The Supply Chain Pros Guide to Warehouse Execution Systems

CONVEYCO | Integrated Solutions & Software

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Introduction

In the ever-evolving world of distribution and fulfilment, speed, accuracy, and adaptability are no longer advantages, they're necessities. As customer expectations rise and supply chain complexities grow, the need for smarter, more agile warehouse operations has never been more urgent. This is where Warehouse Execution Systems have stepped in. Not as a luxury, but as a strategic imperative.

At Conveyco, we've spent decades helping organizations design and implement intelligent, integrated systems that maximize throughput and efficiency. We've witnessed firsthand the shift in the industry: traditional Warehouse Management Systems and control software alone are no longer enough. Operations require more than just order tracking or machine control—they need orchestration. They need real-time decision making. They need WES.

This eBook explores the rise of Warehouse Execution Systems, how they evolved, why they're now existential, and what role they play in the future of warehouse operations. Whether you're new to the concept or evaluating your next upgrade, this guide will provide insights from our team of experienced system integrators on how to harness the full potential of WES to transform your operation.

Let's Dive In!



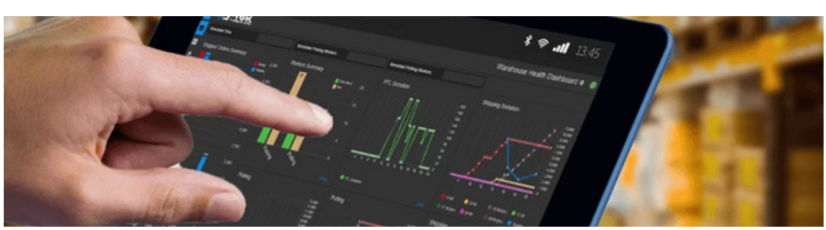
PART ONE



Conveyco WES Software Differences

Distribution operations can vary greatly from one client to another, even within the same industry segments. Conveyco works closely with each client to identify the unique aspects of their operations and then develop a solution tailored to their specific needs and objectives. Conveyco Warehouse Execution Software (WES) is a smart, modular software system designed for this purpose.

Conveyco WES stands apart from typical WCS systems because it fully integrates people, processes, and automation. Our in-depth understanding of processes, controls, and automation allows our team to strike the right balance between hardware and software technologies. Our goal is to create the RightFITTM solution for every client by blending these elements seamlessly.



The Conveyco WES suite of software can be used as a fully integrated system to optimize the entire operation, or modularly to focus on specific tasks within the operation.

Conveyco WES Software Differences



INVENTORY MANAGEMENT

Inventory is never in a static state as it moves through a distribution center. It passes through the storage, replenishment and picking processes, often across different locations with various storage and picking methods. Conveyco WES is a valuable supplement to Host software systems that don't handle this level of dynamic control.

WES allows operations to efficiently manage inventory with real time communication such as handheld Radio Frequency (RF) and truck mounted or voice recognition terminals. Location management and quantity tracking by location are essential for a fast-paced operation. This level of control is becoming the new standard within most industry models, including real-time forward pick location quantity control and replenishment.



Conveyco WES Software Differences

ORDER MANAGEMENT

The WES Order Management module is a completely integrated order fulfillment engine that manages the entire order fulfillment process from order intake to picking and packing. It consolidates everything from wave and batch planning to final shipment execution.

Instead of using multiple systems, WES centralizes picking and order consolidation functions. WES provides the following order picking technologies within the same software module:

- **Pick-to-Voice (PTV)**
- **Pick-to-Light (PTL)**
- **Radio Frequency (RF)**
- **Hybrid PTL**
- **Picking with Voice**
- **RF Verification**



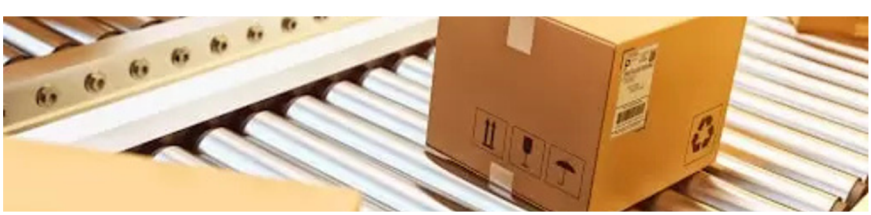
Conveyco WES Software Differences

Cartonization logic is a unique WES feature that determines the size and type of shipping container for each order based on numerous criteria, including:

- **Cube**
- **Weight**
- **Value**
- **Fragility**
- **Temperature Control**
- **Family Group**
- **Style**
- **Size**
- **Department**



For orders that require multiple shipping containers, WES manages each one individually during the picking and packing process to maximize productivity in every area. Depending on product volume and type, there may be different methods of picking used, such as discrete order picking, put-to-order, or bulk picking. WES breaks orders down by the pick method and consolidates them at the end of the process to improve efficiency.



