Applicazioni industriali per la robotica mobile collaborativa

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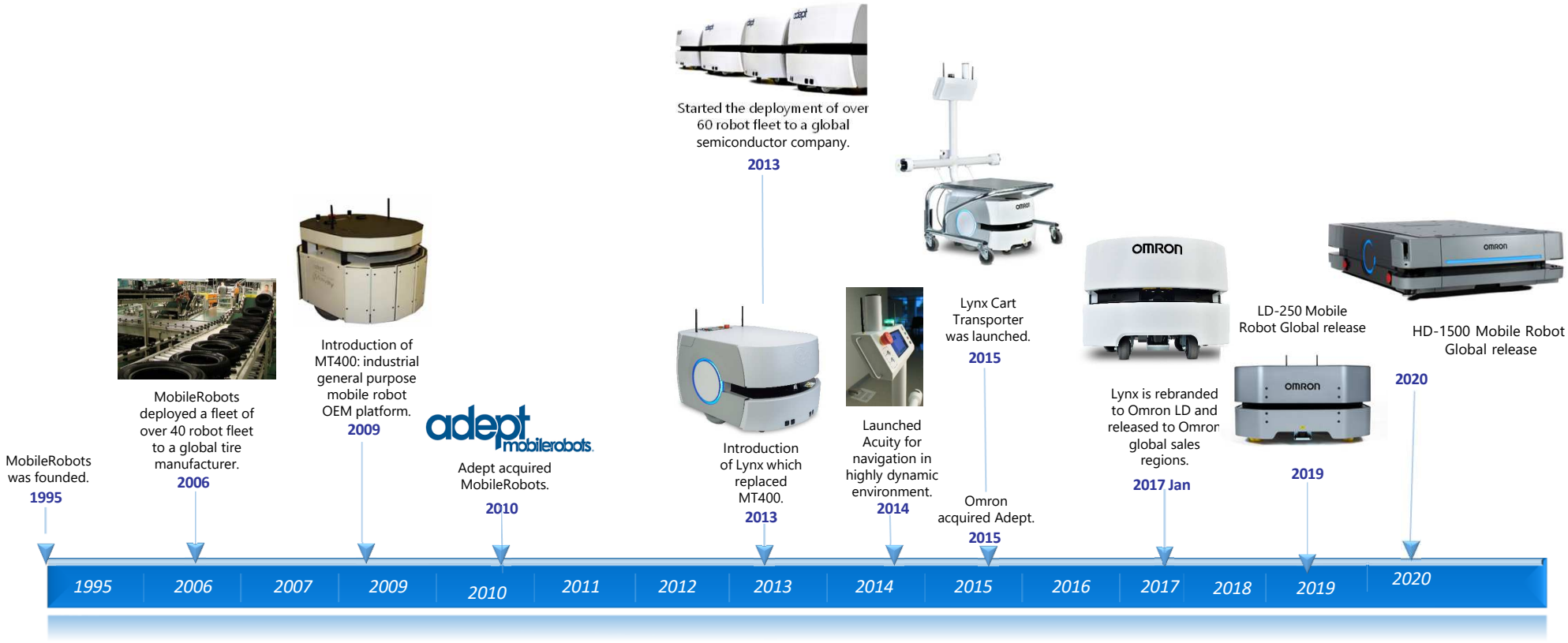
OMRON

What is an Autonomous Mobile Robot?

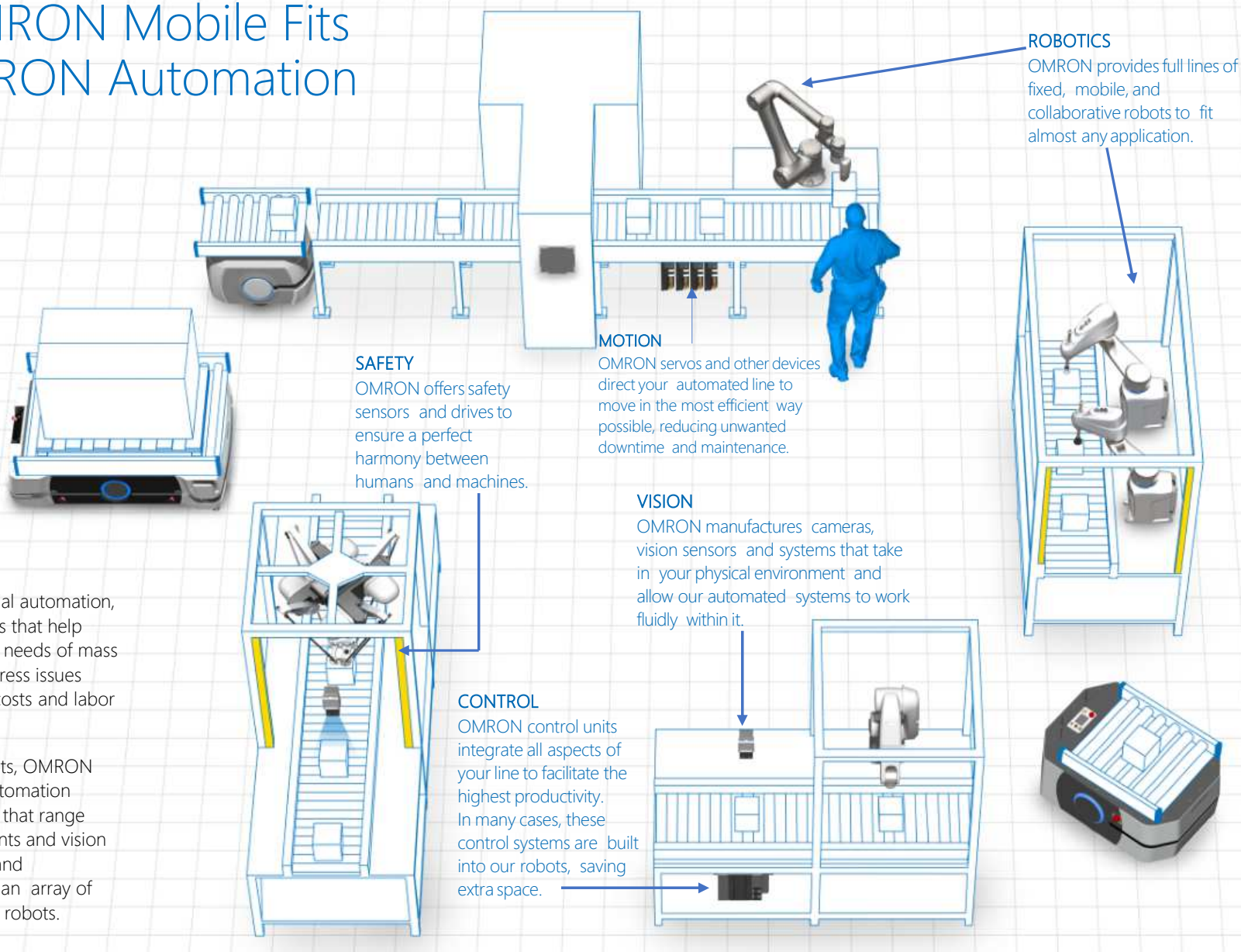
- AGV – Autonomous Guide Vehicle
  - Like a tram
  - Based on guiding technology
  - Fixed schedule
  - Fixed route
  - Fixed fleet
  - PUSH flow
  - Break-down blocks the track

