The Definitive Guide to High-Capacity Autonomous Mobile Robots

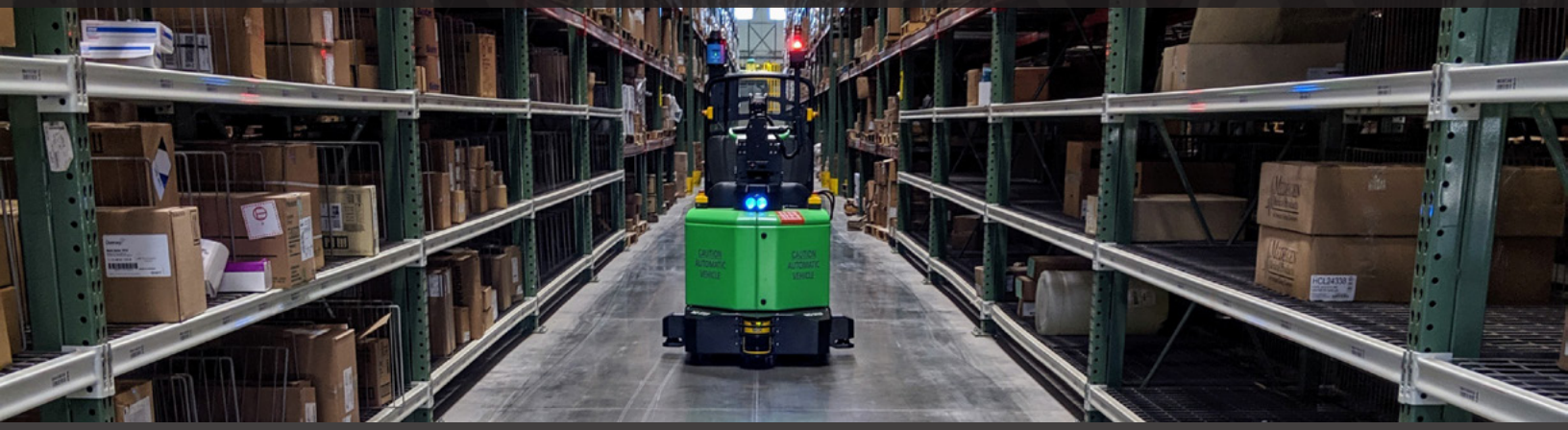
VECNA robotics

Shifting demand and market conditions are forcing businesses within supply chain to find innovative solutions to face the challenges inherent in everyday operations. For years, **Automated Guided Vehicles (AGVs)** and **Vision Guided Vehicles (VGVs)** have been a mainstay in reducing non-value-added travel, but today's market demands require greater flexibility and scalability.

Autonomous Mobile Robots (AMRs) not only reduce key operational waste, but also address major operational challenges like labor shortages, real-time fluctuations in demand, and long-term growth. When paired with an orchestration engine, an AMR solution also offers fleet performance data for continuous improvement. For example, heat mapping may show common areas of traffic jams – valuable information that could be used to redirect manual traffic or make sure aisles are kept clear. In addition, AMRs work effectively with mixed teams, using an orchestration engine for mission assignment to AMRs, robots from other vendors and manual MHE operators.

Path and Task Handling

	AMR	VGV	AGV
Navigation Method	Actively locate & map position by comparing sensor data to facility understanding	Follow pre-recorded individual routes, using sensors to verify	Primarily use markers installed throughout a facility to navigate point-to-point routes
Path Planning	**Path Planners:** Assess multiple routes and priorities, adapting in real-time to changes	**Path Followers:** Follow only predetermined, point-to-point routes	
Fleet Management	Intelligently optimizes throughput based on performance data & current priorities	Schedules jobs and controls traffic based on predetermined work and routes	