Conveyco WES Software Differences



AUTOMATION MANAGEMENT

Conveyco WES was originally designed to coordinate and manage a wide range of automated subsystems. Today's high-volume operations often require more automation to meet shrinking order cycle time requirements. WES excels at synchronizing automated components like:

- **ASRS**
- **Tote And Pallet Shuttles**
- **Packaging Automation**
- **Automated Pallet Cart Systems**



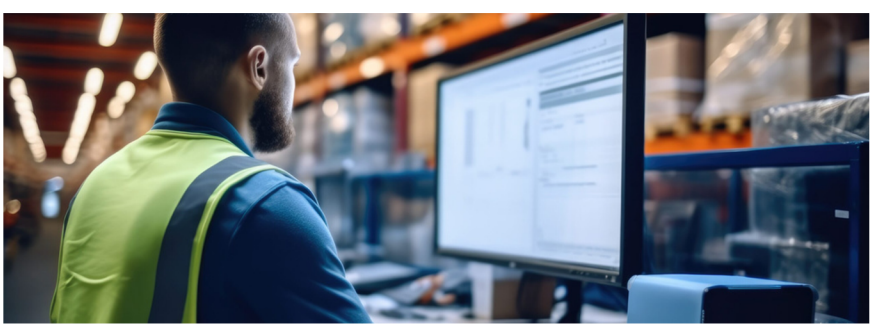
SHIPPING AUTOMATION

Conveyco WES helps balance the flow of the overall operation by providing end to end management of the shipping process, the final and most crucial stage in order fulfillment.

Conveyco WES Software Differences

PARCEL & CONTAINER MANIFESTING

With end-to-end visibility and integration with the Order and Automation Management modules, shipping becomes more flexible and less labor intensive. Parcel manifesting (weighing, dimensioning, checking and labeling of outbound containers) can be fully automated, eliminating associated labor and fewer costly order or compliance errors. As parcel freight rates continue to rise, WES helps manage the carrier selection and shipping methods to cut costs and improve the customer experience.



ORDER CONSOLIDATION & WAVE MANAGEMENT

When large orders are consolidated onto pallets, WES breaks the process down into manageable waves. By controlling the transfer between waves, WES helps maintain a steady product flow and operator productivity.

Conveyco WES Software Differences

EFFICIENCY IN PICKING AND SHIPPING

Whether you operate a wave-based or waveless system WES ensures smooth movement of products and keeps operators productive. Regardless of the picking functionality, shipping operations need flexibility in the way orders are routed to be as efficient as possible. WES provides this flexibility by managing order routing for optimal efficiency.





WES also manages sorting and buffering with real-time decision-making to optimize labor and space. It assigns shipping lanes based on container or pallet space availability and provides unit-level manifesting data for all outbound shipments. This fluid transition maintains continuous product flow and productivity while directing put-away tasks to reduce handling and maximize dock space.

Conveyco WES Software Differences

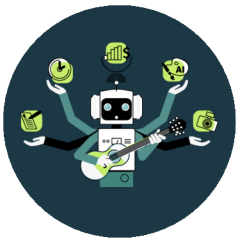
BENEFITS OF CONVEYCO WAREHOUSE EXECUTION SOFTWARE

Conveyco WES is the heart of our RightFIT solutions. It provides proven modular functionality to all processes in the order fulfillment operation. Each software module is tailored to each client's unique needs with one system to coordinate all subsystems (automated and non-automated) within the distribution center.





All system activity is monitored via dashboards to provide managers with real-time visibility and control for the most efficient and accurate operation. Conveyco WES is a battle-tested product with many successful implementations. It comes with the 24/7 support from trained personnel who help our clients keep their operations running smoothly no matter what time, around the clock.



PART TWO

WES vs WCS vs WMS vs ERP: Characteristics, Pros and Cons

This section explores the key differences between Warehouse Management Systems (WMS), Warehouse Control Systems (WCS), WES and Enterprise Resource Planning (ERP) software. It outlines their main features and what to consider when choosing the best type of software for your operations.

In recent years, an additional solution has entered the fray—the Warehouse Execution System (WES), which blurs the lines between a WMS and a WCS.

Selecting the right system for your order fulfillment needs can be overwhelming. With so many acronyms and overlapping features, it is easy to feel lost. The term “warehouse software” covers a range of platforms, including WMS, WES, WCS, and ERP systems. Each plays a different role in supporting warehouse operations, and the best choice depends on what specific job you need the software to do.



WES vs WCS vs WMS vs ERP



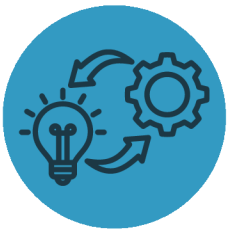
The ideal software setup depends heavily on your business and industry. Your facility's level of automation, the types of material handling systems in use, and how inventory moves through the space will all help determine which systems are necessary.



A Warehouse Execution System (WES) evolved from the traditional WCS. It operates between the WMS and the equipment-level controls that handle specific equipment functions. Typically, a WES will include all the features of a WCS, along with some of the basic features of a WMS. This can include receiving, replenishment, shipping, wave planning, order processing, and the management of picking systems (electronic, radio frequency [RF], and voice).

In a fast paced, global, omnichannel environment, consistent and reliable communication between systems is crucial. Without it, operations would face too many errors and inefficiencies to function effectively.