- AMR – Autonomous Mobile Robot
  - Like a taxi
  - On call
  - Shortest route
  - Existing infrastructure
  - Flexible fleet

Omron Mobile Robot Milestones



How OMRON Mobile Fits Into OMRON Automation



ROBOTICS
OMRON provides full lines of fixed, mobile, and collaborative robots to fit almost any application.

MOTION
OMRON servos and other devices direct your automated line to move in the most efficient way possible, reducing unwanted downtime and maintenance.

SAFETY
OMRON offers safety sensors and drives to ensure a perfect harmony between humans and machines.

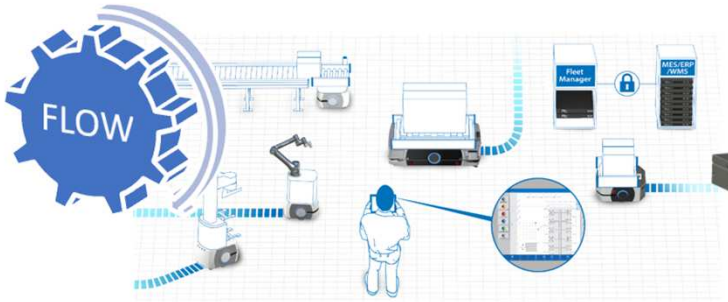
VISION
OMRON manufactures cameras, vision sensors and systems that take in your physical environment and allow our automated systems to work fluidly within it.

CONTROL
OMRON control units integrate all aspects of your line to facilitate the highest productivity. In many cases, these control systems are built into our robots, saving extra space.

As the leader in industrial automation, OMRON offers products that help manufacturers fulfill the needs of mass customization, and address issues related to rising labor costs and labor shortages.

Along with mobile robots, OMRON provides a variety of automation equipment and devices that range from control components and vision sensors to controllers and servomotors, as well as an array of safety devices and fixed robots.

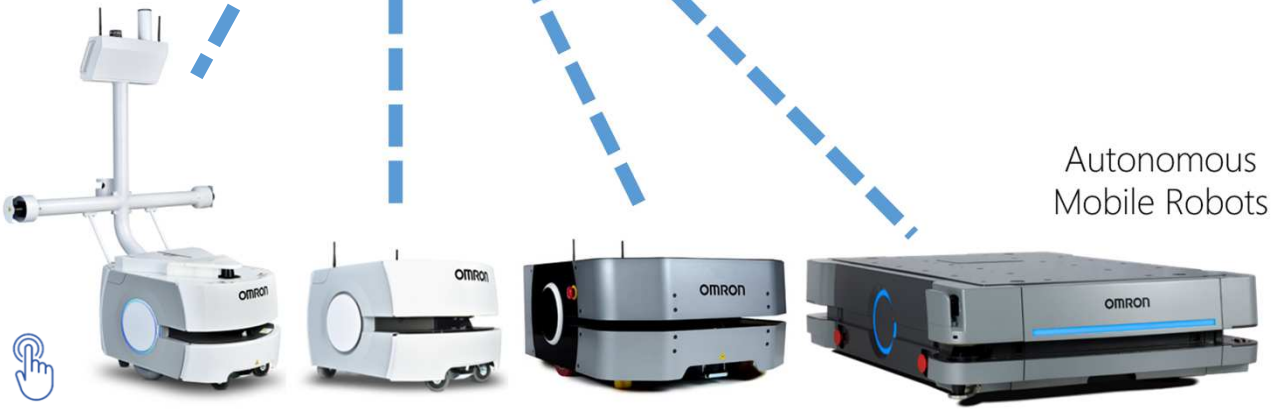
The OMRON AMR solution



Fleet Management

Mobile Planner

Fleet Simulator



Autonomous Mobile Robots

The Omron AMR family

Solution oriented

Cart Transporter

OEM

LD-105/130CT (kg)

LD-60/90 (kg)

LD-250 (kg)

HD-1500 (kg)

60kg 90kg 105kg 130kg 250kg 1500kg Payload

Anatomy of a Mobile Robot: LD-250

- OMRON mobile robots interact with people to promote a collaborative, safe working environment.
- Lasers and TOF sensor allow our robots to detect obstacles in their path and prevent collisions.

