing around that same flexibility. By offering a firm-cost Capex purchase, as well as an Opex lease plan, and Automation-as-a-Service subscription, Numina lets customers decide how they want to carry the investment on its books, rather than forcing a single model.



Validated Performance: NorthShore Care Supply

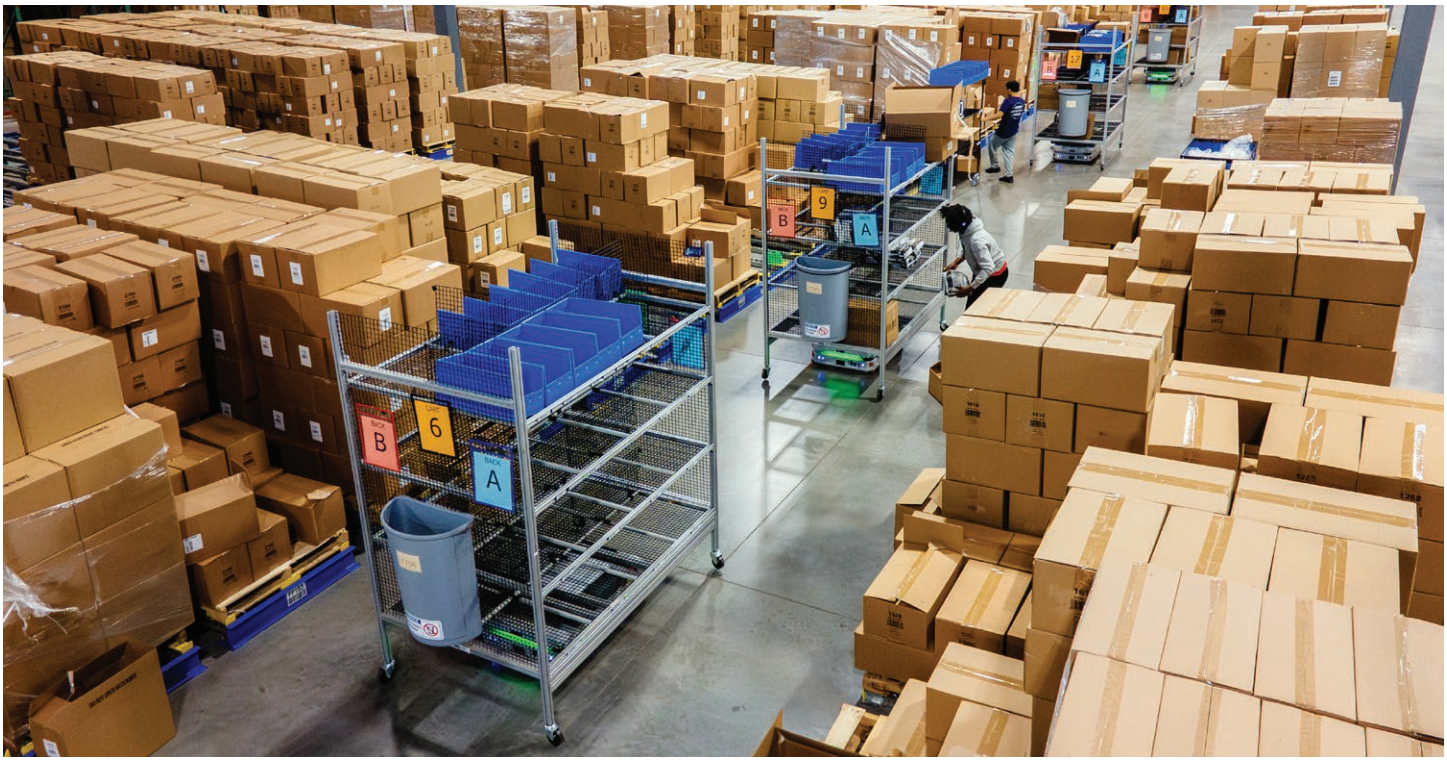
The strongest evidence published behind these performance driver comparisons comes from an active deployment rather than a simulated performance benchmark. At NorthShore Care Supply, a direct-to-consumer distribution operation, the Batchbot 2.0 mixed-case and each-picking solution is achieving the highest documented AMR picking rates on record. The original Numina Group automated solution with AMRs, voice picking, barcode scanning, and end-of-line pack automation, allowed NorthShore to immediately reduce staffing needs by close to 50%. The Northshore system also effectively demonstrates the versatility and adaptability of the Numina Group's Batchbot approach. After upgrading the initial system to Batchbot 2.0, featuring the latest software enhancements, and faster higher capacity AMRs, the operation saw an additional 25 to 30% efficiency gain allowing NorthShore to manage their order volume growth over the last 24 months, without adding any order fulfillment headcount.

Numina Group's published performance figures for Batchbot 2.0, drawn from validated customer applications including NorthShore Care Supply, average 300+ picks per operator per hour in combined split-case and mixed -case picking operations. The upgraded higher-capacity batch carts and AMRs reduced end-to-end pick-trip time by 20% versus the original legacy AMRs.

Questions to Bring to Any Vendor Evaluation

Use these questions when evaluating any AMR picking solution. Require each vendor to provide the data sources, site-validated performance results, and customer references behind their claims.

1. What is your published pick rate, and is it a per-operator figure? Ask for the specific validated site it was measured at, and total investment cost required to achieve the performance rate. Can you see it in person?
2. What are the order, cube, and weight capacities of the batch-cart missions, and how do they scale as your order volume grows?
3. Does the orchestration software simultaneously manage AMRs and operators to minimize operator walk time across the order picking zones?
4. Is the cart pickup and drop-off fully automated, and is the cart decoupled from the AMR?
5. Is picking directed by voice, screen, or light, and what is the measured accuracy rate?
6. Is task release optimized by a WES, or a legacy ERP/WMS that queues it based on arrival?
7. Does the platform require facility modifications, or can it deploy inside our existing footprint?
8. What is purchase structure, and how does the deployment scale from an area/pilot to full-facility rollout?



Conclusion

The performance gap between AMR platforms in warehouse picking and order fulfillment operations is rarely about robot speed. It is a function of how much work a robot performs per pick trip, how efficiently operator picking is coordinated with AMR movement, how effectively the picking technology supports productivity and accuracy validation, and whether the software has the functionality required to optimize order release for both AMR and workforce efficiency. RDS™ Batchbot 2.0 was built to support all of these variables within its software suite. NorthShore Care Supply's production results are the clearest evidence of how application expertise and the right combination of software and technologies can deliver superior ROI through increased pick-rate performance.

To discuss your specific facility and order picking profile, contact Numina Group's warehouse automation team. Or call 630-343-2600

About Numina Group

As an independent, design-first automation integrator, Numina Group brings 40+ years of warehouse and manufacturing expertise in process improvement, system design, software, and the integration of 1,000+ automation projects. We take a customer-centric approach to designing, recommending, selecting, and blending end-to-end automation technologies, managed by RDS™ WES-WCS, our best-in-class warehouse automation software, into a cohesive solution.

A great example of uniting multiple technologies is highlighted in this white paper covering RDS™ Batchbot 2.0. The solution combines AMRs with voice-directed picking for mixed-case pick-to-pallet and large-capacity batch-cart each- and case-picking automation. The base approach utilizes a 600 kg AMR. Batch carts can support over 35 orders and 1,100-lb. loads per trip, delivering documented picking performance of 300+ lines per hour per operator.

At Numina, we work in partnership with your team to develop process improvements and recommend the automation technologies best suited to your business. Our goal is to eliminate inefficiencies, reduce labor costs, and deliver an ROI that improves your operation and increases profitability.