



# Smart Conveyance and the future of **intelligent factory automation**

Maximizing manufacturing production  
through integrated, automated solutions

# Take control of your manufacturing

As manufacturing evolves, automakers are expected to do more with less.

**Meeting the demand for fast, flexible and customized operations requires manufacturers to use updated flexible, cutting-edge processes.** To accomplish this, they must drive integration and create differentiation throughout the entire manufacturing process. This is difficult because many traditional automotive manufacturers rely on antiquated, chain-based conveyor systems in their assembly process and don't have infrastructures in place that can safely connect, manage, validate, and optimize all aspects of their production.

Moving large parts across the plant floor, unforeseen safety incidents, and inconsistent transport systems can often slow down production and cause loss of production efficiency.

Yet, this is how most manufacturers currently operate, with no foreseeable plans to improve.

What if your factory could better meet these evolving demands? Do you know what the factory of the future looks like? Do you know what it takes to make sure that your operations have the necessary flexibility for highly specialized applications and numerous customizations?

**The solution may surprise you...**



# Shift into gear

## What is Smart Conveyance and why it matters

Installing a new automotive conveyor system independent of the rest of your enterprise is like having an iPhone without service. You can't maximize the phone's full potential if you don't have a way to connect it to a larger network.

Automotive manufacturers in the U.S. have traditionally relied on either belts, gears, or chain-based conveyor systems to advance vehicles through the assembly process.

These solutions have limited flexibility, waste energy and can lead to excessive maintenance costs and downtime.

New advances in independent cart conveyance – based on linear motor technology – are showing substantial gains for manufacturers. Smart Conveyance provides value by combining several features into one platform, boosting the level of performance and productivity over that of traditional conveyance. Linear motor technology powers the new platform by using MagneMotion®

Independent Cart Technology. The result is a servo system that gives you independent control of all shuttles; it's fast and precise, more dependable, and it's incredibly flexible in terms of scalability and process flows. **How?**

Linear motor technology brings end-to-end configuration of conveyor components, creating an electromagnetic force to index carriers more rapidly than traditional systems. Maintenance for the linear motors is reduced as a result of components that don't wear or contact each other. But linear motors are only half of the story – intelligent motion control brings critical improvements to productivity, flexibility, and sustainability.



# Linear Synchronous Motors

Compared to traditional conveyance, Linear Synchronous Motors (LSM) bring necessary innovative solutions to meet evolving manufacturing demands.

You can unlock the potential of Linear Synchronous Motors with Independent Cart Technology (ICT) which replaces complex mechanical systems with simple, useful software profiles redefining speed and flexibility in automation through software modules and ICT mechanics. They present another intelligent and efficient alternative to traditional conveyor systems that are widely adopted and used within various consumer industries and critical OEM applications.

Traditional Conveyance	vs.	LSM (Linear Synchronous Motors)
Customized lengths, not scalable or modular	<b>HARDWARE</b>	Highly scalable & modular
Typically slow. Constant and variable speed when using VFD (Variable Frequency Drives)	<b>THROUGH PUT</b> (Velocity, Acceleration)	<b>Faster acceleration station to station (2.5 m/s) [5.6mph] and 9.8m/s<sup>2</sup> [1.0g]</b> Multiple modes: Indexing, synchronous, asynchronous
Crude simulation, requires recise knowledge of line, each intersection requires station programming (PLC)	<b>TIME TO MARKET</b>	Full line simulation: High speed single part or batch transfer. Built in track and trace capabilities
PC based. Pre-determine moves, decision points & stops and starts required	<b>SOFTWARE</b>	Comprehensive code libraries. Reduction of program complexity, ideal for complex vehicle routing. Anti-collision & automativ queing built-in
Large radius curves. Requires buffer zones to meet similar Magnemotion throughput	<b>FLOOR SPACE</b>	20% to 30% reduction in floor space = more production / sq-meter. No need for buffer zones
Conveyor is constantly moving. Motors are fully engaged when power is on. Saves energy when VFD is used	<b>ENERGY EFFICIENCY</b>	30% to 40% reduction in power consumption - inactive componants do not draw power
100's of moving parts, belts/chains require tightening. Significant spares inventory.	<b>MAINTENANCE &amp; RELIABILITY</b>	No moving partd, higher machine reliability, highest OEE (Overall Equipment Effectiveness) available
Creates dust and debris. Lubrication is necessary.	<b>CLEANLINESS</b>	No particle generation, Frictionless, contactless and clean