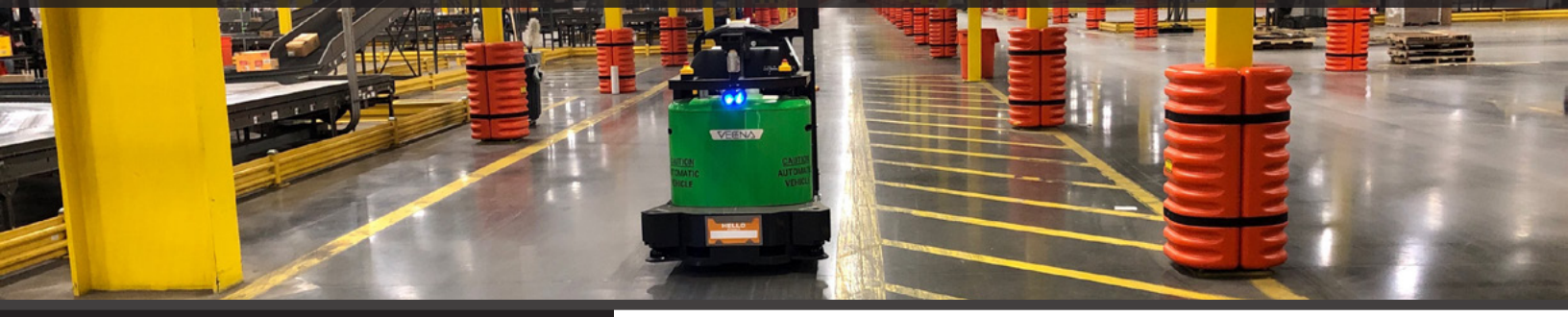
In this white paper, we'll discuss how AMRs can help to:

- Conquer Operational Challenges
- Streamline Processes in a Variety of Industries
- Create Workflows for Maximum Efficiency

Conquer Operational Challenges

Supply chain operations across all industries face similar obstacles that interfere with productivity and efficiency such as labor shortages, keeping up with demand, scaling automation solutions, and optimizing safety. AMRs paired with an orchestration solution help to overcome these common obstacles:

- Extend your staff
- Create flexibility on-demand
- Speed up scalability
- Reduce accidents



Extend your staff

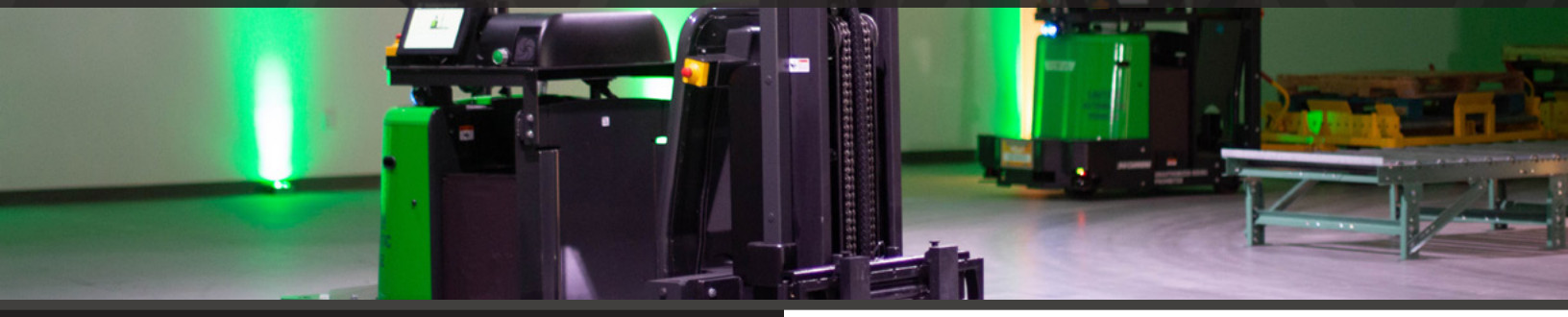
Rising labor costs and high turnover rates due to the repetitive and manual work have left many operations with gaps in their workforce. It is estimated by 2028 that the manufacturing industry will have 2.4 million open positions to fill.