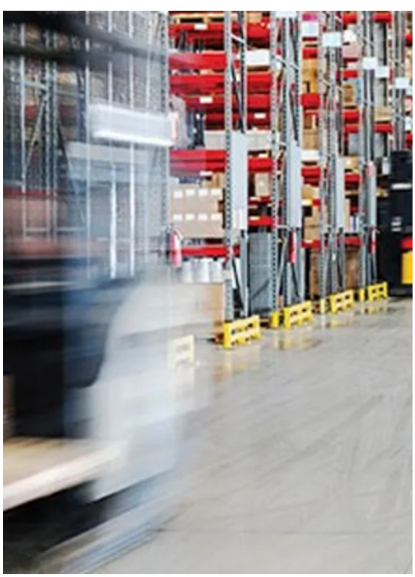
WES vs WCS vs WMS vs ERP



IN THE BEGINNING: WCS

The WCS has historically been responsible for an array of functions, such as **automated picking management, pick label creation, pick-to-light management, full system routing management, QC/QA management, packing station management, and print and apply operations.**

The WCS is designed to communicate directly with and control automated equipment, from **basic conveyors** to more complex systems like **sorters, automated storage and retrieval systems (AS/RS), goods-to- person solutions, palletizing/depalletizing, print and apply (PANDA), and other technologies.**



Depending on the operation, some may use a single WCS that controls all of the automated technology within the facility, while some other operations may deploy multiple WCSs, each dedicated to a different equipment type.

WES vs WCS vs WMS vs ERP

TODAY WHAT DOES WES DO

In simple terms, the Warehouse Execution System (WES) can be thought of as a conductor, orchestrating the different zones and equipment and workstations within your facility. While the WMS is concerned with the flow of inventory and goods, the WES is typically concerned with issues of labor and equipment and is designed to ensure that all the systems within your operation are working at peak performance.

The WES is essentially the next generation of the WCS. It includes all of the machine controls capabilities of the WCS but builds upon them by adding labor and order management capabilities.

The result is a more holistic approach to warehouse management, capable of looking at all zones within an operation to more efficiently distribute orders, reroute labor, and more.



For example, if you have five zones in your operation and one falls behind, the WES can adjust picks in the other zones to allow the slower zone to catch up, boosting overall efficiency.

WES vs WCS vs WMS vs ERP



WAREHOUSE MANAGEMENT SYSTEMS (WMS)

For decades, order fulfillment operations have used Warehouse Management Systems (WMS) to control inventory flow from receipt of product to putaway, to replenishment, and eventually shipping. WMS also supports labor activities like wave planning and manual picking.



In order to accomplish these tasks, the WMS must track inventory throughout the supply chain. As the most established system of the four, WMS platforms are often deeply integrated into warehouse workflows.

Depending on the operation, the WMS may also be responsible for additional functions:

- **wave and order management**
- **bin level inventory management**
- **manifesting**
- **business intelligence**
- **RF scanner integration**
- **voice integration**
- **manual picking (paper slip)**
- **and forward pick replenishment.**

WES vs WCS vs WMS vs ERP

WAREHOUSE MANAGEMENT SYSTEMS (WMS) LIMITATIONS

In many companies, especially older or more established businesses, the WMS system has become **something of a third rail: Something that everyone knows not to touch.**

You might want to add features or reports, but changes are often difficult. Legacy systems were often custom-built years ago by engineers who are no longer around. Without them, even small updates can be risky and time consuming.

On the other hand, perhaps you purchased your WMS from a vendor who is perfectly capable and willing to write whatever custom code you request.

Unfortunately, this custom coding often comes at such a high cost **(in both dollars and time)** that it simply isn't viable for most operations**.** As a result, many operations settle for **inefficiencies** rather than pay for updates. But in a fast moving industry, that is **not sustainable.**

That is why many businesses turn to a Warehouse Execution System to enhance their WMS. While some get by with a Warehouse Control System, a WES typically delivers more value, functionality, and ROI. If you are relying only on a WMS, or considering an upgrade from a WCS, a WES is likely the better choice.

WES vs WCS vs WMS vs ERP

HOW THE RIGHT WES CAN SAVE YOUR WMS

It is important to note that a Warehouse Execution System is meant to complement—and not replace— your WMS. It achieves this in several ways by filling in gaps, especially in areas like wave management, picking, and equipment controls.

Using a WES allows you to add functionality more affordably and with lower risk than customizing your WMS. It also helps protect the integrity of your existing systems by avoiding direct code changes.



WES vs WCS vs WMS vs ERP



ERP: THE BIGGER PICTURE

Enterprise Resource Planning (ERP) software acts as the c**entral nervous system of your business.** It is designed to **collect, store, and manage data** across multiple departments. This will often include information about **manufacturing, ecommerce, customer relations, sales, marketing, inventory management, shipping, product planning, and more.**

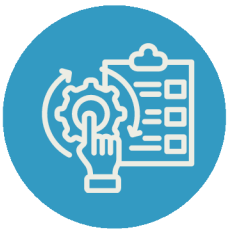
BENEFITS OF ERP

ERP platforms are especially valuable for financial operations since they include **comprehensive financial reporting capabilities** that allows you to **invoice, bill, track, etc**. They receive data from the WMS and other systems, becoming the **primary data hub** for the business.

ERPs allow businesses to access needed information quickly and accurately for clients and vendors, contributing to **improved customer and employee satisfaction, quicker response rates, and increased accuracy rates.** Associated costs often decrease as the company operates more efficiently.

However, ERP success depends on the **willingness of teams** to align their processes with the software. When companies **cling to outdated workflows**, ERP systems often **fail to deliver on their full potential**.

WES vs WCS vs WMS vs ERP



CHOOSING THE RIGHT SOFTWARE

If it is decided that a WES makes sense for your operation, the next hurdle is in choosing the right system for you. While this will again depend upon the specifics of your operation, it is typically recommended that any WES that you consider should exhibit three characteristics: it is **configurable, it is truly modular, and it is ready-to-run**.