REAR TIME OF FLIGHT (TOF) SENSOR
Measures distance between sensor and objects for obstacle detection when moving in reverse.

LIGHT DISCS
Status indicator is located on both sides.

SAFETY SCANNING LASER
Safety-rated laser used for SLAM (simultaneous localization and mapping) and safety functionality.

LOW FRONT LASER
Obstacle sensor detects low-profile objects when moving forward.

LD's ESD versions

- Protection for both the robot and Electrostatic Sensitive Discharge Sensitive (ESDS) items.
- The optional ESD skins are compliant to IEC 61340-5-1 as static controlled surfaces with Rg < 1 x 10^9 Ω.
- Protection for field strengths above approximately 40 kV/cm of air.
- Skins designed to resist the static build-up.

Anatomy of a Mobile Robot: HD-1500

- OMRON mobile robots interact with people to promote a collaborative, safe working environment.
- Lasers covering 360° range allow our robots to detect obstacles in their path and prevent collisions.

SAFETY SCANNING LASERS
Safety-rated lasers used for SLAM and safety functionality provide 360°coverage

LOW FRONT & REAR LASERS
Obstacle sensors detect low-profile objects in forward and reverse

LEFT & RIGHT SIDE LASER
Obstacle sensors detect vertical objects above deck

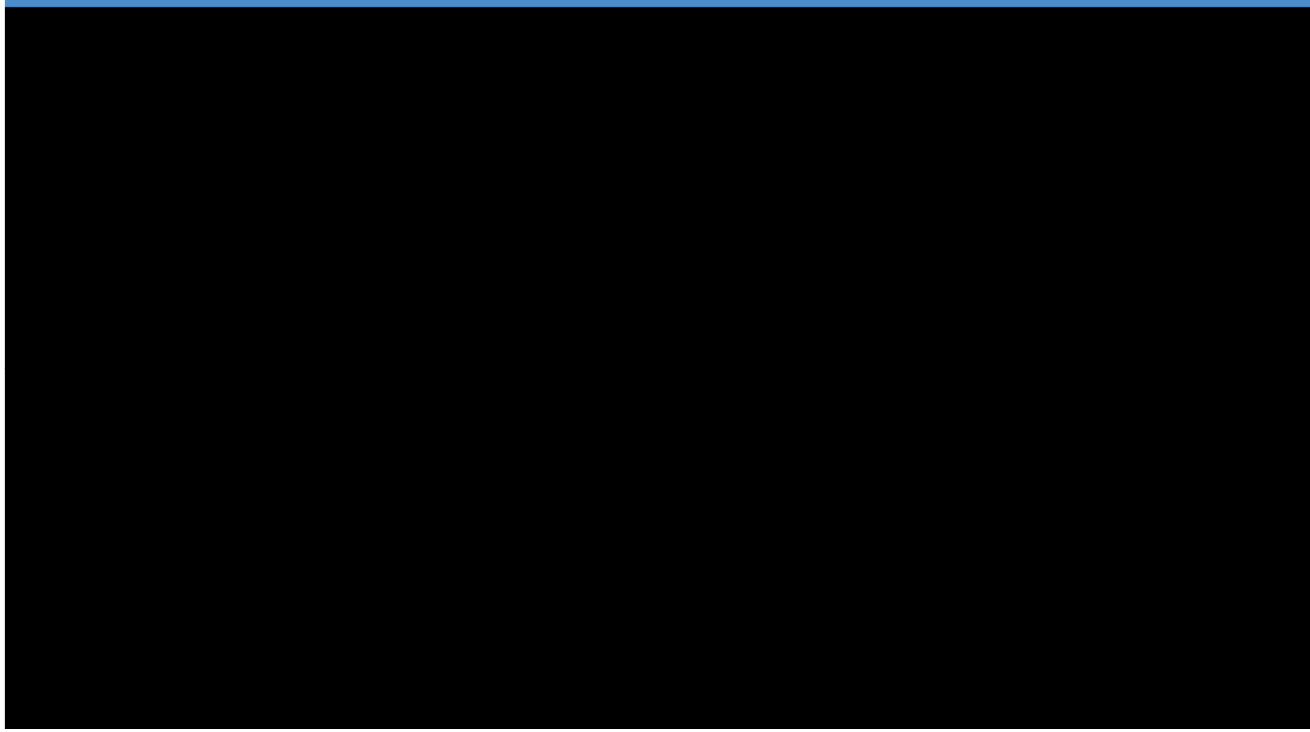
LIGHT DISC & BAR
Status and motion indicator located on all sides

PERIMETER ESTOPS
Four kick E-stops at each corner provide protection at all angles

Solutions - MoMa (Mobile Manipulator)

MoMa is a robotics solution that automates not only transportation of goods but also complicated picking operations.