- AMRs are not replacements for human employees and never will be. Even the most intelligent AMRs lack the critical thinking and creative problem-solving abilities that only humans possess. However, AMRs are great at accomplishing repetitive and tedious assignments, which frees up employees to use their skills on high value projects. With greater purpose at work, employees feel more satisfied and retention increases.

Create flexibility on-demand

Shifts in demand used to be seasonal. Now, they're more frequent and more unpredictable. Pre-programmed AGV routes contribute to this problem by creating bottlenecks at critical points in the workflow and traffic.

- AMRs powered by orchestration solutions help to create consistent operational processes and optimize workflows. AMRs are set up to run workflows that accomplish tasks based on the operation's priorities instead of running on a planned, roundabout path. In addition, AMRs are capable of task interleaving, meaning one robot can be used interchangeably for a number of tasks, further reducing forks-empty or non-value add travel. By safely traveling on dynamic routes to these high priority assignments, AMRs reduce transport time and boost productivity and throughput.



Speed up scalability

Supply chains have operated for a while using manual processes. However, with the surge in e-commerce–five years ahead of the predicted rate of adoption–operations need streamlined processes that allow for growth over time.

- AMR fleets can be scaled easily and quickly to work within a variety of workflows and facilities. With an Industrial Internet of Things approach, facilities can begin with a small fleet of self-driving vehicles and add more as needed. Data insights are automatically captured and inform process improvements to create even greater efficiency.

Reduce accidents

In 2017, the Bureau of Labor Statistics reported that injury and illness cases where forklifts were involved resulted in workers taking a median of 13 days away from work, higher than the median of 8 days for all cases. Employees driving manual vehicles like forklifts involve a mix of high-speed travel and monotonous tasks that can result in injury, inventory damage, and even death. It only takes a momentary lack of focus when moving a pallet to create a potential safety incident.

- The deployment of AMRs offsets the amount of manual traffic operating in a facility every day, which reduces the chance for human error. AMRs take on the heavy lifting and long-distance hauling and lower the risk of an accident. Because AMRs use 360-degree sensors for protection and enhanced obstacle detection and avoidance, if an individual or machine gets too close, the AMR will slow down, find an alternate path to avoid the obstacle, or safely stop to avoid a collision. AMRs are also B56.5 compliant, and safely work alongside floor staff and other equipment.

Operational Challenge	AMRs Powered by Orchestration Engine
Unreliable data	Provides accurate, real-time data insights
Increased variability across large network of smaller facilities	Consistent experience for easy handshaking across the network
Non-technical users	Intuitive platform that provides easy and insightful visualization
Manual facilities not equipped for automation	Manual and automated components integrate

