

Transport of Work-in-progress Materials in Different Stages of Semiconductor Manufacturing

Overview

AUTOMATION TO MEET FUTURE DEMANDS

The global semiconductor industry posted its highest ever annual total in 2020, with technology trends such as artificial intelligence, the Internet of Things and a data economy fuelling future growth for the industry in spite of macro-economic conditions. In a highly competitive industry, semiconductor manufacturers are actively seeking means and ways to automate processes and achieve high uptime.



The Worldwide Semiconductor Market was up 5.1% Year-to-Year in June 2020 to US\$34.5 billion.

Source: World Semiconductor Trade Statistics

ABOUT THE PROJECT

In a matured industry, back and front end semiconductor manufacturers are constantly pursuing productivity improvement tools to raise efficiency and in turn, boost revenues. The shifts in job expectations and a shrinking workforce have pushed manufacturers to redesign their value chains in order to deploy their current workforce to manage value adding tasks and find substitute methods to carry out mundane yet necessary work. Many companies are looking for flexible solutions to automate material transportation in their plants.

Challenge

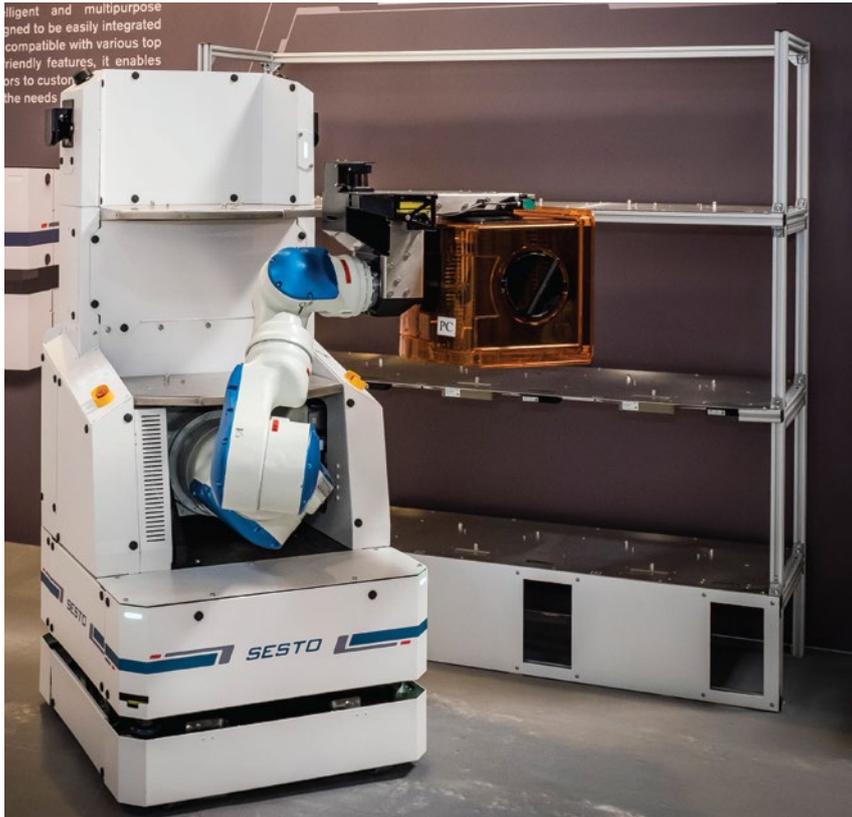
Semiconductor manufacturing plants are generally characterised by narrow passageways in production areas. Depending on the facility design, automation solutions that are introduced may need to work across building floors or traverse through long distances to deliver work-in-progress materials from one station to another.

As semiconductor plants run continuous shifts, deliveries of high value materials are made 24/7, at times among people and important equipment. Depending on the stage of production, activities related to item transportation can range from loading a FOUP weighing at least 9 kilogrammes onto machines in clean rooms, to pushing trolleys loaded with heavy tote boxes containing a variety of semiconductor components.

Solutions

SESTO Robotics has developed strong understanding of both front and back end processes of semiconductor manufacturing over the years. To cater to the different requirements at different stages of production, SESTO Robotics has deployed several types of SESTO Autonomous Mobile Robots (AMRs) for various companies.

EQUIPPED WITH A 7-AXIS ROBOT ARM FOR MACHINE TENDING APPLICATIONS



SESTO AMR equipped with 7-axis robot arm

To enable the plant's transition towards lights-out manufacturing, a fleet of SESTO AMRs are deployed in a clean room to carry out machine tending functions. Integrated with the factory's enterprise resource planning system, the AMRs are each equipped with a 7-axis robot arm to autonomously swap FOUPs between the stocker, multi-tier rack and tooling machines within a limited space. This has resulted in reduced machine idling time and improved traceability of payload.

The AMRs' dual charging options allows for operational flexibility where users can choose between auto-docking and a manual hot swap for high uptime. With its high level of intelligence and mature fleet management system, the AMRs optimise operational processes and improve efficiency.

In addition, safety lasers on the AMRs provide 3 dimensional coverage to ensure the safety of operators working alongside the AMRs in the clean room.

Solutions

AUTOMATED TRANSPORTATION OF LOTS BETWEEN DROP POINTS & TEST STATIONS

SESTO AMRs designed to autonomously transport lots placed on trolleys are deployed in a wafer production plant to address manpower challenges and enable the plant to become a smart factory.

The AMRs are integrated to the production's scheduler and dispatcher to automatically transport the loaded trolleys between the drop points and test stations, freeing up the operators to focus on value-adding tasks.



(L) Front view of Sesto AMR designed to autonomously transport trolleys
(R) With trolley placed on Sesto AMR

AUTOMATED TRANSPORTATION OF TOTE BOXES

SESTO AMRs with shelves are also introduced to help operators transport heavy tote boxes to various parts of the manufacturing plant. These AMRs are designed for heavy-duty use to cover about 40 kilometres of distance daily, reducing fatigue that may have otherwise been experienced by the operators.



SESTO AMRs with shelves to hold heavy tote boxes, covering long travelling distances daily