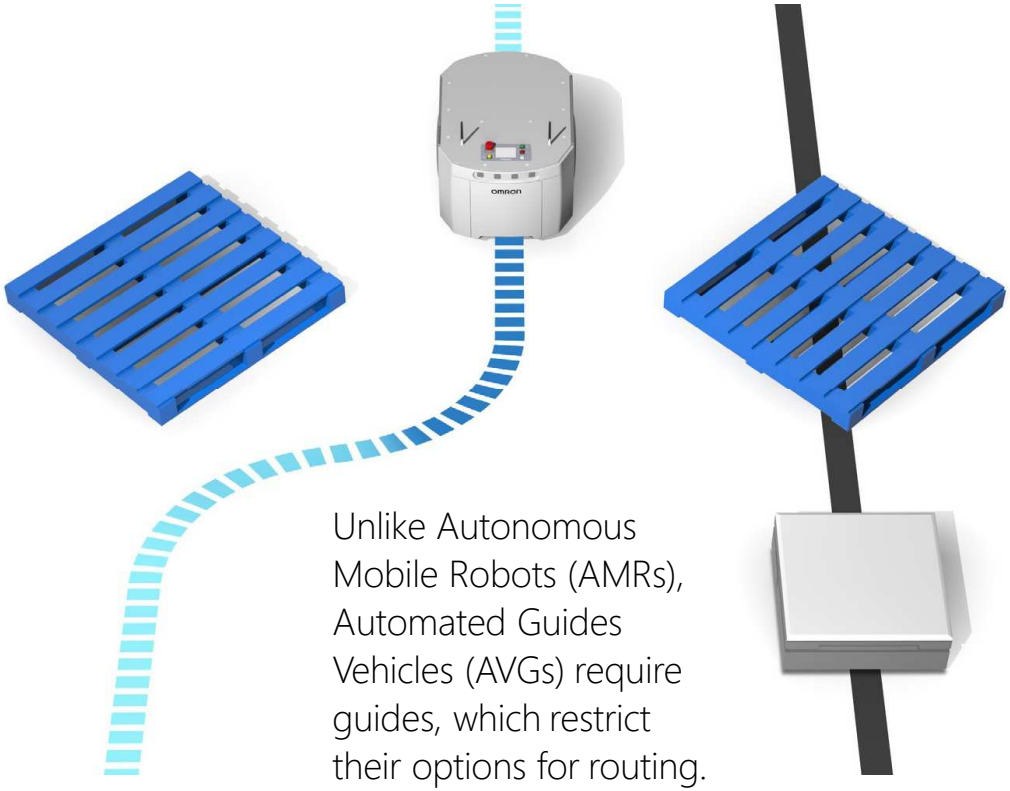
- Machine tending and random inspection
- Material transportation
- Picking boxes of assembled parts to the inspection station
- Automobile inspections (e.g., cracks or paint on moving products)



Why AMR's instead of AGV's ?

The difference is flexibility

	OMRON AMR	AGV
Set Up	Ready to go after simple mapping	Requires navigation guides
Navigation	Navigates autonomously and **safely** without physical guides magnets or beacons	Needs guides, such as floor
Obstacles	**Safely** avoids obstacles without stopping	Stops at obstacles and remains still until obstacles are removed
Map Change	Easy	Factory modifications
Changing Destinations	Easy	Factory modifications
Scalability	Easy	Factory modifications



Unlike Autonomous Mobile Robots (AMRs), Automated Guides Vehicles (AVGs) require guides, which restrict their options for routing.

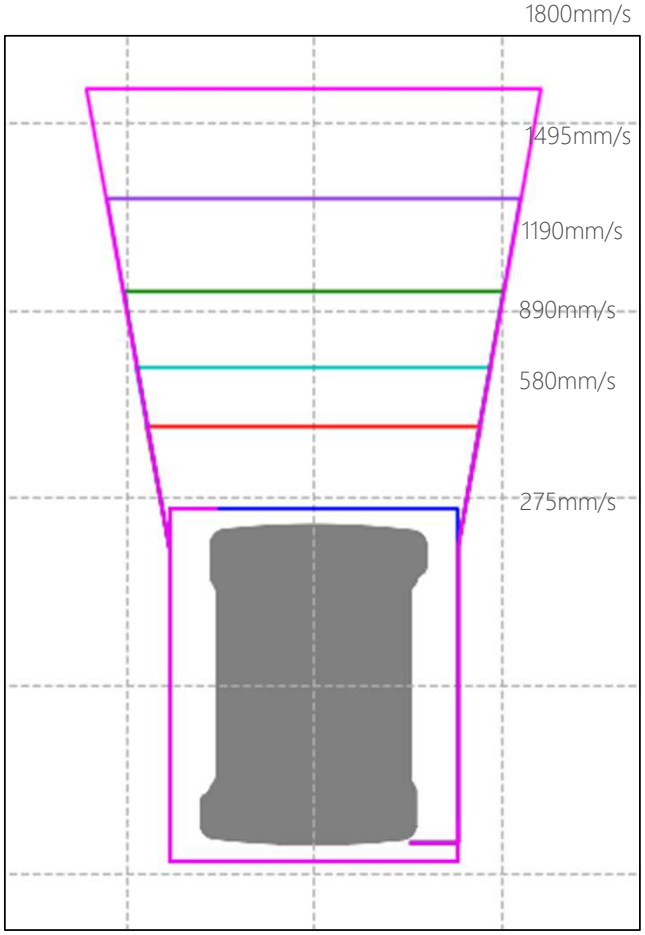
Easy deployment

- No workspace retrofits required.
- No need to pre-program path.
- Rapid Installation.
- Self Mapping with on board PC.
- Operate in very dynamic environment.

NATURAL FEATURE NAVIGATION !