- **Configurability** - The WCS in a WES typically covers **80-90%** of your needs, but customization is often necessary to fully align with your operation. This requires **change orders, adding time, and cost**. A well-designed WES will **offer flexibility** within the base module, **streamlining implementation and reducing the need for costly changes**.

- **Modularity** - Every operation is unique, so a single WES may not be a perfect fit out of the box. A modular WES uses a **core system with pre-designed modules** that can be added to **meet specific needs**. This approach **avoids bloat, speeds up deployment, and makes support easier**.

- **Ready-to-Run** - A top tier WES should **include external device emulation,** allowing the system to be thoroughly **tested and debugged before implementation**. This ensures it **functions as expected** when deployed in the real world environment.

Ultimately, the right combination of **WMS, WES, WCS, and ERP** depends on your specific operation. By understanding what each system does best, you can **build a solution** that **maximizes efficiency, reduces risk, and supports long term growth.**

PART THREE

Warehouse Execution Systems Software Best Practices

Warehouse Execution Software (WES) has gained in popularity and sophistication in recent years due to some of the systems best practices such as its ability to create efficiencies, solve specific user business requirements and its cost effectiveness.

FREEDOM OF CHOICE

The ability to choose hardware should be a commonsense decision when selecting a WES platform. Many leading WES providers are hardware-agnostic, but not all. Providers owned by hardware companies may lock you into using only their equipment for the life of the system.

Hardware-agnostic WES platforms typically support various platforms––Microsoft, Unix, Oracle, SAP, and more—especially if written in Java.



WES Software Best Practices



FLEXIBLE & FRIENDLY HOST INTEGRATION

Since WES is layered into an existing infrastructure, it's vital that it can integrate to the host quickly and easily regardless of the system. Modern WES platforms achieve this by conforming to the host system's existing output format, eliminating the need for host-side programming and reducing installation time and complexity.

OPEN API & WEB-ENABLED

Another good feature for a WES to support is an open API. It allows organizations to customize the WES UI to match their branding, incorporate existing system layouts, and design custom screens. A web-based UI is also essential, enabling access from any mobile device with a browser like Google Chrome.

This translates to easier management, deployment, and usage. It also frees management from being tied to a PC terminal and free to roam the DC while still having the data at their fingertips.



WES Software Best Practices

The Problem with Recycled Code

Many software companies will sell their first system and write the code. Then they sell another system, and they modify the first system to meet the second project's needs. This continues job after job. You wind up with similar, but "totally different" systems that are very, very difficult to maintain.

If the original programmer is no longer available, support becomes a challenge. Add in constant updates, hardware variations, and new drivers, and you get bloated or "spaghetti" code. These deficiencies will eventually result in poor performance, system crashes, memory leaks, and overall complexity to maintain.

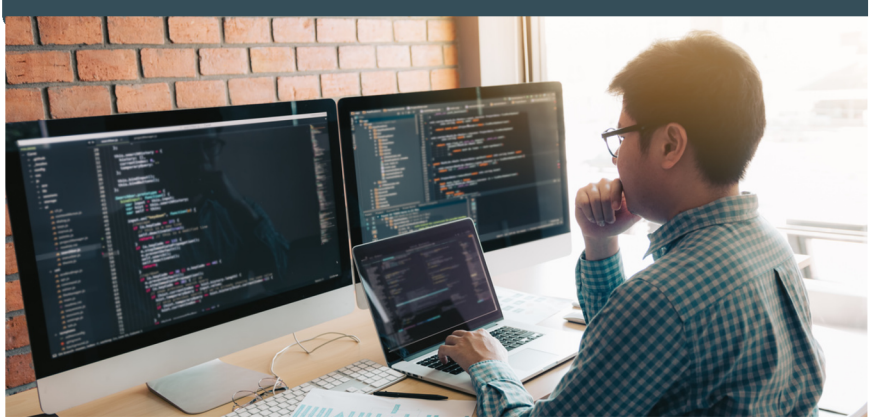


WES Software Best Practices

Original Code, Modularity, & Configurability

Leading WES providers today benefit from writing software from scratch using modern tools and best practices. By developing clean, concise code, they create highly configurable modules tailored to operational needs. This creates a flexible and cost-effective solution for organizations.

Each project's code is compiled from the original version every time. This eliminates the hidden issues found in reused code. Each module can be operated independently but can also communicate to each other. This modular design means updates or additions don't impact the rest of the system, reducing both acquisition and maintenance costs while enabling scalable growth. This methodology also reduces implementation time and maintenance requirements without sacrificing future needs. Many minor updates that used to require expensive change orders can now be handled by users through configuration, at no additional cost.



WES Software Best Practices

EMULATION: RUNNING THE SYSTEM BEFORE INSTALLATION

Top-tier WES platforms come with built-in emulators that mimic the behavior of external devices such as PLCs, scanners, robotic controllers, and host systems.

Besides performance, integrated emulators minimize installation time and the need for on-site coding. With emulators, systems can be pre-configured, speeding up deployment and ensuring they meet performance expectations from day one.

Best of all, emulators allow you to test changes on a separate environment before going live, helping you plan and prepare for future needs.



WES Software Best Practices



SYSTEM CONFIGURATION TOOLS

Leading WES systems utilize rapid configuration tools to create customized systems. There are several different ways WES companies perform this, but many use a drag-and-drop, Visio-style interface to lay out hardware elements like conveyors, diverters, PLCs, etc. This then intelligently guides the user through setting correct parameters.

The emulators will act like the PLCs and communicate to you designed system to assure accuracy and performance levels.

