

Autonomous mobile robots simplify intralogistics at Diva International

Diva International has upgraded the transport of wet wipes in its production facility using a machine controller and five autonomous mobile robots (AMRs) from OMRON. This has resulted in a safer, more efficient process, which keeps track of each step - from the order through to fulfilment in the warehouse.



For over 30 years, Diva International has produced and distributed products for personal care and cleaning. Based in Umbria, Italy, the company has grown considerably. Its production plant in Spello currently occupies 20,000 square metres. The site recently decided to deploy a new robotic system for palletising the wet wipes it produces, to optimise efficiency and the use of limited space.

The modernisation project was handled by FM Vision, which works closely with OMRON Industrial Automation. OMRON helped the company to develop a fully automated solution that uses five AMRs for loading and unloading packaged batches of wet wipes from the end of the line to the palletising stations.

The year-long development project also involved a complete revision of the control architecture. An OMRON Sysmac NJ machine controller (NX701) was installed to provide holistic management of the data, from ordering to fulfilment. A tracking history was also created for the plant's coordinated activities.

Improving end-of-line logistics

The new robotic system met Diva's need to upgrade its end-of-line logistics without having to expand the existing warehouse, which contains five production lines. The complete automation of the manual process of sorting the packages to pallets had to take into account a series of challenges in terms of safety, speed and cleanliness. The biggest challenge was to design a system for loading 12 cardboard boxes in the shortest possible time, whilst managing 60 different formats (from 40x60 to 400x600mm) and weights ranging from 300g to 12kg.



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Augusto Falchetti, Owner of FM Vision, observes: „A sorting and conveyor system for packages with such different formats would have proved too difficult, due to problems of space, cost and safety. A flow of 120 pallets, each with 70 packs, means that over 8,000 packs needed to be moved each day.“

Another challenge was that the production area had to be kept separate from the palletising area, due to potential contaminants and fire regulations. This was why the sorting operations were entrusted to five mobile robots from OMRON. These were programmed to transport the boxes leaving the production lines to the palletising stations.

Overcoming the challenges

OMRON's AMRs can move independently within the work environment, deciding which path to take to the destination. Their navigation system is based on a map of the premises and a dynamic reading of the environment. A laser scanner allows the AMRs to 'see' up to 15m away and at an angle of 250°. Their movements are managed by a series of sensors and controls. The big advantage over traditional automated guided vehicles (AGVs) lies in their ability to avoid obstacles, including people.

“All this translates into a dramatic reduction in waiting time,” explains Luca Polzoni, Data Analyst at Diva.

“When an obstacle is detected on the path, the robot can always find an alternative route by performing a recalculation in real time.“

An important part of the project focused on the engagement and disengagement operations between the AMRs and the conveyor belts at the loading and unloading stations. The challenges included some design constraints, as the robot wasn't allowed to move beyond 800mm from the conveyor belt.

The frame of the fixed station was therefore designed to have an adjustable height so that it could manage the batches of four boxes on each of three levels. Augusto Falchetti explains: “Between the trolleys mounted on the robots and the belts on the loading and unloading stations, the positioning has to be calibrated almost to the millimetre. The robot engages the trolley frame by intersecting its combs with those of the fixed station for the entire length of the belt. When the engagement is complete, the levels of the fixed station are raised by 2cm by a series of motorised rollers, which remove the packages from the robot.“

Everything happens within very narrow tolerances of position and speed. The robot's movement must be precise: even one degree of error could compromise the process. Therefore, magnetic strips with a maximum tolerance of

about one degree were used in the final section. The robot moves autonomously until it places itself on the magnetic strip, whilst the navigation system monitors the surrounding environment.

By using autonomous robots, FM Vision also minimised energy consumption. On average, the robots have been programmed to recharge every 20 minutes, going from a minimum of 70% residual charge to approximately 90%. This prevents the stop from being too long or too frequent.