HD Safety Laser – Collaborative

HD-1500 features dynamic safety zones, which adapt to speed and direction of travel

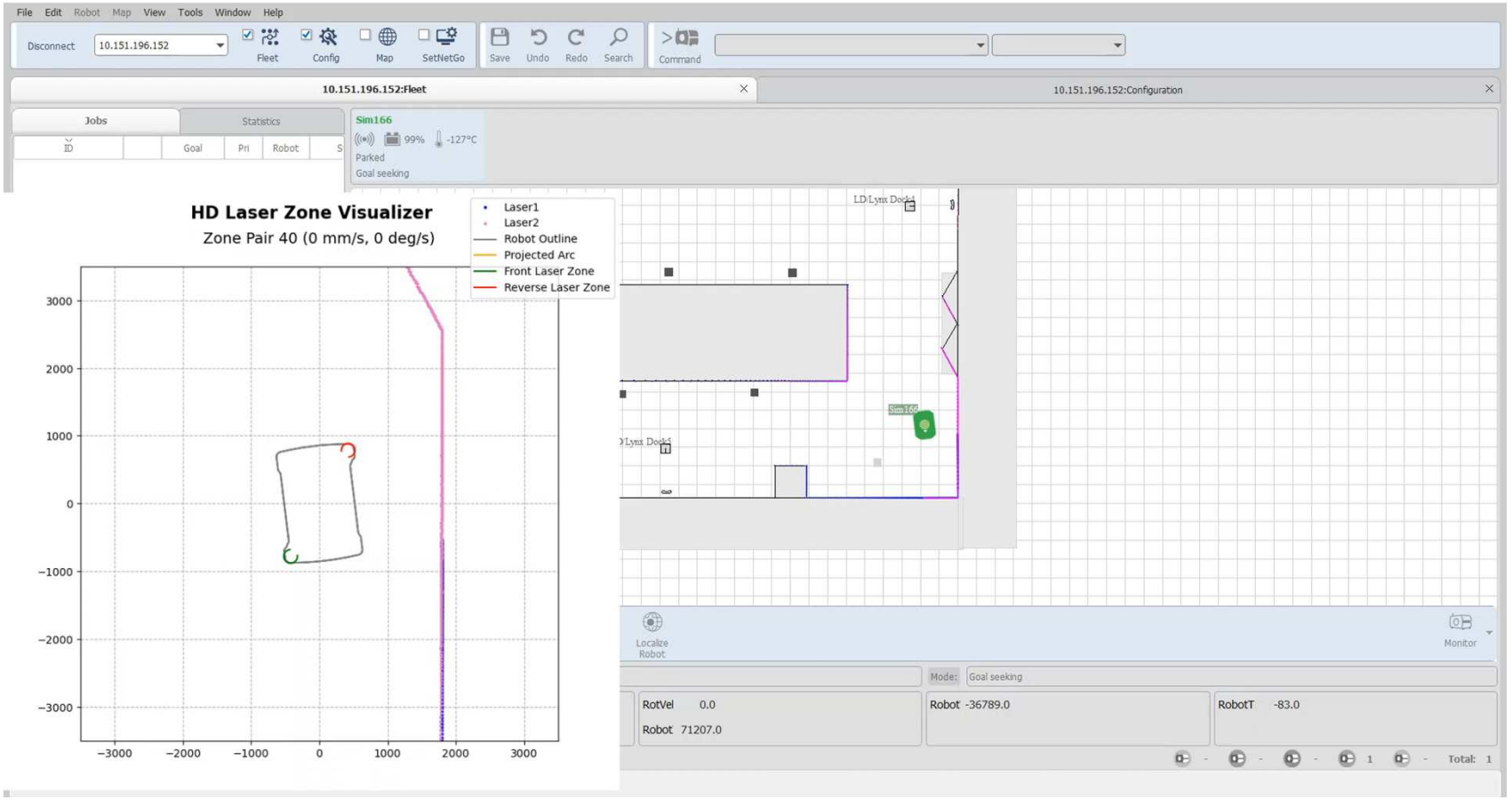


- Laser safety zone increases with robot speed.
- Safety zone intrusion causes Emergency Stop.
- The motion re-enabled 2 seconds later.
- Have zones for:
  - Driving forward and reverse
  - Rotating left and right
  - Driving in an arc to the left and right.
  - Docking zone.
  - No movement zone.
  - Low speed zone.

HD Safety Laser – Collaborative

The Dynamic Safety Zones

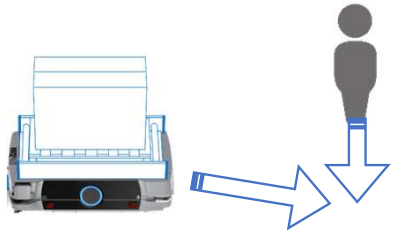
- HD-1500 has 360°safety coverage, and it used it front safety LiDAR for navigation



Dynamic Obstacle Avoidance

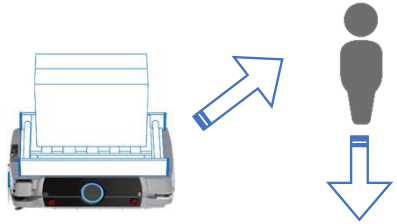
- Moving object motion tracked by robot
- Collaborative and intuitive robot motion with “pass-behind” decision making

Before:



- Robots only avoid current obstacle position.
  Robot can drive in front of walking person