This type of configuration also allows for fast, easy updates. You can change conditions, routings, destination settings, scanners and barcode formats, and more. All without requiring new coding or programming. What used to require time-consuming, expensive change orders can now be handled through parameter changes.

Once your design is finalized and tested with the emulator, the system can automatically generate clean, production-ready code.

Understanding how WES best practices has evolved over the last few years is often eye opening. With clean code, modular architecture, advanced emulation tools, and open integration capabilities, today's Warehouse Execution Systems give organizations unprecedented control and flexibility. Businesses can now optimize their operations at their own pace, without the traditional cost, complexity, or risk.



PART FOUR

Four Questions to Ask Before Upgrading Your Warehouse Execution Systems

If you're considering upgrading your WES, asking the right questions can help you determine whether a new system will actually solve the problems you are facing.

These following questions in this section also help guide you in identifying the features and functionality your next WES should include.



Four Questions to Ask Before Upgrading

1. Is the WES really the problem?

The decision to upgrade or replace a WES often stems from operational changes like longer order cycle times, missed delivery deadlines, or declining perfect order rates. Because the WES manages much of the operation's flow, it often takes the blame.

The truth is, there are countless potential explanations for why a particular KPI may be slipping that has nothing to do with your WES. From workflow inefficiencies, bottlenecks, staffing challenges, to outdated hardware may be the true culprits. Before moving forward with a new system, conduct a full assessment of your operations to confirm that the WES is the root of the problem and not just a symptom.

2. What are the biggest complaints with your existing WES?

If you've determined that the problems you are facing do in fact stem from your WES, or you are considering upgrading your existing system because it is outdated, then it makes sense to begin comparing your options.

Before you begin looking at different systems, create a list of your top complaints. Common issues include:

- The WES doesn't perform to expectations
- Key features are missing
- It struggles to integrate with newer systems and technologies

This list will help guide your evaluation process and ensure you're focused on finding a solution that directly addresses your needs.

Four Questions to Ask Before Upgrading

3. What should a new WES do that your current system cannot?

Use your list of current issues to develop a set of expectations for a new system. Then, divide those expectations into two groups:

- Must-haves: Features the new system absolutely needs in order to support your operations
- Nice-to-haves: Add-on features that would be beneficial, but aren't deal breakers

This approach streamlines your selection process by helping you quickly eliminate systems that don't meet your core requirements, while still allowing flexibility in your final decision.

4. Are there any other major projects in the plans for your operation?

It's important to evaluate your upgrade in the context of other planned changes. Whether you're adding new automation (like AS/RS or robotics), modifying your IT infrastructure, expanding your facility, or shifting toward omni-channel fulfilment—these changes can all influence the kind of WES you need.

If the problems you are experiencing do in fact lie with your existing WES, then choosing the right replacement system will be critical to the success of your operation. If the issue lies in a different part of your business, however, then the answer will be to ensure you are addressing the root cause and not making an unnecessary change to your WES.

PART FIVE



A Deeper Dive Into Emulation

As previously mentioned, top-tier WES platforms have built-in emulators. Emulation—the ability to test the software in real-world conditions before it officially goes live—delivers many powerful benefits.

Here's how it works: As your software vendor and engineers design and configure your WES, emulation allows them to regularly test the system's performance under a wide range of conditions. This includes both "ideal" conditions (your typical daily throughput and capacity) and "peak" conditions (the highest throughput or capacity that your operation sees on its busiest days)



A Deeper Dive Into Emulation



BENEFITS OF EMULATION TO WES

One of the biggest advantages of emulators is their ability to stress test the software. This helps identify situations where the system might fail or stop operating at optimal levels. Emulation also enables testing at much faster speeds than a live production environment, revealing hidden issues like memory leaks or database performance problems.

While it's easy to make assumptions about how the WES will perform, emulators provide you with proof—well before launch—that the system can meet or exceed expectations. The benefits include:

- **Reduced installation time:** By stress-testing the software in advance, you can be confident that everything is working as designed. This reduces installation time, minimizing downtime, and helps avoid emergency coding on go-live day.
- **Fewer Memory and Database Leaks:** Emulation uncovers database and memory leaks early and prevents them from becoming an issue. If you have ever had to shut down and restart your software system to keep it working, especially during peak periods, you have experienced the consequences of these leaks: missing shipping times, increased labor, and often more errors.
- **Lower costs:** By verifying the system before launch, you reduce the likelihood of needing software maintenance or additional coding later on, which reduces your overall WES costs.
- **Scalability:** By verifying the system before launch, you reduce the likelihood of needing software maintenance or additional coding later on, which reduces your overall WES costs.

A Deeper Dive Into Emulation

HOW TO EVALUATE WES FOR "READINESS"

When considering potential WES solutions, the primary question you should be asking the vendor is: How is the system tested before it goes live? Their answer should include the use of emulators that test the software against expected and beyond-peak conditions. If it doesn't, the system cannot be considered truly "ready-to-run," because it hasn't been fully vetted.

Also ask: How does your team handle unexpected issues during a launch? While no one can predict every challenge, a well-tested system should come with few surprises. The vendor's answer should reflect that confidence.

What you're likely to find as you evaluate different WES options is that not many of them are truly ready to run, because not many of them include the emulation and rigorous testing required to make them so.



Bonus tip: Look for solutions that leave the emulators accessible to your team after installation. This allows you to use them for future testing and planning–without needing to rely on (or pay for) ongoing software development support.

