PRIMX

AGVs & ASRs: Misconceptions in Modern Warehouse and Distribution Flooring Specifications

Ecommerce experienced booming growth in the second half of the last decade—as annual ecommerce sales soared from $1.54 billion in 2015 to a projected $4.2 billion by the end of this year.[1] In order to keep up with the speed of fulfillment expected by modern ecommerce consumers, distribution centers began moving full steam ahead toward Industry 4.0 technologies.

The Race to the Top

86% of manufacturers and warehouse managers believe that smart solutions will be the main driver of competitiveness in five years.[2]

Industry 4.0—Here Come the Robots

The fourth industrial revolution, Industry 4.0, is the latest in a series of major technological advancements since the first Industrial Revolution was powered by the steam engine in the 18th and 19th centuries. Industry 4.0 is characterized by IoT sensors and automated robots that promise to help uncover new efficiency through actionable insights collected at every point in an operation's workflows.

Now, COVID-19 is renewing interest in warehouse automation and accelerating the adoption of innovative technologies to minimize health risks to warehouse workers and maximize distribution output at a time when many consumers have turned to online shopping as a safer alternative to in-person retail experiences.

Building a futuristic warehouse requires careful consideration of infrastructure needs from the ground up. Industry 4.0-friendly facilities begin with future-ready floors—massive surfaces that can handle self-driving forklifts, automated guided carts and autonomous mobile robots—offering trusted reliability across the entire operation.

Here are three foundational flooring principles every warehouse operation should consider when preparing its facilities for successful Industry 4.0 adoption.

[1] https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/
[2] https://www2.deloitte.com/us/en/pages/consulting/solutions/the-smart-factory.html#

1. Silence the Static:
Promote IoT Connectivity

Connected, autonomous vehicles offer more than simply unmanned labor. These autonomous mobile robots (AMRs) can also help make the entire distribution center operate more efficiently.

For example, autonomous pickers or tow tractors powered with IoT sensors can wirelessly transmit data to internet-connected systems that empower warehouse facilities to track, allocate and move stock-keeping units (SKUs) like never before. With the right combination of automated tools and advanced analytics, distribution centers can better understand their own processes and make adjustments in real time to improve material flow.

However, many warehouse facilities—particularly older facilities —were not designed to facilitate digital communications between AMRs and connected systems. As a result, their flooring, and other features, may disrupt the communication channels required for automated workflows.

According to one analysis measuring overall equipment effectiveness (OEE), the average warehouse only operates at **60%** of its theoretical capacity.[3] IoT technologies can help uncover valuable efficiency gains.

Fact or Fiction:

An IoT system will experience interference where warehouse floors have been reinforced with a steel fiber content higher than 35-50 lbs/yd³?

FICTION: While a typical automated guided vehicle (AGV) statement will note a steel fiber content limit of 35-50 lbs/yd³, this metric does not account for all fiber volumes—including the innovative steel fiber system used in PrimX floors. PrimX floors offer steel fiber content in the range of 60-70 lbs/yd³, yet they have not encountered a single case of AGV connectivity issues.

This phenomenon, called the "antennae effect," stems from the belief that the use of steel fiber, above approximately 50 lbs/yd³ in warehouse flooring, can disrupt IoT communication between these connected systems and AMRs as they move throughout the facility. While the specific threshold noted above is not true when steel fiber reinforcement is used, the principle applies to warehouse facilities that use rebar reinforcement with steel continuity.

The Solution?

The PrimX system leverages a floor composition that eliminates any potential IoT interference. It uses smaller steel fibers throughout the floor composition rather than larger, continuous reinforcing steel, which promotes floor strength—without the negative side effects.

PrimX Floors in Action:

Client: John Deere
Location: Sweden

One of the first warehouses ever fitted with PrimX flooring, John Deere's 200,000 square-foot facility in Sweden contains flooring with a fiber dosage of 67 lbs/yd³. In more than 10 years of operation, this facility has experienced no known issues of wire-guided truck communication interference.

[3] https://www.cbinsights.com/research/future-factory-manufacturing-tech-trends/
[4] https://www.cbre.us/research-and-reports/US-MarketFlash-Warehouse-Modernization-Early-Stages?utm_source=Media&utm_medium=NewsRelease

2. Freedom to Move:
Facilitate AGV Navigation in the Warehouse

At the center of the hyper-efficient warehousing and distribution center practices is the concept of material movement. Material movement, closely linked to material handling, emphasizes the importance of SKU transportation processes in warehouse and distribution facilities.

Adaptations in material movement processes are one of the simplest ways to increase facility performance—while also addressing growing skilled labor shortages in the distribution center. As mentioned earlier, AMRs and AGVs allow warehouses to introduce unmanned workflows, which can help reduce reliance on human labor for routine material handling tasks—such as the transporting of materials between warehouse kitting stations.

