NEXT-GENERATION MACHINE CONTROLS DRIVE DC PERFORMANCE IMPROVEMENTS.

How to Get the Most out of Critical Conveyor and Sortation Systems

Honeywell
Intelligrated®

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INTRODUCTION

Maximizing throughput without sacrificing accuracy or damaging product is critical to the success of any DC that hopes to keep pace in today's evolving marketplace. At the same time, these capabilities need to be achieved with solutions that are easy to operate and maintain, preferably with proactive safeguards to identify maintenance risks before they cause unexpected downtime. Many DCs also are seeking logistical support to integrate multiple material handling equipment types, often made by different manufacturers, and better ways to track and improve key performance indicators (KPIs).



Finding a machine control solution to achieve all these goals can be a tall order, not least because of the potential expense of supporting the growing diversity of equipment in warehouse environments. Multiple user interfaces (UIs) often incur an additional level of complexity, significantly impacting both manageability and the DC operator's user experience.

Despite these challenges, precise coordination of material handling assets is essential to get the most from your DC. This white paper will review some of the key control system options that are currently available, with the goal of helping you to determine which offers the best potential benefit for your operation.

CONTROL SYSTEM OPTIONS

Getting optimum performance from a DC facility requires many different types of equipment and systems to work in tandem with precise coordination. When does each conveyor need to start or stop? At what speed should sorters operate? To which lane does each carton need to be diverted? Control systems can manage all of these decisions plus many other aspects of the fulfillment system, including scanners, labelers, photo eyes, merging capabilities, performance data and more.

Each DC has its own unique combination of employee expertise, existing equipment, product mix and other factors. Identifying the right control system for any given facility means finding the right balance among cost, efficiency and compatibility. Here's a quick overview of the leading control solutions available today.

PROGRAMMABLE LOGIC CONTROLLERS (PLCS)

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First developed for auto manufacturing, PLCs have been used as highly reliable automation controllers in the logistics industry for many decades. When first introduced, they offered a welcome alternative to hard-wired relays, timers and sequencers, and still continue to see widespread use.

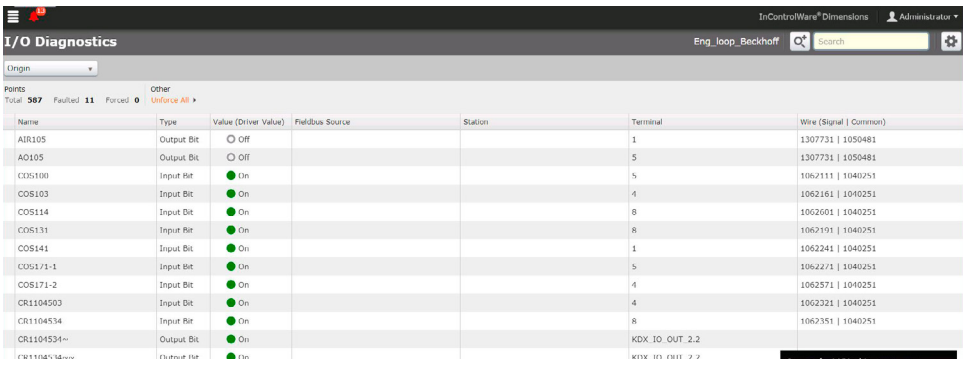


PLCs are relatively easy to program, typically using simple control language rather than requiring expertise in C++ or Java coding. On the surface, the cost of PLCs often looks competitive compared with many other types of control solutions. And since they've been around for a while, many people in the industry have extensive know-how relating to their use and maintenance.

The primary issue with PLCs is performance. In most cases, they're simply not capable of keeping up with the greater demands for speed and throughput that are critical to today's DCs, especially in e-commerce operations. The fastest high-speed merge strategy PLCs are capable of managing is slug merging, which limits their maximum throughput rate to around 250 cartons per minute under ideal conditions.

Another disadvantage is their lack of flexibility and responsiveness when issues arise in the system. While PLCs are easy to program, they are limited to performing the same task repeatedly. The distributed control architecture of PLCs means the rest of the system will continue to function in the event of an unexpected problem.

PLC systems struggle to keep up with modern-day needs without third-party add-ons, such as user interfaces. There's also no way to customize their functionality without third-party software. These additional requirements add to the overall cost of the system when third-party solutions are first implemented and can lead to higher costs later when upgrades or modifications are needed. And unlike more modern control systems, PLCs lack the ability to monitor the condition of equipment proactively and provide alerts before failures occur.