One standout in this space is the Horizon WES. Built on more than 21 man-years of R&D, It includes extensive emulation and testing prior to installation. This shortens implementation time, eliminates costly launch-day issues, and sets your operation up for real, lasting success.

PART SIX

Choosing Horizon Modular Warehouse Execution Software (WES)

Horizon reaches the field in a truly **ready-to-run** state, thanks to two core advantages:

1. **A highly configurable base code** that creates a stable, adaptable system.
2. **Full-system emulation testing before go-live**, ensuring performance and reliability under pressure.

Before deployment, Horizon WES is stress tested using emulators that push the system beyond its expected maximum throughput. This ensures it can handle real-world conditions with ease. If it performs well under these extreme tests, we can be confident it will excel in your day-to-day operations.



Choosing Horizon Modular WES

Ongoing Value of Horizons Built-in Emulation

Even after go-live, Horizon's built in emulators remain a powerful tool. They let your team test various operational scenarios, including:

- **SKU proliferation**
- **Capacity increases**
- **Changing delivery timelines**
- **System modifications**

This kind of testing helps inform decisions and fine-tune your business strategy with confidence and data.

Horizons Configurability & Modularity

Horizon was built on the idea that a WES should be configurable from the start, not through endless change orders. To accomplish this, New Dawn assembled a team of engineers with 20+ years of experience in material handling and order fulfillment.

Their deep industry knowledge helped create a WES base where most frequently requested features are already configurable.

This level of configurability is a major differentiator, customers can easily turn on what they need instead of investing in custom development every time.

Choosing Horizon Modular WES

Cost Effectiveness

Horizon WES is cost-effective not just in its pricing, but in how it reduces future expenses. Because of its modular and configurable nature:

- **Fewer custom change orders are needed**
- **Testing is completed before deployment**
- **More time can be spent on training, not debugging**

You get a tailored system that fits your operation without the hidden costs of post-implementation rework.

Benefits of a Modular WES

A truly modular WES has a central core module that handles essential system functions. Additional optional modules can be plugged in as needed, making it easy to build a system tailored to your exact needs.

Why Modular Matters:

- **You only buy what you need, no unnecessary features or costs**
- **It keeps the system lean, fast, and easier to maintain**
- **Future upgrades are simple and low risk**
- **There is minimal disruption when adding new modules**

This approach also reduces risks compared to systems built with custom code, which can introduce errors during development. A modular system draws from tested, reusable code, offering both reliability and flexibility.

Choosing Horizon Modular WES



Examples of Horizon WES Modules

When comparing WES platforms, always ask for a module list. It'll help you understand what is available and ensure the system meets your requirements. Horizon offers a wide range of modules, including:

- **Human-Machine Interface (HMI)** - Real-time, graphical visualization of equipment status
- **Container Tracking** - Core tracking logic for sorters, merges, and conveyor decision points
- **AMR Management** - Controls and reports on AMR operations
- **Wave Builder** - Organizes and schedules picking waves
- **Order controller** - Ensures complete orders are grouped and routed to shipping
- **Pick Processing** - Supports PTL, RF, voces, and vision-based picking.
- **Replenish Inventory** - Monitors inventory levels and tiggers restocking at reorder points

Choosing Horizon Modular WES

- **Container Printing -** Print & Apply label management for accuracy and placement
- **Put Wall System -** Guides operators in sorting SKUs to orders via lights or screens
- **Packing Station -** Handles packing logic and value-added service (VAS) instructions
- **Quality Assurance -** Supports blind and open QA processes
- **Audit Process -** Tracks and verifies pick module or AMR inventory.
- **Pallet Building -** Assembles and documents what cartons go on each pallet
- **Shipping Manifesting -** Accurately logs outgoing shipments, trailers, and contents

It is important to note: you only receive the **modules your operation needs**. This keeps **costs down, eliminates system bloat,** and **improves performance** across the board**.**

Choosing Horizon Modular WES

Wrapping Up: Why Horizon

Horizon stands out as a Warehouse Execution Software solution that is engineered for real-world flexibility, speed, and reliability. With a stable, configurable core, modular architecture, and powerful built-in emulation, it is designed to meet your current operational needs while making future growth simple and low-risk.

You don't have to overbuy, over-customize, or overcomplicate, just choose the modules you need and Horizon does the rest.

With Horizon, you get a WES that’s built for today and ready for tomorrow.



PART SEVEN

How a WES Can Augment Your Autonomous Mobile Robot (AMR) & Robotics Systems

Autonomous mobile robots are becoming increasingly common in **warehouses, distribution centers,** and **order fulfillment operations** across the globe, for one simple reason: **they work**.

Robots **boost efficiency, increase productivity and throughput**, and **reduce labor costs**. Unlike human workers, they don't take breaks, make errors, or ask for raises. That's a win-win by any measure.

If you're considering implementing AMRs or other robotic systems in your operation, it's essential to have the **right software** in place to **maximize your return on investment**. That's where a Warehouse Execution System comes in.



How a WES Can Augment Your AMRs and Robotic Systems

What You're Really Buying: Hardware + Software

When you invest in an AMR system, you're actually purchasing two components:

1. **The hardware** - the robot itself, which performs physical tasks like retrieving, storing, or transporting inventory.
2. **The software** - known as Robot Control Software, which controls the robot's actions and behavior.

