

THE BUSINESS CASE FOR Autonomous Mobile Robots IN MANUFACTURING

AMR technology can be the backbone of advanced manufacturing.



As companies deal with the impact of changing operations and supply chain, they are evaluating ways to become more resilient. Resilience in manufacturing means being able to adapt to change, whether it is fluctuating demand for product or availability of labor to keep operations moving.

Autonomous Mobile Robots or AMRs have been considered a promising technology for manufacturing resiliency. They combine the flexibility of human forklift or cart-based movement with the throughput and reliability of a fixed machine such as a conveyor – all while being able to work safely alongside operators on a factory floor. However, to date, there have been few examples of AMRs being deployed ‘at scale’ within manufacturing facilities.

OTTO
MOTORS

PULSE
INTEGRATION

OTTO Motors and PULSE have deployed one of the world’s first ‘at scale’ AMR deployments and the impact is clear:

✓ **Productivity**

Just-in-time and LEAN principles embodied.

✓ **Return On Investment**

The business case for 24/7 operations show a 1 to 2 year payback.

✓ **Safety**

AMRs are pedestrian-safe and work alongside operators.

✓ **Flexibility**

The plant environment can keep up with changing market demands without the facility and equipment.

For most manufacturers, these impacts can be realized immediately with small deployments. But at scale, the system becomes more valuable as additional islands of automation are networked together via AMRs.



THE OTTO MATERIALS HANDLING PLATFORM

The OTTO® Material Handling Platform is an end-to-end solution for autonomous material movement. Designed to quickly adapt to different tasks, floorplans and workflows, an OTTO AMR can perform routine tasks throughout the factory floor. For example, transporting tires to an automotive production line, collecting materials from human pickers and traveling to automated machining cells, moving spare parts between workcells, delivering finished goods to an AS/RS, and more.

The platform is made up of industrial-grade AMRs, custom tooling, charging stations and the fleet management software to orchestrate their movement, at scale.

TWO 'AT SCALE' OTTO AMR DEPLOYMENTS WERE ANALYZED

Greenfield Deployment	Brownfield Deployment
<p>Facility 1,000,000 square feet facility, of which 400,000 square feet is exclusively for AMR transport.</p> <p>Applications</p> <ul style="list-style-type: none"> • AMRs perform routine tasks of collecting materials from human pickers and traveling to automated machining cells. • AMRs perform automated collection of materials from automated cells. <p>By The Numbers</p> <ul style="list-style-type: none"> • 100% reliant on AMR technology • 1000+ miles driven per day • 100% of forklift traffic eliminated from AMR zone 	<p>Facility 700,000 square feet facility, of which 350,000 square feet has been converted to primarily AMR transport in lieu of forklifts.</p> <p>Applications AMRs provide pallet transport of raw material pallets, work in progress pallets, and finished goods pallets.</p> <p>By The Numbers</p> <ul style="list-style-type: none"> • 100% reliant on AMR technology • 175 miles traveled per day • 100% manual forklift traffic and pallet staging was eliminated from the AMR zone

THE BUSINESS CASE FOR AMRs

Labor Cost Savings

- 1:1 ratio with human labor for intra-plant transport.
- OTTO 100 works 24 x 7 x 52 for a fully loaded annualized cost of **\$15-25k per vehicle**.
- The human equivalent is 1 person x 4.2 shifts/week x 52 weeks, with an annual cost of **\$150k-250k per human**.

➤ **OTTO is 10% the cost of the human equivalent.**



Payback Drivers

- ✓ Labor Savings
- ✓ Increased Productivity And Efficiency
- ✓ Compact Facility Design Compared to Forklift or AGV
- ✓ Lower Capital Cost Compared to Conveyor
- ✓ Enhanced Ergonomics
- ✓ Improved Safety

OTTO vs. Conveyor

- Conveyor is fixed for format and routing and cannot be easily retrofitted.
 - OTTO has a 1:250 ratio with fixed conveyance (1 OTTO vehicle = 250LF conveyor) for large systems.
- **OTTO is 50% the cost of a conveyor system equivalent.**

OTTO vs. Forklift

- OTTO 1500 has a 0.75:1 ratio with human labor for intra-plant transport.
 - OTTO 1500 works 24 x 7 x 52 for a fully loaded annual cost of \$40-50k per vehicle.
 - The forklift equivalent is 1 driver x 4.2 shifts / week x 52 weeks + forklift lease for an annual cost of \$200-280k per forklift position.
- **OTTO is 20% the cost of a forklift driver equivalent.**

OTTO vs. AGVs

- OTTO 1500 can navigate within the footprint of a pallet, making overall space requirements much less.
 - OTTO 1500 can self-route around obstacles and pedestrians, making it ideal to interface with work cells or production machinery.
 - AGVs require fixed paths or guideways.
- **OTTO is 66% the cost of the AGV system equivalent.**