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Latest Smart Transport Technology Moves Assembly Operations into Factory of the Future

Whether a company is producing automotive brake systems, display screens, refrigerators or ventilators for ICUs, manufacturers need efficient throughput combined with high levels of automated tracking and process control. The goal: assembly processes that are as close to error-free as possible.

Such optimized processes help global manufacturers maintain a competitive edge as they face constant pressures to increase production in shorter time frames while managing costs and profitability. In response, many are investing in new technologies to improve productivity and provide greater flexibility to respond to changing market trends.

One area where new solutions and tools are becoming available is material transport systems. The newest generation of conveyors and transport systems incorporate features that can enable new kinds of automation for a wide range of manufacturing and assembly applications. These transport technologies are one more tool that will help manufacturers evolve their operations to take full advantage of Industry 4.0 Factory of the Future capabilities.

Introducing ActiveMover

Bosch Rexroth has created a dynamic linear motor transfer system that transports products with great speed and precision. ActiveMover improves processes by enabling shorter cycle times and transporting higher payloads, up to 10 kilograms (kg). These advanced capabilities increase process quality, productivity and profitability, with every single workpiece.

The ActiveMover transfer system sets new standards of performance through:

- **Precision:** The integrated measuring system enables exact positioning of workpiece pallets without additional indexing.
- **Speed:** High speed and faster pallet changes result in shorter cycle times – with cycle times under one second possible.
- **Strength:** The rugged design and powerful drive that can generate propelling forces up to 160 N allows easy process integration for a wide range of applications.
- **Flexibility:** It can be connected to any control system, and every pallet is freely programmable and simple to change out.

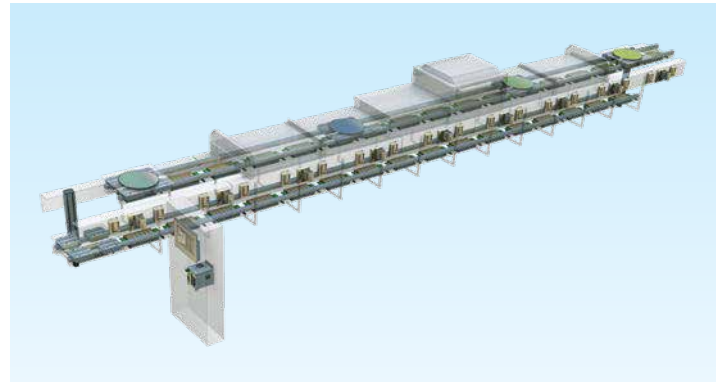
ActiveMover is an innovative transport technology designed to help manufacturers advance their operations and make the Factory of the Future a reality.

DEFINING THE FACTORY OF THE FUTURE

The Factory of The Future is an intelligent and highly agile vision for manufacturing that is being rapidly implemented across multiple industries. It involves digitalized and fully networked production systems that equip plant operations and management with the real-time, in-depth information they need to maximize the value and performance of every machine and production unit.

As with other critical automation systems, material transport technologies are incorporating Industry 4.0 capabilities through built-in sensors and more advanced controls. Sophisticated software collects, transfers, and processes data in ways to provide both production transparency and actionable answers to questions about production bottlenecks, inefficient workflows and equipment in need of preventive maintenance.

Bosch Rexroth has been at the forefront of developing and updating its technologies – from industrial hydraulics and automation controls to linear technology and material handling systems – to fully support the Factory of the Future vision in its own manufacturing facilities while helping other manufacturers benefit from these capabilities as well.



Global manufacturers are investing in new technologies to improve productivity and provide greater flexibility to respond to changing market trends, such as material transport systems. The newest generation of Bosch Rexroth conveyors and transport systems incorporate features that can enable new kinds of automation for a wide range of manufacturing and assembly applications.

CAPABILITIES OF CURRENT TRANSPORT SYSTEMS

Depending on the type of product being produced, manufacturers and product assemblers use a mixture of manual and automated production processes to go from raw materials and components to finished products. Standard conveyor systems used in these operations typically include twin-strand conveyors like the Rexroth TS family of conveyors or flexible plastic chain conveyors like the company's VarioFlow *plus* platform.

These systems can transport loads of 10 kilograms or more, which satisfies the requirements for a broad range of assembly operations, such as automotive parts or battery production. Typical transport speeds are 10 to 12 meters per minute and use diverters to offload products or components at workstations or assembly systems.

The line of TS conveyors includes a range of systems designed to transport different pallet sizes and item weights, from disk drives to solar panels. All TS models are pallet-based, non-synchronous conveyors designed to improve manufacturing productivity and product quality while allowing for maximum assembly flexibility. The latest generation of TS conveyors offers an expanded set of modules and built-in capabilities for wider applications and Industry 4.0 solutions.

As the easiest to assemble, quietest, most flexible and energy-efficient plastic chain conveyor available, the VarioFlow *plus* provides a modular transport option, particularly well-suited for high-volume packaging operations. It is often used for consumer goods such as tea, crackers, aspirin and shampoo.