Understanding Robot Control Software (RCS)

AMRs are equipped with **integrated sensors, LIDAR, SLAM, cameras**, and **processors** that allow them to navigate with or without guides like **reflectors, RFID tags or QR codes**, depending on the environment and application.

The RCS enables each robot to make decisions about **routing, maintenance, charging,** and **task execution**—often with a high level of autonomy. This software handles real-time control of the robot, **tracking its status, managing individual tasks,** and **avoiding traffic conflicts.**

RCS often integrates with larger warehouse systems like WMS, WES, and ERP, enabling better coordination across your operation. More advanced RCS platforms may even support capabilities like **slotting,** which is quickly becoming a **standard feature.**

How a WES Can Augment Your AMRs and Robotic Systems

WHY ADD A WES TO YOUR AMR SYSTEM?

While RCS is essential, it often has limitations, especially if you are using standard software that comes bundled with the AMR. Here's how a WES can elevate your operation:

1. **Fills in the Gaps of RCS Functionality**

If your AMR's RCS only controls basic robotic functions, a WES can take over higher level orchestration. For instance, if your robots can't perform slotting or zone balancing, a WES can provide that functionality.

Other advanced WES capabilities include:

- **Wave management**
- **Labor balancing across zones**
- **Dynamic task allocation based on real-time activity**

Even if your RCS has some of these features, a WES is typically more robust and adaptable—especially for complex or growing operations.



How a WES Can Augment Your AMRs and Robotic Systems

2. **Enables Multi-Vendor Hardware Integration**
Not all WES platforms are created equal. Many are tied to specific AMR manufacturers, which can lock you into a limited hardware ecosystem.

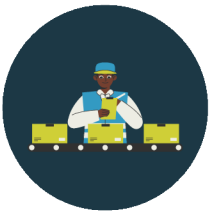
A **manufacturer-agnostic WES**, however, is designed to work with hardware from multiple vendors. This gives you the flexibility to choose **best-in-class robots** for each task:

- **AMRs from Vendor A for picking**
- **AMRs from Vendor B for transportation**
- **AMRs from Vendor C for sortation**

This mix and match approach ensures you're not stuck with a "good enough" solution, you can always opt for the best available technology.

3. **Acts as the Central Communication Hub**
A WES becomes the central brain that connects **all levels of warehouse technology**, including AMRs and other robotic systems. It communicates upward to the WMS and ERP, and downward to the individual robots and machines

With a top-tier WES, this communication is seamless and reliable. The WES also serves as a **single point** for monitoring alarms and alerts across your entire operation, eliminating the need to check multiple systems when something goes wrong.



PART EIGHT

The Pros and Cons of Wave, Waveless, and Overlapping Wave Picking

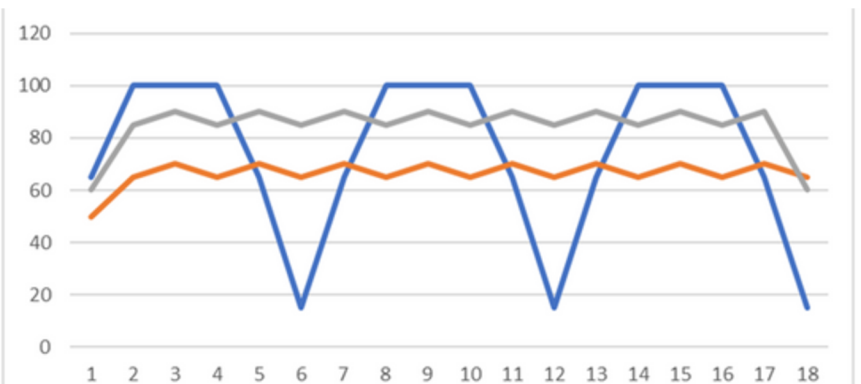
Order picking is the act of selecting individual pieces of inventory (broken-case picking) to fulfill customer orders. It is one of the most time and labor intensive tasks in any order fulfillment operation. Depending on the type of product and the business's needs, picking can be fully manual, partially automated, or fully automated.

To manage rising labor costs, improve efficiency, and support evolving workflows and technologies, warehouses and distribution centers often re-evaluate their picking strategies. The right strategy depends on the nature of your operation and goals.

When picking is manual or semi-automated, multiple picking methodologies are available, each with distinct advantages and drawbacks. Understanding the strengths and limitations of wave, waveless, and overlapping wave picking can help identify the best fit for your operation.

The Pros and Cons of Wave, Waveless, and Overlapping Wave Picking

Comparing Productivity: A Visual Summary



- **Wave picking** (blue) shows productivity peaks followed by low valleys as each wave completes
- **Waveless picking** (orange) flattens those peaks and valleys, offering steadier but lower overall throughput.
- **Overlapping waves** (grey) combine elements of both, keeping productivity consistently higher than wave picking alone

The Pros and Cons of Wave, Waveless, and Overlapping Wave Picking

Wave Picking

Wave picking is a **strategy** that combines elements of zone and batch picking. Orders are grouped into a "wave," and pickers receive assignments—either digitally or via pick lists—to complete in a designated area. Picked items move through sortation and consolidation before shipping. All orders in a wave must be completed before the next wave begins.

Key Characteristics:

- Batches are **static**; once a wave begins, its contents don't change.
- Pickers often complete a full walkthrough of the facility in a single direction, then reverse direction for the next wave, **reducing travel time**.

Ideal Use Cases:

- **High-volume**, recurring order patterns (e.g., B2B operations with scheduled daily orders).