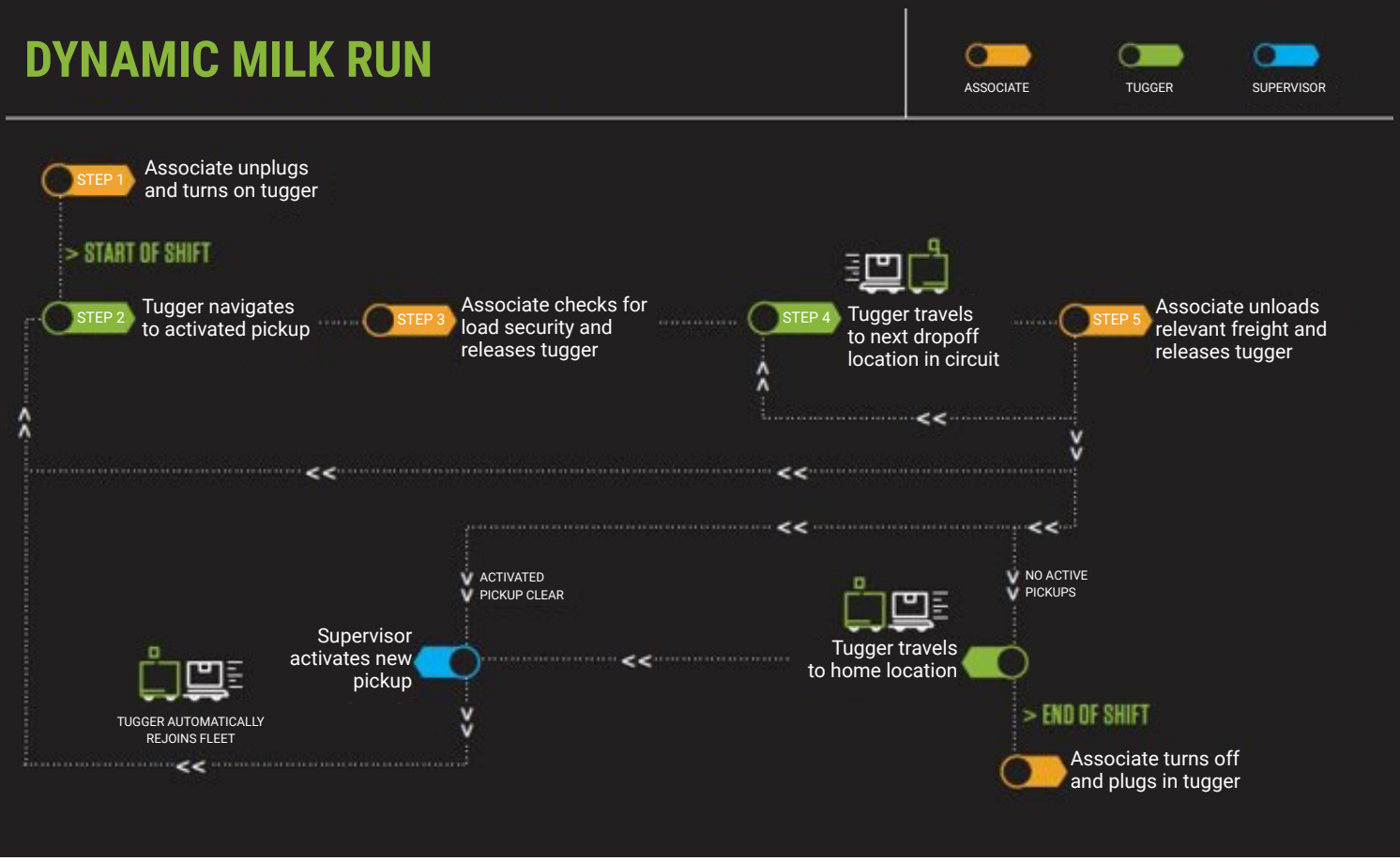
Create Workflows for Maximum Efficiency

Operations can make great strides with materials handling efficiency by incorporating AMRs into their workflows. Below are three AMR workflows that are commonly used across supply chain operations.

Multi-Area Transport

Multi-Area Transport, also known as Dynamic Milk Runs, is most effective in facilities where there are multiple pick-up and drop-off points along a route. Autonomous tuggers are the AMR of choice for this workflow because they can haul large payloads long distances. Multi-Area Transport is used to deliver parts to manufacturing assembly lines, put away loads from warehouse receiving, and transport oversized packages throughout distribution centers.