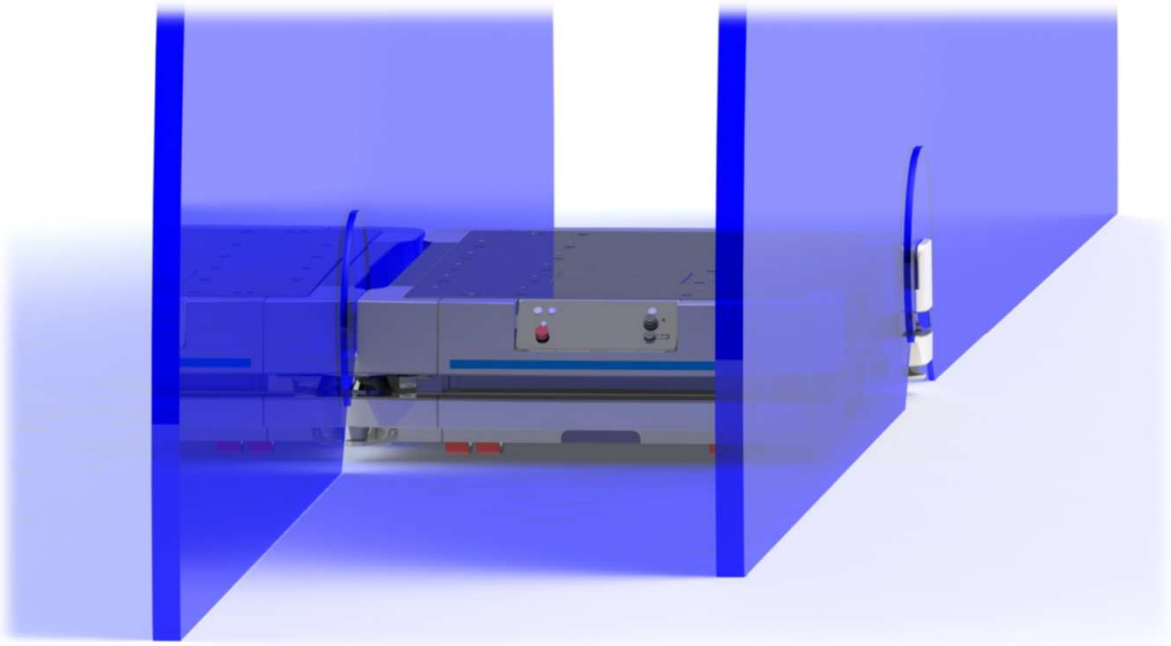
Now:



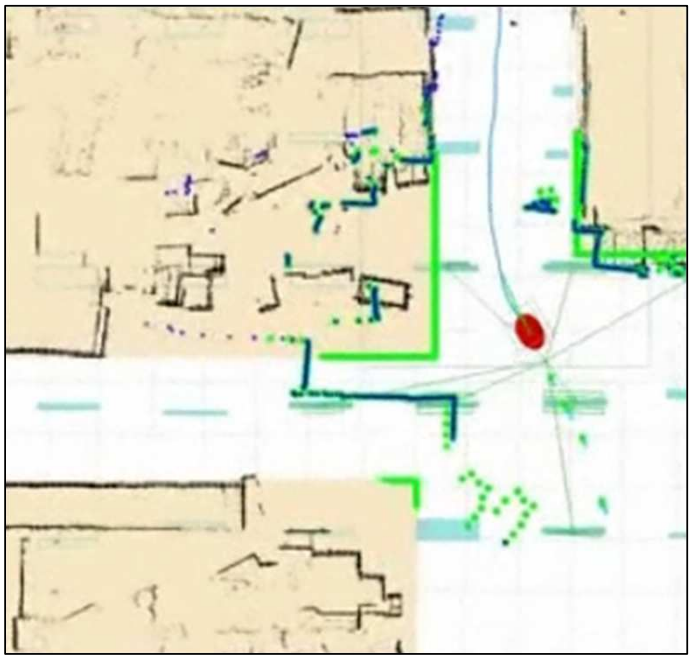
- Robots now understands obstacle movement.
  Robot will drive behind the walking person

Navigation Features: Side Lasers

- Side lasers as an option.
- Side lasers create two vertical light curtains for anti-collision detection.
- Voids and obstacles detection.
- Overhanging objects detection.



Navigation Features: Acuity



OMRON's patented Acuity generates navigation markers from ceiling lights and objects, since these are more likely to remain fixed. Using these ceiling features, it generates an additional map to identify the fleet's position, no matter how frequently the environment on the floor changes.

EM2100 -The brain of your logistics

Manage Fleets of Up to 100 Robots

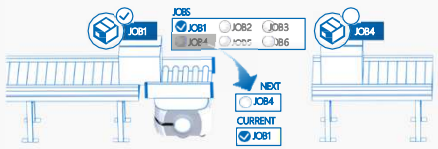
- Displays robot location, status and job queue.
- Selects fastest routes based on traffic.
- Identifies blocked paths and creates alternative routes.
- Coordinating collective robot motion.
- Centralized configuration management.
- Fleet Simulator based on real-world facilities.