In addition to the five AMRs, OMRON also supplied the Sysmac machine controller. This guides the whole process, from the arrival of the order to the sorting of packages on the palletising islands and their dispatch to the warehouse. It presides over all operations that involve interactions with the company's databases.

Paolo Capezzuoli, Field Application Engineer Motion Specialist at OMRON Industrial Automation Europe, says: "We worked with FM Vision to protect the whole system by isolating it in a software bubble. This creates a customised communication channel for interfacing with third-party software and managing the robot very easily, solving any difficulties generated by the machine programs and the stop and restart procedures. When the machine controller sees a problem in the real world, it can stop the palletising robot with a single stop sequence."

The most complex aspect involves the wireless communication with the AMRs for generating jobs. This activity passes through the mobile planner: a fleet manager developed by OMRON that assigns tasks to the mobile robots based on certain conditions (such as battery level and proximity to the pick-up point). It also defines the most intelligent routes for avoiding collisions and reductions in speed.

Once a task is assigned, there is direct communication with the AMR through the wireless communication protocol. From the user interface, all AMR data can be monitored. The machine controller informs each assignee of the relative position of the other robots, whilst allowing autonomy on the route. It can also be used to take advantage of a procedure for restoring and releasing missing or damaged packages through a special fault area: a 'free zone' in which pending tasks can be reworked.



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Increased efficiency, safety and flexibility

The new automated solution has enabled Diva to streamline its logistics operations, especially those related to transport from the end of the line to the palletising island. Without changing the space available, the company can now take advantage of two separate areas - one for the end of the line and the other for palletisation. These are connected continuously by the automated transport of the packaged products via the AMRs.

Luca Polzoni says: "The mobile robots self-adapt to the available slots and have the necessary certifications, including safety, to operate in the same environment as the operators. In about one and a half minutes, they complete their journey, which averages 10 metres, plus loading and unloading, carrying a dozen packages to the palletising island."

Apart from labour savings (allowing employees to be retrained for less menial tasks), the new automated system

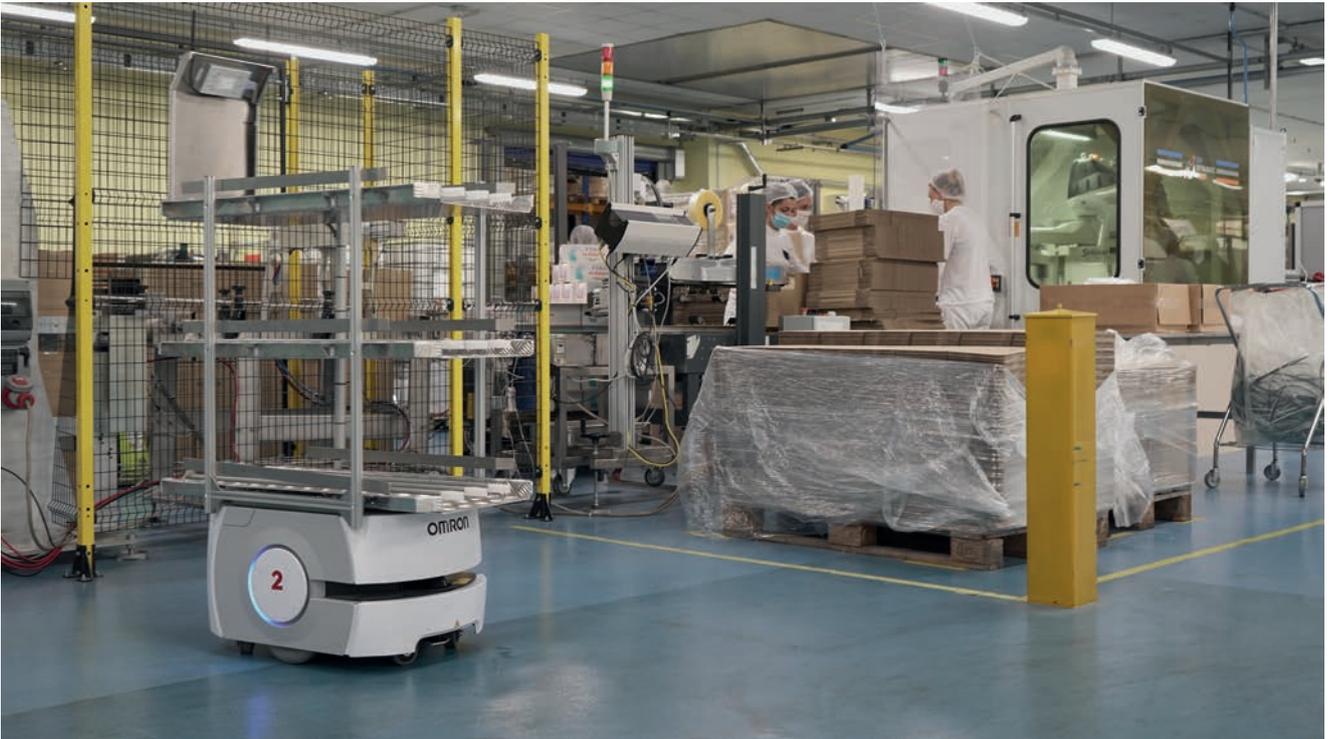
has helped to eliminate human errors relating to data management in the warehouse. It has also provided a more effective management of anomalies. The integration with the IT system is vital. On one hand, it takes the information for generating the production batch and bringing it to the forklift driver, who takes away the pallet. On the other hand, it recovers all the data and processing steps for traceability.