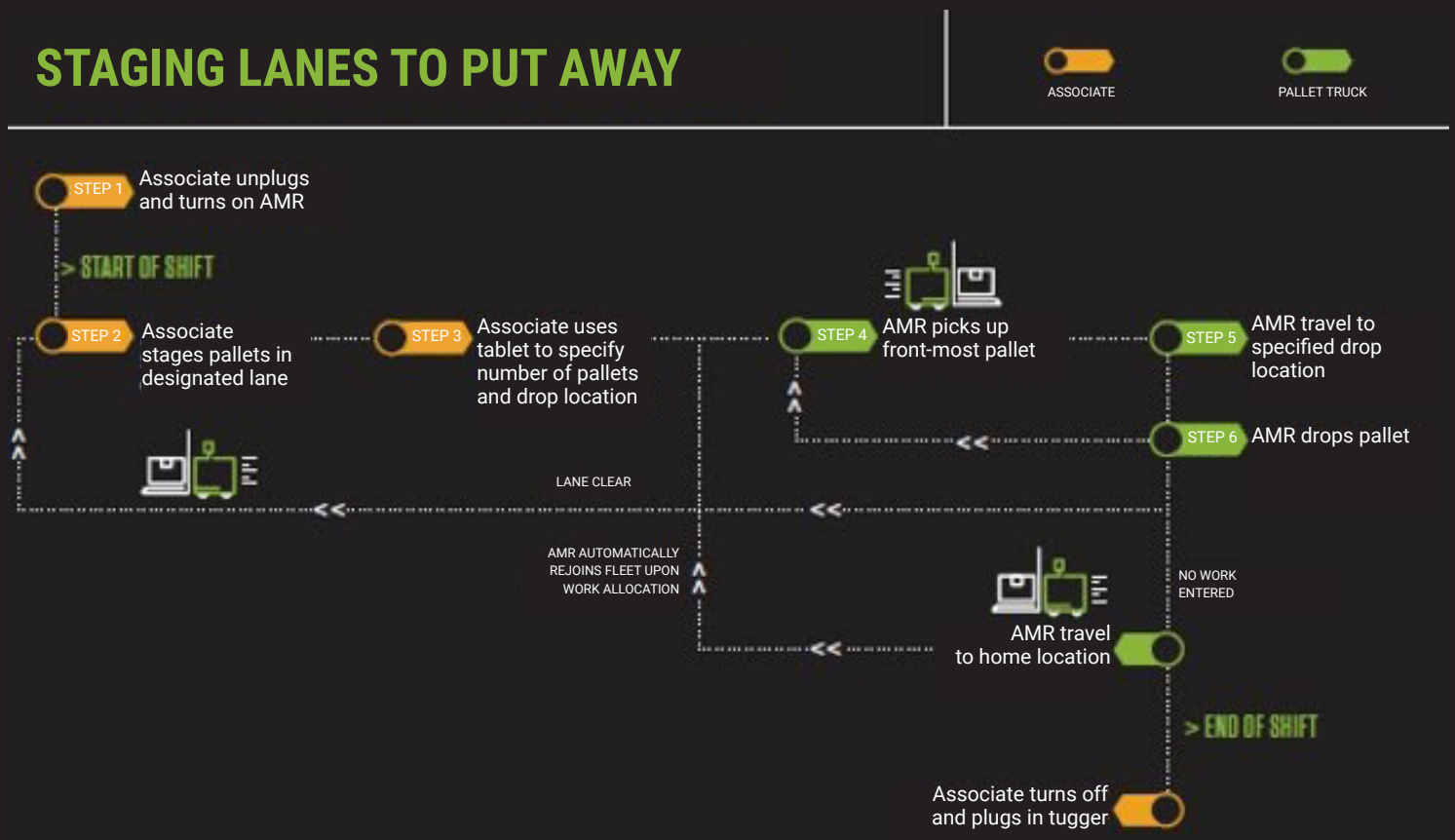
AMR Type: Autonomous Tugger



Staging Lane to Put-Away

To prevent bottlenecks, the Staging Lane to Put-Away workflow focuses on clearing dock doors quickly and efficiently. Autonomous pallet trucks or fork trucks retrieve pallets from staging and drop them at specified locations throughout the facility. Some of these vehicles have advanced pallet detection capabilities which enables them to scan an area to locate empty pallets throughout the facility instead of going to one place to get them. Advanced pallet detection helps to free up employees from waiting at a designated location to clear before staging more pallets. Now employees can move loads away from docks and keep facility traffic moving. Staging Lane to Put-Away is a workflow often used for inbound logistics, moving goods from receiving to storage, and transporting payloads long distances throughout a facility.

AMR Type: Autonomous Pallet Truck and Fork Truck



Multi-Point to Multi-Point Transport

This workflow isn't just about moving loads from one point to another but is where the autonomous pallet trucks or fork trucks plan efficient routes when doing pallet builds, tote returns, garbage runs, and more. Because autonomous pallet trucks safely handshake with other equipment and infrastructure such as tuggers and conveyor belts, a lot of time is saved in retrieving empty pallets in between pick ups and drop offs and retrieving materials for pallet builds. Autonomous pallet trucks can also move pallets through very narrow aisles without slowing down operations.