Pros:

- **Maximizes picker efficiency** by consolidating workload in a single path.
- Reduces **travel time** in structured environments.
- Efficient for larger, consistent batches.

Cons:

- Errors like **short-picks** or **mis-picks** can delay reconciliation, pausing the next wave.
- Larger waves increase efficiency but also risk more errors.
- **Inconsistent throughput:** productivity dips between waves.

The Pros and Cons of Wave, Waveless, and Overlapping Wave Picking

Waveless Picking

Also known as **order streaming,** waveless picking dynamically adjusts to incoming orders. Instead of grouping batches ahead of time, orders are continuously added and prioritized based on urgency, especially helpful for same-day or next-day shipping.

Key Characteristics:

- Orders are not locked; the system **continuously updates** the pick queue.
- The WES **identifies the next best pick** in real-time as pickers complete tasks.

Ideal Use Cases:

- E-commerce and fast-fulfillment operations with **unpredictable order volumes** or **tight shipping windows**.

Pros:

- Prioritizes **urgent shipments** in real-time.
- **Smooth, continuous** picking flows with c**onsistent throughput**
- **Eliminates** productivity peaks and valleys.
- Ideal for handling **high volumes** of dynamic, fast turn orders.

Cons:

- May offer **lower overall throughput** compared to large, structured waves.
- Less efficient in environments with **predictable, scheduled orders.**

The Pros and Cons of Wave, Waveless, and Overlapping Wave Picking

Overlapping Wave Picking

Overlapping wave picking is a **hybrid approach** that combines the structure of wave picking with continuous flow of waveless picking.

How It Works:
Let's say you have 30 picking lanes. The WES initiates wave picking for the first 15 lanes. As that wave progresses, the system starts a second wave in the remaining 15 lanes before the first wave loses efficiency. This method keeps productivity high and steady by minimizing downtimes between waves.

Ideal Use Cases:

- Operations that want structured batching with **more consistent throughput.**
- Facilities looking to **balance labor utilization and equipment efficiency.**

Pros:

- **Raises the productivity valleys** that occur in traditional wave picking.
- Maintains a more **stable, higher-performing operation**.
- Reduces **labor strain** and increases **equipment utilization**.

Cons:

- **Slightly more** complex to configure and manage.
- May require **advanced WES functionality** to execute effectively.

The Pros and Cons of Wave, Waveless, and Overlapping Wave Picking

Choosing the Right Strategy: Wave, Waveless, or Overlapping?

There's no one-size-fits-all answer when it comes to order picking strategies. Each method—wave, waveless, and overlapping waves—has its place depending on your **business model, order profile,** and **operational goals.**

- **Wave picking** works best for **consistent, high volume B2B orders** with **regular schedules.**
- **Waveless picking** is ideal for **fast paced e-commerce** or any operation that **prioritizes speed** and **order urgency.**
- **Overlapping waves** are perfect for operations that want to **combine structure** with **continuous flow** to maintain **high productivity.**

The key takeaway? Choose a Warehouse Execution system that supports all three methods. Having flexible picking strategies ensures you can optimize labor and equipment use, **no matter how your order patterns evolve.**

10 Key Takeaways












- Conveyco WES stands apart from typical WCS systems because it fully integrates people, processes, and automation
- Conveyco WES is the heart of our RightFIT solutions.
- The WES can be thought of as a conductor, orchestrating the different zones and equipment and workstations within your facility
- By understanding what each system does best, you can build a solution that maximizes efficiency, reduces risk, and supports long term growth.
- Any WES that you consider should exhibit three characteristics: it is configurable, it is truly modular, and it is ready-to-run.
- With clean code, modular architecture, advanced emulation tools, and open integration capabilities, today's WES's give organizations unprecedented control and flexibility.
- Top-tier WES platforms have built-in emulators. Emulation—the ability to test the software in real-world conditions before it officially goes live—delivers many powerful benefits.
- A WES can elevate your operation by filling the Gaps of RCS Functionality, enabling Multi-Vendor Hardware Integration, and acting as the Central Communication Hub
- With a top-tier WES, this communication is seamless and reliable.
- Choose a Warehouse Execution system that supports all three methods: wave, waveless, and overlapping picking.

About Conveyco

At Conveyco, we are your trusted system integration partner, dedicated to designing and implementing innovative, efficient, and reliable solutions tailored to your unique needs. With almost 50 years of experience, we specialize in creating seamless, end-to-end systems that optimize performance and deliver measurable results. Unlike OEMs tied to their own equipment, we independently select from vetted partners and technologies to deliver solutions that exceed expectations.

Our in-house software expertise ensures seamless integration and performance tailored to your operation. From system design to implementation, our industry-leading controls provide efficiency, reliability, and scalability. Led by a team of seasoned industry veterans, we prioritize building long-term relationships and delivering on our promises with the integrity of a family-owned business. Free from outside investors, we make decisions with your best interests in mind, allowing us to provide solutions without compromise.

Contact Us

Supporting Your Sustainability Goals

We understand the growing importance of sustainable practices in today's supply chain. Our systems are designed to improve efficiency, reduce energy consumption, optimize resources, and support your sustainability objectives—helping you build a greener future without sacrificing performance.

Let's Build Your Future, Together

When you choose Conveyco, you're not just gaining an integrator—you're gaining a partner committed to helping you achieve your goals. We redefine what's possible, together.

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To learn more about how Conveyco can help transform your operations, visit www.conveyco.com or reach out to our team at conveyco@conveyco.com.

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