# Independent Cart Technology

In automotive assembly, Independent Cart Technology (ICT) provides an essential piece of your new factory's workflow. ICT technology gives control over positioning, and by using independent carts that ride on a roller supported track, enable multiple products on the same line. They use integrated position sensing to allow independent control of separate carriers on a loop-style track.

And the improvements are almost immediate:

**40%** productivity increase

**20%** energy savings

**30%** floor layout savings

Benefits	Independant Cart System Feature
Throughput	Fewer mechanical components and linkages creates higher speed. Higher speeds (2.5 m/s)[5.6 mph] combined with fully controlled motion profiles for better carrier positioning.
Flexibility	Each moving cart is controlled independently. Flexible mechanical pitch enable the machine to handle multiple package/format sizes at once with full control package.
Constant Carrier Tracking	Integrated track and trace system. Software contolled carts with precise caty positioning eliminate external sensing with complexed tracking solutions.
Increased Uptime	Elimination of mechanical linkages and components allow minimal number of moving parts. It reduces overall downtime, maintenance and energy consumption.
Simplicity	Software controlled carts reduce need for components such as sensors, actuators, stops, etc.



## EXAMPLE:

The PULSE carrier conveyance system by KUKA, which was created for automotive body assembly lines. **This conveyor uses linear synchronous motor technology from MagneMotion technology to enable fully independent control over each carrier on the track.**



## Autonomous Guided Vehicles

Another smart conveyance solution available to manufacturers are Autonomous Guided Vehicles (AGVs). As part of an ICT system, AGVs perform material handling tasks, such as transporting pallets, rolls, racks, carts, and containers, automatically without human intervention via routing data from the MES. These AGVs are a critical piece of an operation that allows manufacturers to start realizing the true potential of a factory built for the future.

AGVs are industrial autonomous guided vehicles that navigate on their own without human intervention and follow fixed paths or can freely navigate throughout a facility. Additionally, these AGVs offer flexibility that would never be seen in traditional automotive assembly lines. As information-enabled machines, these AGVs fully integrate with end-user information systems (MES) and are an intelligent solution that, as part of a larger Connected Enterprise, provide real-time data to manufacturers. As an alternative to traditional conveyor systems, autonomous guided vehicles (AGVs) greatly reduce the construction costs and limitations of chain-based systems.

They provide dependable, easy-to-integrate solutions based on proven industrial-standard products and technologies for facilities that are looking to optimize and streamline steps in their manufacturing process.

This doesn't just affect the Automotive industry. Those in the Defense and Consumer Product Goods industries are forced to explore what new technologies are available and what solutions to apply.

### SOME OF THE CHALLENGES THEY FACE INCLUDE:

- The need for flexibility in manufacturing operations due to customization
- Demand for consistent interface across End-User systems
- Increased workforce safety and productivity

CONTINUED...

## THEY TRANSPORT:

- Raw materials from receiving to storage, and from storage to production
- Work in progress and intermediate products in between production steps (for auto manufacturers)
- Finished products from the end of the production line to shipping



So, what problems does intelligent conveyance help solve? When done correctly, you can increase production flexibility and speed, reduce floor space and downtime, reduce capital equipment, decrease products you need in stock and improve profitability, productivity and overall ownership costs.