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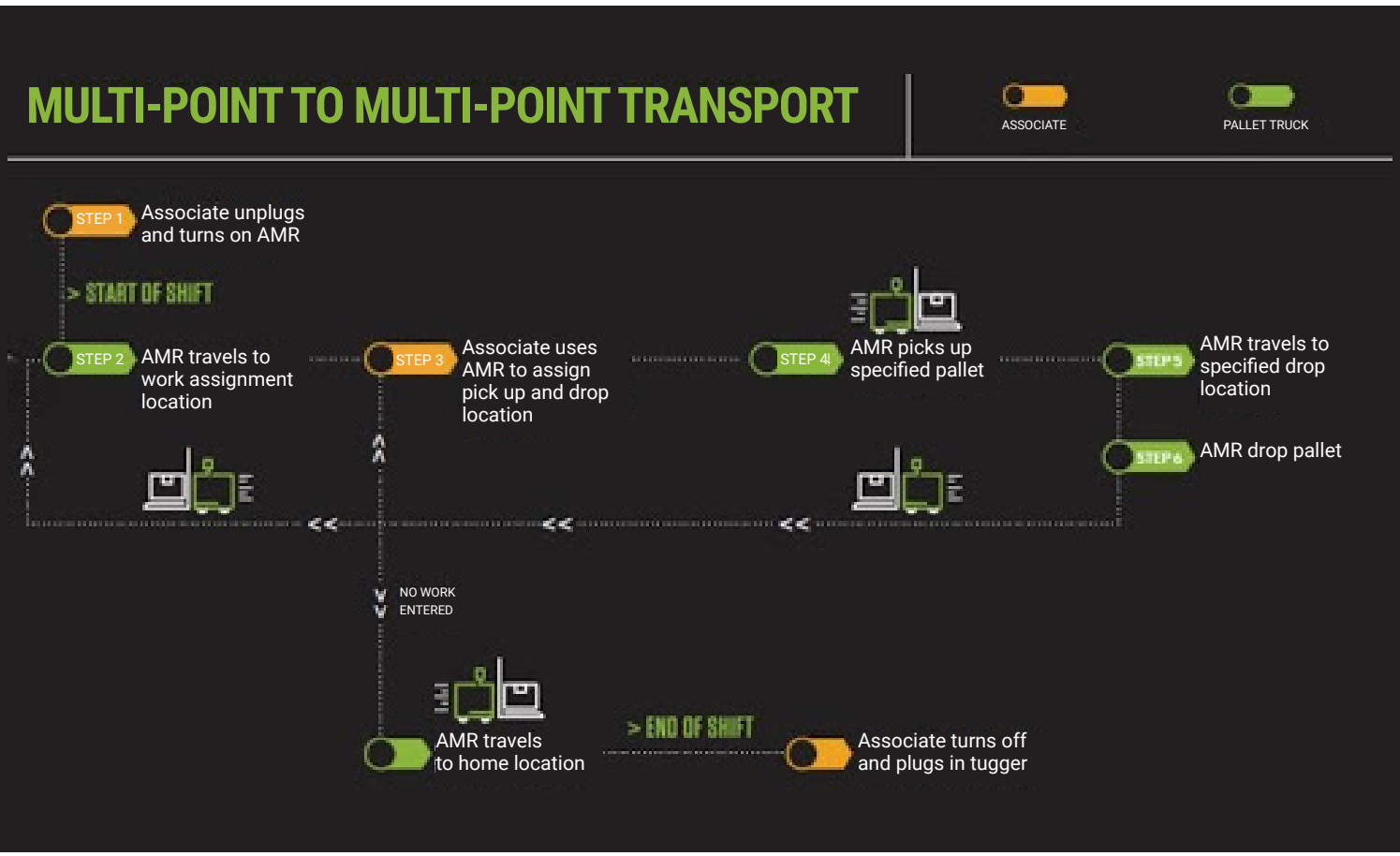