Jobs & The Automated Guided Vehicle

While the sci-fi genre might have you believe differently, in most cases, AMRs and AGVs aren't actually replacing human jobs. Rather, they're working alongside human employees to make distribution centers and warehouses more efficient.

One of the most common tasks on the warehouse floor is the horizontal movement of SKUs. By allocating this task to autonomous vehicles, warehouse workers are freed to handle more complex tasks—including shelving and unshelving units, handling customer service requests, and, of course, managing and servicing their new robot coworkers.[5]

However, humans and AGVs take very different movement paths and require different operating environments to move materials throughout the warehouse safely. For one, human workers can operate and navigate in much smaller, crowded spaces. They can also modify forklift and tow tractor routing in real time to accommodate for unexpected hazards.

As a result, warehouse facilities must be designed and constructed to fit the modified workflows of AGVs. This means safe, open transportation lanes that provide adequate space to maneuver along their pre-recorded routes.

The Solution?

PrimX flooring delivers a solid foundation to keep up with the evolution of traffic on the warehouse floor. As frequent autonomous vehicle movement along designated transportation routes becomes the norm, warehouse managers can rest easy knowing PrimX's fiber-reinforced, no shrink concrete flooring won't experience early wear in high-traffic areas. Despite offering a thinner standard floor slab, a PrimX floor can carry higher loads than traditional constructions. Additionally, because PrimX flooring does not use rebar, warehouse managers are free to reconfigure facilities (including racking and equipment) as needed to adopt new AGV movement best practices quickly.

[5] https://www.supplychaindive.com/news/what-not-to-automate-supply-chain/546488/

3. Do Away with Downtime:
Preserve the Efficiency Gains Created by Automation

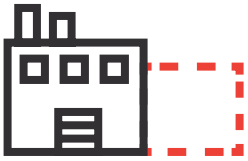
While one of the major selling points of IoT integrations and automated technology is its ability to unlock new levels of efficiency and productivity, this belief follows one key assumption: that these technologies are able to operate as intended day in and day out.

However, just like traditional warehouse workflows, many of the same productivity drains can affect Industry 4.0 warehouse operations as well. These sources of downtime can include:

Vehicle Maintenance and Repair

Accidents

Labor Shortages



Facility Repairs or Expansions

Some of these sources of downtime can be directly addressed by the introduction of smart, automated technologies—such as labor challenges. Even vehicle maintenance can experience a productivity boost by including sensors to monitor and schedule routine check-ups and repairs before they become major challenges.

Yet, some of the most overlooked, foundational downtime challenges remain. Often regarded as an unavoidable disruption, facility repairs—such as the replacement of shelving units or concrete flooring—can bring facility productivity to a screeching halt. Most AGVs rely on pre-programmed routes to make their SKU deliveries throughout the warehouse, using digital scans of the route environment to create a route map. When AGVs encounter large joints or cracks in the floor, floor curling, or other hazards caused by floor disrepair, it can disrupt their carefully programmed routes.

> "One major distribution company had to reprogram robot paths in a facility because one central floor joint had separated so much that the robots could no longer travel over it."
>
> Mike Gresser, Principal for PrimX

The Solution?

Most traditional concrete floors in warehouses and distribution centers require regular costly maintenance and repairs on miles of joints to fix curling, joint deterioration, and cracks. Extended joint concrete floors can help with this problem—while jointless concrete floors solve it.

PrimX offers a jointless concrete floor that has no saw cuts. The steel fiber-reinforced, no-shrink concrete flooring system contains steel fibers and two types of proprietary admixtures combined with ready-mix concrete to create a composite flooring system that won't shrink or curl under heavy traffic and usage.

Getting Your Warehouse Infrastructure Equipped for Robotics

Despite the fact that many warehouse automation technologies and tools have been around for nearly a decade, AMR and AGV usage is poised for rapid growth in the coming months and years as companies grapple with new safety precautions and elevated ecommerce demand driven by COVID-19.

As automated technologies evolve, it is important to invest in the foundational warehouse infrastructure that can help make this ongoing evolution a seamless, cost-effective process. Warehouse and distribution center floors are at the center of the action, supporting efficient AMR and AGV transportation throughout the facility.

PrimX has installed over 160 million square feet of seamless, sustainable floor slabs globally—including in many operations that use AGV equipment from a variety of different vendors.

To learn more about the game-changing composition of PrimX flooring and why it is the smart foundation for forward-thinking warehouse and distribution centers, contact our team today.

PRIMX

HAVE MORE QUESTIONS? LET'S TALK

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