Manufacturers can now resolve production issues in the short term, and with ICTs and AGVs as smart conveyance solutions, also transform them into operational advantages in the long term:

- ↗ Increased productivity, safety, and more efficient line operation.
- ↙ Reduce downtime and MTTR (mean time to repair)
- ↙ Reduced direct labor costs and capital acquisition costs, minimizing tow motors.
- ↗ Improve manufacturing flexibility and efficiency
- ⇒ Faster speed to market



# Making the connection

## Smart connected machine solutions

While ICT addresses the issues of safety, flexibility and easy integration for conveyor systems, it also plays an important part in building your connected facility of the future. Making sure that your production is functioning, optimized and compliant is only possible if you're able to pull all that data into one place. You can meet common challenges and drive out variability using a Manufacturing Execution System (MES).

MES is software that integrates your production and business systems across your enterprise. And as important, it turns all your raw data into actionable information for better visibility and data-driven decision-making.

However, managing and making that data useful for the right purpose, at the right place and time, is challenging. FactoryTalk® InnovationSuite is a comprehensive portfolio that brings scalable analytics, machine learning, Industrial Internet of Things (IIoT) and augmented reality (AR) to industrial operations. InnovationSuite makes it easy to connect data so you can improve operational

insight across your business. Additionally, it helps you turn these insights into actions. It blends advanced analytics with information from your MES to add context to your analytics, supporting quality, compliance and continuous improvement initiatives.

But before you construct a system using this data in the physical world, you can test it in a virtual one and manage any unforeseen risk. Emulate3D's software enables you to virtually test machine and system designs before incurring manufacturing and automation costs and committing to a final design.

In a fully Connected Enterprise, an MES is the heart of the operation, connecting all aspects of production in your facility. Incorporating InnovationSuite and Emulate3D™ enables you to easily access real-time data to make better decisions and improve your manufacturing operations. Additionally, it can connect, manage, validate, and optimize all aspects of production while confirming you meet your productivity, quality, compliance, and cost-saving goals.





## MES case study

Wanli, a global tire manufacturer, implemented the first full-process MES system in the domestic tire industry. By implementing a Rockwell Automation MES solution, Wanli saw the following improvements within one year:



Single tire production time reduced from 48 to 30 hours, with a per capita annual output value of \$480,489



Product qualification rate is 99.99%



Saving 400,000 tons of water per year

After Wanli leveraged adopted Rockwell Automation's MES solution, they were able to streamline and enhance their operations to confirm they reach their goal of achieving a 2 million annual production capacity.



# Enabling you to do more with less

## Achieving your success now and in the future

Whether you're an experienced company looking to take the next step in your manufacturing operations or a new business looking to get started, we can help. No matter if you're looking to connect your factory and plant systems or easily pull data from across your operations, we're with you each step of the way.

With a connected, streamlined production system in place, you can deploy customized, connected smart technologies, such as an MES and ICT, that allow your operations to run faster, with more flexibility and reduced safety incidents.

**Some of the solutions we offer include:**

### Rockwell Automation Technology

We offer a broad range of scalable technology and tools for your AGV solutions. These encompass everything from your AGV control platform up through the MES layer. And for the AGV, the technology package incorporates safety component, sensors, Servos, I/O and VFDs.

### Application Support

Take advantage of our OEM Team Assistance, which allows you to discover and specify the right Rockwell Automation hardware and software. It also allows you to shorten the learning curve of Rockwell Automation products, create standards, naming conventions, and most importantly bring products to market faster while driving innovation.

### Automation Solutions

Geared for the OEM or EU who currently has an AGV solution and is looking for a collaborator to help integrate to PLC or other software solutions. Using our PartnerNetwork™ program brings you system integrators and solutions providers.

# Let's build something great. Together.

**Teaming up with Rockwell Automation can help you bring your factory up to speed and prepare it for necessary changes and updates as manufacturing continues to evolve. We connect the imaginations of people with the potential of technology to expand what is humanly possible, making the world more intelligent, more connected and more productive.**

Get answers to your questions on sales, products, services and technical support. **Find out more**

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**rockwellautomation.com** — expanding **human possibility**™

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