Designed to work in tight footprints and complex production lines, its modularity allows for many combinations. Users have the freedom to move products horizontally, vertically, on an incline or decline, overhead, sub-floor, around obstacles and over long distances.

While for some operations this kind of transport is suitable, companies seeking to implement Industry 4.0 capabilities may require even greater flexibility and automation. Most conveyors are powered by AC motors turning at a constant speed, moving in one direction. Products are transported in totes or on pallets and are delivered to set points along the length of the conveyor through mechanical or pneumatic stops or diverters.

Tracking products on these systems often involves attaching RFID tags, either directly to the product being transported or to a tote, which sometimes contains multiple items. Industry 4.0 manufacturers want product by product detail and the ability to track and document how every component in every device was handled, integrated, and tested throughout the production process.

These standard conveyors offer the most benefit to production systems or uniform lines that don't require frequent changes. The speed, flow of manufacturing and throughput is determined by the upper limit of the conveyor. And it can sometimes be more difficult and time consuming to modify these conveyors, for example adding an assembly station or an automated seal insertion machine into the production flow.

ADVANTAGE OF INDUSTRY 4.0 TRANSPORT SYSTEMS

Bosch Rexroth developed the ActiveMover system to supply greater flexibility and automation in Industry 4.0 manufacturing. This system supports much faster throughput and more efficient use of costly manufacturing floor space while making it easier to track material transport

activities and communicate that data to plant management systems for documentation and analysis purposes.

ActiveMover uses advanced linear motor technology to provide significantly increased transport speeds, as well as ultra-precise stop points. The system uses a revolving linear motor with vertically mounted workpiece pallets. Each workpiece pallet's motion can be individually defined, with high repeatability of individual stopping points within ± 0.01 millimeters.

The ActiveMover features an integrated measuring system that allows for precise indexing of the pallets, eliminating the need for additional lift and locate units. Stop positions can be configured in software anywhere around the system, even in curves. This feature greatly increases the process quality, productivity and efficiency. Equally important, the system can support transport speeds up to 4 meters per second, which are significantly faster than many standard conveyors.

Bosch Rexroth makes it easier to configure the right ActiveMover system for a manufacturer's unique operational requirements. The ActiveMover pro (AMpro) software tool interfaces with ActiveMover and can be used to program many machine features.

The AMpro system also features a simulator that allows users to create a "digital twin" of their machine: they can calculate power consumption, cycle time, quantity of pallets and power units, and fully program the system – defining motion sequences, stop positions, move configurations and many other system functions – before hardware is installed.

Since each pallet is independently programmable, its position can be tracked and documented with 100% accuracy. These types of systems also pack a lot of functionality into tight footprints: Some installations have replaced multiple conveyors with a single linear transport system and saved nearly 40% of the plant's floor space.



Bosch Rexroth's ActiveMover is a highly dynamic, flexible transfer system based on linear motors. ActiveMover unlocks the potential to increase productivity for small batch sizes, thanks to its quick and precise positioning of workpiece pallets.

THE CHALLENGE: A fuse holder manufacturer required automatic conversion of part feeding and wanted to integrate fully automatic processes into fuse holder production.

THE SOLUTION: A fully automatic assembly line with ActiveMover transfer system from Bosch Rexroth channels 20 workpiece pallets at speeds of up to 40 m/s² asynchronously through the processing stations.

THE RESULTS: The highly dynamic solution moves fuse holders in the shortest transport times possible: the cycle time at each station for each component is less than three seconds. The manufacturer is now able to assemble 40,000 fuse holders in up to 94 different varieties each day.

Manufacturers who have installed these types of transport systems have been able to dramatically improve productivity and reduce cycle time since the system has much faster throughput speeds. The ability to independently program each pallet means that changeovers from one product to another, with changes to station stops, are much faster and simpler.

Also, Bosch Rexroth's ActiveMover system works with many high-speed automation busses, such as ProfiNet and Ethernet IP, and EtherCAT. These interfaces allow easier integration with a device manufacturer's existing machine communications backbone, as well as connecting to edge-computing devices such as IoT gateways that many Industry 4.0 operations are implementing to collect and integrate data from across the factory floor.

CONSIDER FACTORY OF THE FUTURE TRANSPORT SOLUTIONS

As medical device manufacturers explore ways to integrate the latest Factory of the Future technologies into their operations, and increase the use of automation to improve manufacturing productivity and flexibility, this new generation of material transport systems can become a valuable tool that is relatively easy to implement.

Instead of treating material transport after the fact, these types of systems can become the foundation for expanded and more versatile automation solutions, enabling device manufacturers to build their process steps, process speed and process cycles around the system's full range of capabilities.

One way to ensure success is to work with knowledgeable suppliers whose technology is fully aligned with Factory of the Future concepts. This includes having a deep understanding of lean processes and principles and how to use technology within a lean operation to maximize the outcomes of continuous improvement processes.

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