OMRON

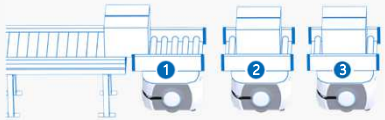
Made for Flexible Manufacturing Systems

Optimize Efficiency

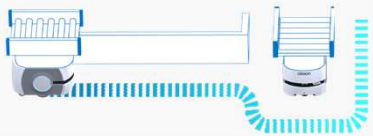
1. Intelligent Job Assignment



2. Managed Motion



3. Traffic Control



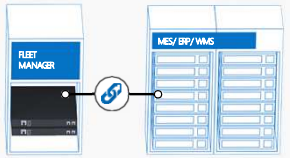
Maximize Uptime

4. Automatic Updates

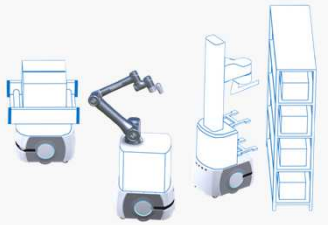
5. Charge Management

Increase Flexibility

6. Easy Integration with IT Systems



7. Skill Administration



Intralogistics integrated with your factory

OMRON

Plant Systems

MES/ERP/WMS

Application Integration layer

Developed using standard programming languages

Java C/C++ python

Fleet Manager

Open Interfaces

RESTful

RabbitMQ

PostgreSQL

Enterprise Manager

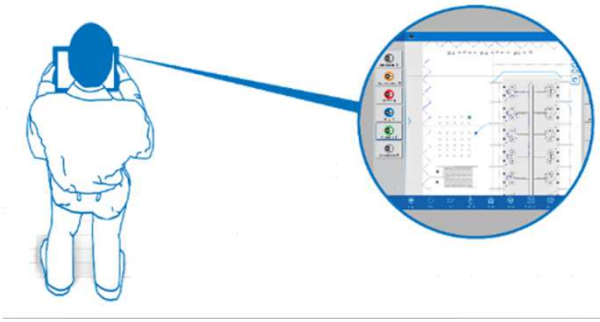
PostgreSQL

Shop Floor Lines/Machines

EtherCAT

EtherNet/IP

Proprietary Protocol



Fleet Simulator

Solve problems before they arise. Optimize your fleet before you deploy it.

- Simulates up to 10 robots, in up to three separate fleets
- Visualizes individual robot path planning and interaction with other robots
- Simulates custom environment based on real-world facilities
- Identifies traffic flow bottlenecks
- Program robots completely offline to optimize efficiency and validate software.

Made for logistics

Automotive

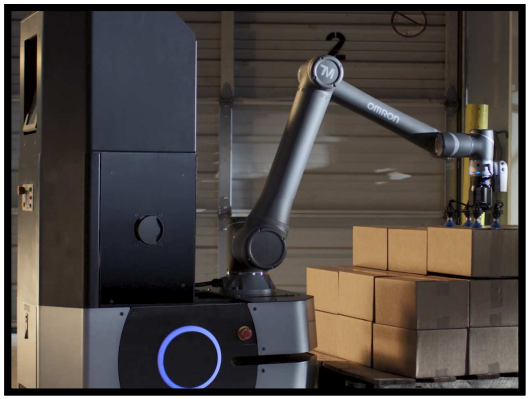
Digital

F&C

The entire logistic process automated with the **same technology** and the **same hybrid fleet**.

1. Lineside Replenishment
2. Work in progress
3. Finish Goods to pck. / inspect
4. Warehouse (recv. / ship.)

Heavy parts and pallets



Vola

Challenge/Application details

- Location: Denmark.
- Flexible manufacturing application of Taps for the kitchen and bath industries, operating 24/7.
- Need to move boxes very quickly from one place to another automatically to improve efficiency and lead time.
- Transport bill of material (BOM) and finished goods between OSR storage and assembly area.

Omron Solution

- 9 Mobile Robots LD-90
- Robots take empty totes out to the assembly area, then workers scan the totes to see what is going to be produced.
- Robots pick-up the finished goods and put them back to the warehouse.
- Fleet Manager.

Customer Benefits

- The new system automated 75% of transport, shortening the production lead time from as long as 42 days to a single day.
- VOLA can fulfill existing and new customer demands very quickly.
- For about a year after, the LDs have facilitated production, conveying between 1300 and 1600 boxes of parts and products every day.
- OMRON solution has improved flexibility, quality, safety, and efficiency.

Normagrup Technology S.A.

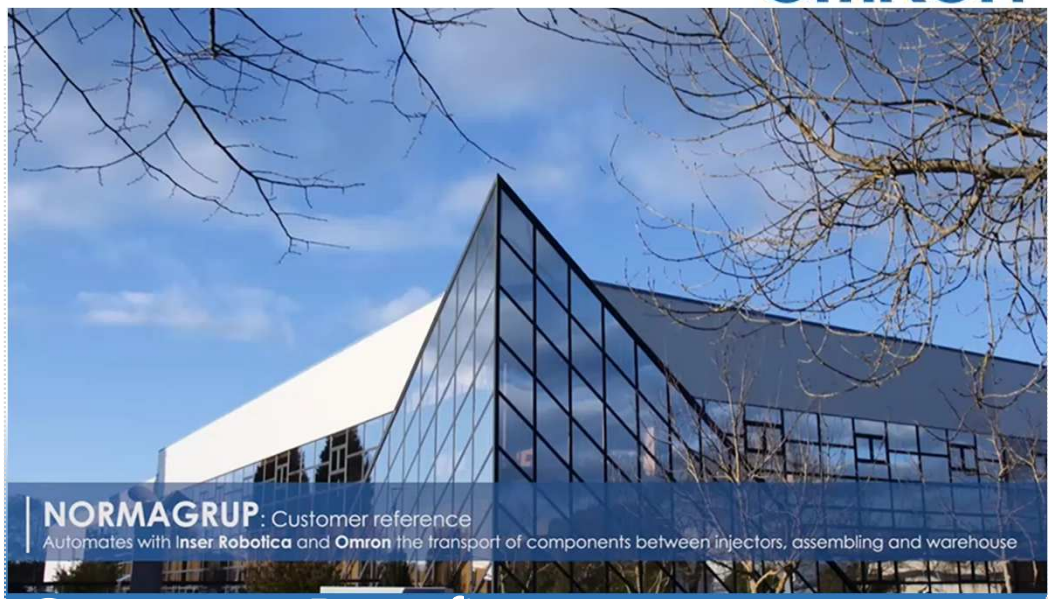
Challenge/Application details

- Location: Spain
- Normagrup is a manufacturer and specialist in technical lighting and emergency light.
- The client wanted to automate the material flow, from the injectors to the warehouse, from the warehouse to three assembly lines and from the lines to the warehouse.
- Operating 24h/5days
- Small space in the facilities.