Common Applications for Autonomous Mobile Robots

AMR Type	Application Performed
Autonomous Tugger	Dynamic Milk Run delivery Lineside replenishment Dock-dock, dock-to-stock, storage-to-dock Finished goods to warehousing High-throughput hauling Nonconveyable transport Non value-add transport
Autonomous Pallet Truck	Full pallet pick and put-away VNA/Turret Truck induction and extraction Full pallet replenishment Cross-docking Non value-add transport
Autonomous Counterbalanced Fork Truck	Full pallet pick and put-away, and replenishment VNA/Turret Truck induction and extraction Cross-docking Conveyor pick and drop Empty pallet handling Transporting and destacking multiple-stacked pallets Non value-add transport

AMRs Streamline Processes in a Variety of Industries

From manufacturing to warehousing to distribution, AMRs streamline workflows wherever heavy goods need to be towed, lifted, and transported. Here are some use cases that illustrate the use of AMRs in these industries.

Industries that Benefit from Self-Driving Vehicles

- 3PL
- Parcel
- Retail
- Grocery
- Food and Beverage

Manufacturing

A subsidiary of a well-known home appliance manufacturer incorporated AMRs in their new $32M logistics center. The logistics hub is critical to company operations, and facilitates the distribution of more than two billion parts across nine plants and five states. To ensure optimal pickups and drop offs, the company added autonomous tuggers powered by fleet orchestration software to move parts throughout the distribution center. The tuggers met forklift operators at the right location and time, reducing non-value travel and maximizing throughput of up to 10,000 lb. of parts at a time.

3rd Party Logistics

A leading global supply chain business wanted to improve operational processes in its distribution centers. They implemented autonomous pallet trucks into their 350,000 sq. ft. retail case pick and consolidation distribution center. With the autonomous pallet trucks helping to clear loading docks, the facility increased throughput and dock-to-stock time, improving overall productivity by approximately 30%.

Shipping

An established global shipping company was looking for ways to improve sorting processes for oversized items like furniture and car engines, which caused logjams and slowed productivity. Autonomous tuggers were added to their operation to transport oversized items, resulting in a production volume increase of 30%. Additionally, the orchestration engine helped the operation to learn from the data insights and boost operational performance by another 20%.

About Us

We automate and orchestrate how goods move.

Vecna Robotics is the leading logistics automation and orchestration company that helps distribution, warehousing, and manufacturing organizations streamline their materials handling operations. Pivotal™, the company's proprietary orchestration engine, integrates with existing warehouse management systems for a coordinated approach that maximizes throughput, operational efficiency, and human and robot collaboration. Vecna Robotics' robots are baked with 24/7 US-based live support and proactive monitoring for an industry-leading **99%+ uptime**.

Through partnerships with some of the largest industrial original equipment manufacturers, service providers, systems integrators, and best-in-class complementary technologies. Vecna Robotics delivers reliable and scalable warehouse automation solutions across North America.

High-Capacity Autonomous Mobile Robots

From pallet trucks to tow tractors and counterbalanced lift trucks, Vecna Robotics offers a range of high-capacity autonomous mobile robots (AMRs) for all types of materials handling applications. With navigation enabled by multi-sensor fusion and best-in-class safety systems, Vecna Robotics' self-driving industrial vehicles offer the payload capacity of automated guided vehicles (AGVs) with the intelligence, safety, path planning and obstacle avoidance of AMRs.

Safe for Operation in Mixed Environments

Vecna Robotics' AMRs are architected with a multi-level safety system and meet or exceed all safety regulations. These powerful robots are equipped with 360-degree sensor protection and enhanced obstacle detection and avoidance, allowing smooth navigation around static and dynamic obstacles. Vecna Robotics' AMRs run at speeds tuned to the environment and load capacity to deliver maximum throughput without sacrificing the safety of other people or machines.

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