The flexibility of the OMRON robots, and the ability to create a dynamic association between the database and a real task, allow Diva to have a complete view of orders and individual data transfers from its information system. This level of integration allows the company to be open to the world of artificial intelligence - in which data isn't a simple repository of information but also a useful asset for improving application conditions.

Paolo Cocchioni, Diva International's Commercial Director, concludes: „For a world leader in the sale of wet wipes, it's essential to be able to rely on a level of automation that can support the production of about 60 million packs a year. This modernisation allows us to carry out the work even in the presence of staff, meeting deadlines whilst also complying with hygiene and safety rules.“



The AMRs can move independently within the work environment, deciding which path to take to the destination.



Results: A safer, more efficient process, which keeps track of each step - from the order through to fulfilment in the warehouse.

About Diva International

For over 30 years, Diva International s.r.l. has produced and distributed products for personal care and well-being, home hygiene and pet cleanings, both under its own brand and on behalf of third parties. In the Umbrian factory in Spello, the company follows every single design and production phase. The adoption of modern data detection, automation and robotics solutions allow the achievement of high production performance in compliance with rigorous quality standards for the finished product. In order to measure and reduce its ecological footprint, the company supports and develops sustainable projects for people and the environment, from the choice of materials to the resources used for the production and handling of its products. For more details, visit www.divaint.it

About FM Vision

FM Vision specialises in automatic inspection machines with artificial vision systems in the food, beverage and pharmaceutical sectors. The company has been involved since 1997 in the design and construction of machines and automatic systems for online quality control, using 2D and 3D artificial vision. FM Vision is the head of a consortium of companies with a high level of specialisation for covering all needs, from the feasibility study, to the design and production of mechanical and electrical components, through to commissioning. Since 2007, it had been an OMRON Solution Partner and since 2015 it has made use of a division (FM Vision Robotics) that designs and manufactures automatic end-of-line systems that use OMRON mobile robots and industrial robots. For more details, visit www.fmvision.it

About OMRON

As a leading company of automation centred on its proprietary Sensing & Control + Think technologies, OMRON Corporation is engaged in a wide range of businesses, including control equipment, electronic components, social systems, healthcare, and the environment. OMRON, founded in 1933, has approximately 30,000 employees worldwide and provides products and services in approximately 120 countries and regions. In the field of industrial automation, OMRON supports manufacturing innovation by providing advanced automation technologies and products, as well as through extensive customer support, in order to help create a better society. For more information, visit OMRON's website: www.industrial.omron.eu.