Omron Solution

- 4 Mobile Robots LD-90.
- Fleet Manager.
- The client chose OMRON for:

- The flexibility of the solution.
- The possibility of working the 4 AMRs in confined spaces.
- And the ability of communication with the WMS of their warehouse.



Customer Benefits

- Production increase.
- Space optimization by reduction picking area.
- Reduction of manual transport time,
  - Improves production cost.
  - More safety for workers by eliminating hand trucks.
- Complete traceability of the product.

Skoda

Challenge/Application details

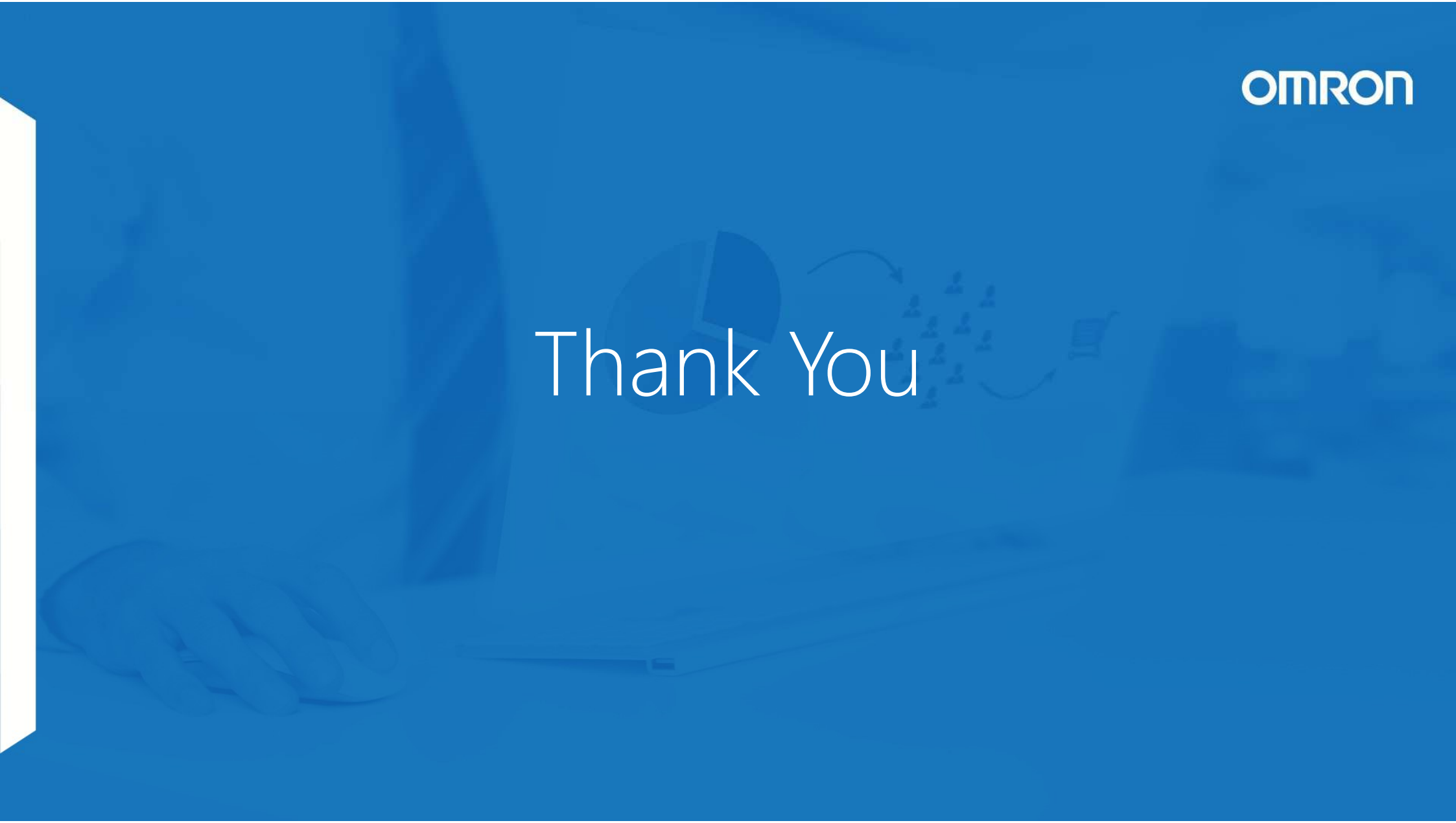
- Location: Vrchlabí, Czech Republic.
- The LD robot completes 120 trips per day and travels a total distance of 35 km between the mechanical measuring centre and the processing machines.

Omron Solution

- OMRON LD-130CT mobile robots.
- Customer wanted to move away from magnetic tape to an autonomous system, and in particular liked Mobile Planner programming.

Customer Benefits

- Demand increase led to higher capacity for the plants and more traffic in the production areas, leading to safety risks and fatigue for workers that had to continuously transport material from one part of the factory to another.
- Škoda expanded production and improved worker safety without increasing labor cost at the plant.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Thank You