

PROCESS OPTIMIZATION

SUCCESS STORY

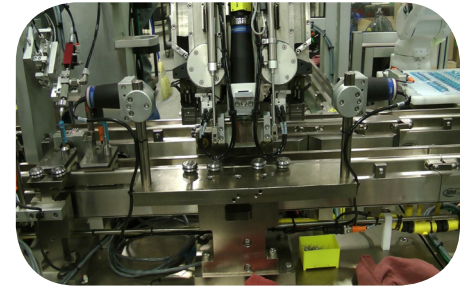
INNOVATIVE CONVEYING SYSTEM FROM MAGNEMOTION REDUCES COST, IMPROVES FLEXIBILITY IN MEDICAL DEVICE AUTOMATED ASSEMBLY SYSTEM

Systematix Inc. designs and builds turnkey factory automation systems for demanding industries such as automotive, pharmaceuticals, and medical devices. When their customer, a company prominent in the medical device industry, engaged Systematix to provide a new, fully automated assembly and inspection system for a single-use specialty medical device containing a needle and vial, the Company developed a flexible automation system with the help of MagneMotion's MagneMover® LITE (MM LITE™) Intelligent Transport System.

The end customer was already manufacturing this device and needed a second production line to provide additional capacity. The assembly process consisted of several steps, including mechanical assembly, adhesive application and cure, and

- Performing automated inspection of components and in-process assemblies with rejection of nonconforming parts
- Maintaining a 2.5 second cycle time
- Operating inside an ISO 7 (Class 10,000) clean room
- Assembling at least two devices in the product family without significant changeover time or labor input
- Minimizing the capital outlay, while still providing for a robust assembly process
- Minimizing operating costs by reducing labor to a single operator, and minimizing scheduled maintenance and spares requirements
- Maximizing Mean Time Between Failures (MTBF)
- Minimizing cost and effort required for validation of the process

To achieve the customer's goals, Systematix developed the appropriate level of automation to achieve the varied requirements: flexibility to handle different assemblies, ability to scale up as needed, and operation by one person. Major factors in the successful design and implementation of this system were the inclusion of in-process sensing and the use of an innovative conveying technology, MagneMotion's MM LITE system.



Sensing and Measuring in Place

Systematix integrated sensing/measuring/inspection operations throughout the line, using various technologies to monitor the process, including:

- Mechanical gripping devices that sense part presence
- Load cells and LVDTs to measure force/displacement and ensure processes produce the correct profiles
- Machine vision to detect nonconforming parts so they can be removed from the process, and to monitor product integrity at various points in the process to verify the product has been correctly assembled and not damaged during assembly

Flexible Material Handling with a Linear Synchronous Motor System

To maximize system flexibility, Systematix chose an innovative conveying technology, the MM LITE linear synchronous motor intelligent transport system, from MagneMotion Inc.

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Michael Becker, President at Systematix.

robotic placement into packaging at the end of the line.

The customer's requirements for the finished system included:

- Reliably assembling an intricate product accurately and consistently

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An MM LITE system consists of individual carriers (pucks), the guideway they run on, and the electronics that control their motion. MM LITE operates on the principle of linear synchronous motor technology. A conventional electric motor consists of a cylindrical stationary part on the outside, which contains electrical windings, and a cylindrical rotating part inside, which consists of permanent magnets. When current is driven into the windings of the outside part (the stator) it interacts with the inner part (the rotor) and creates an electro-magnetic field. This field rotates the inner part and creates torque which drives a gear box or similar mechanical assembly. A linear synchronous motor is similar in that there are electrical windings and magnets, but instead of a cylindrical geometry, it is a linear geometry, with a permanent magnet on a carrier resting slightly above the electrical windings and supported by wheels or some other low friction support. As current is driven into the windings and interacts with a permanent magnet, the electromagnetic field creates thrust, which propels the vehicle either forward or backward depending on the direction of the current. A unique feature of a MagneMotion system is that there can be many carriers and many motors, and each carrier

can be individually controlled.

Modular motors and guideway segments fit together like model train tracks. The system's compact size allows for a smaller footprint. It is not uncommon for MagneMotion's customers to realize a 20 to 40 percent reduction in system footprint. The control system manages the speed and direction of each carrier individually and keeps track of its location. The carriers are the only moving parts of the MM LITE system; they operate with a very low coefficient of friction, and do not require lubrication, a definite advantage in the clean room environment.

In the new assembly automation system, MM LITE carriers are fitted with fixtures to handle the two product orientations used during assembly. The carriers have a payload capacity of 1 kg (2.2 lb.) and can travel at speeds up to 2 m/s (6.5 ft/s). This is about 10 times faster than a conventional belt or plastic chain conveyor. Since the carriers move independently, they provide maximum flexibility to the conveying system, allowing optimal use of each process station, as well as the ability to buffer product between stations as needed. The use of a "diverge" module simplifies the removal of rejected parts from the main line. These merge and diverge

"switch" modules are another unique facet of the MM LITE system that offer unparalleled flexibility to customers.

Results

The new flexible automation system from Systematix met or exceeded the customer's original requirements. The use of MM LITE resulted in improvements and/or savings over a conventional fixed-automation solution including:

- 20 fewer redundant tools, for a capital cost saving of 28 percent
- Only one operator required
- Floor space reduced by 50%
- Validation cost reduced by 46%
- Flexible process for assembling three different products on the same line
- Expected reduction in costs for scheduled maintenance
- Anticipated increase in MTBF for the system

"Using MagneMotion's MM LITE system gives us a unique advantage over power-and-free or indexing motion platforms," said Michael Becker, President at Systematix. "The ability to move both asynchronously and synchronously enables one-up, two-up, or three-up processing. We can balance the line without redundant stations and save significant overall project costs."