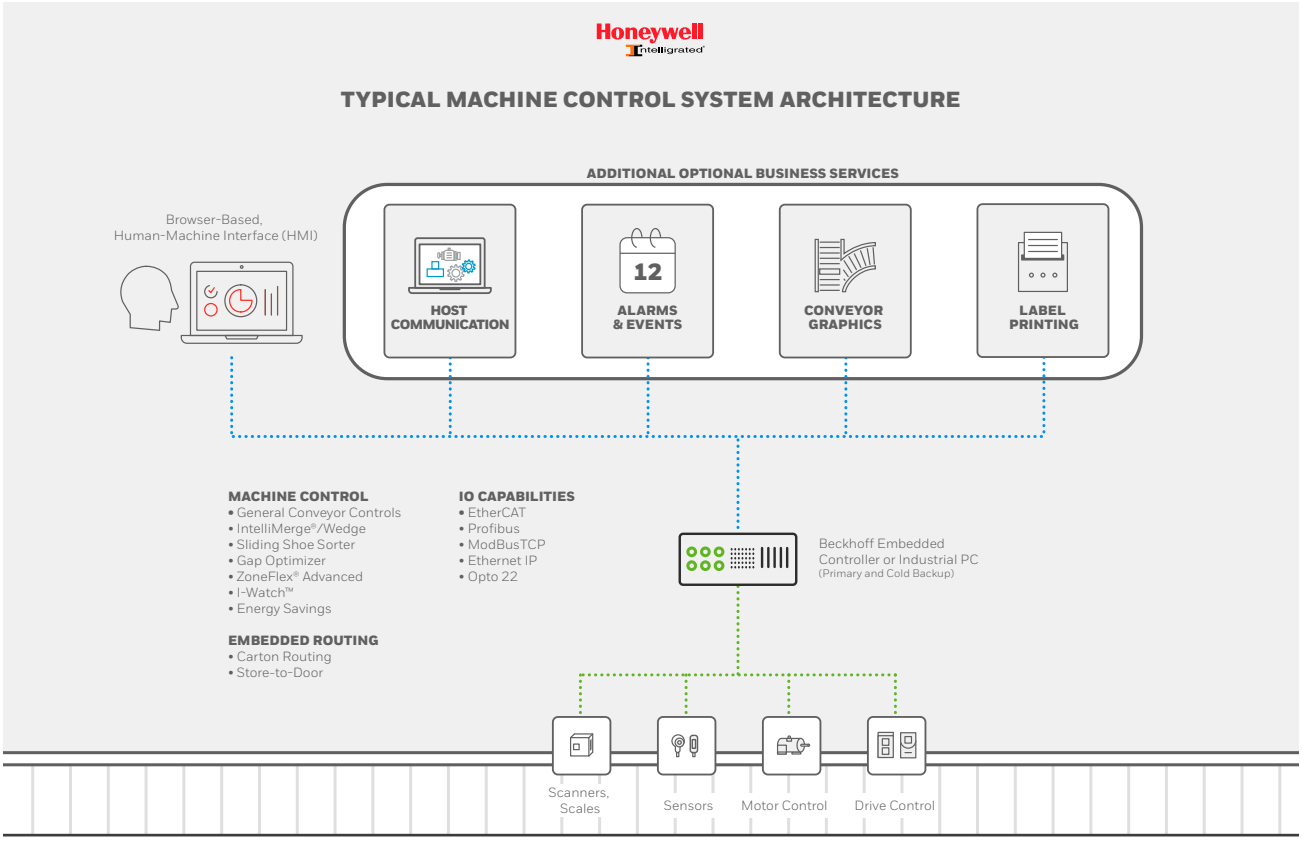
PC-BASED SYSTEMS

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PC-driven solutions offer more flexibility and speed than PLCs. They are the easiest for data gathering, processing, and can achieve high-speed rates of up to 400 cartons per minute using advanced merge solutions.

Unfortunately, these advantages come with higher hardware costs. Every device that needs to be controlled by the system must be hard-wired, individually cabled into a single central panel. In addition, programming is more complicated than with PLCs, often requiring staff with greater coding expertise. And while this centralized control architecture allows everything to be managed from one place, the failure of any part of the system — whether it's a sorter, conveyor, scanner, label printer or even a faulty cable — has the potential to bring the entire system down.

In addition, many PC systems run on the Microsoft Windows® operating system, which is prone to frequent upgrades and patches to correct security vulnerabilities. The entire system must be restarted every time one of these changes is released, resulting in costly downtime.



HYBRID MACHINE CONTROL

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The latest OEM machine control platforms are hybrid systems designed to combine many of the advantages of the aforementioned three solutions. They provide modern, web-based, internationalized, modular and connected solutions for conveyor and sortation control.

While the needs of any given DC may vary, machine control often can be implemented at lower capital and operational costs than other control solutions, while decreasing the cost of delivery for projects of various sizes and complexities. Such systems should ideally be designed to meet the modern-day challenges of materials handling by blending machine control, human-machine interface, business intelligence reporting, extensive system diagnostics and comprehensive maintenance tools.

Hybrid systems can offer the same superior merge speed and much of the flexibility of PC-based systems, while retaining the capability to integrate with PLC-driven equipment. End users also have the option of implementing the system with a centralized control architecture or using a decentralized configuration that allows other parts of the system to continue operating if one area goes down.

For example, imagine that you have cartons going through four different label printing lanes, but one of the lanes malfunctions. In a PLC driven-environment, cartons might continue to be fed to the lane that isn't working, potentially escalating the problem. The same condition could overwhelm centralized PC-based controls, causing the entire system to shut down. With a hybrid solution, however, the system automatically can detect the malfunctioning lane, divert cartons to the three functioning lanes, and alert your maintenance team that attention is required.

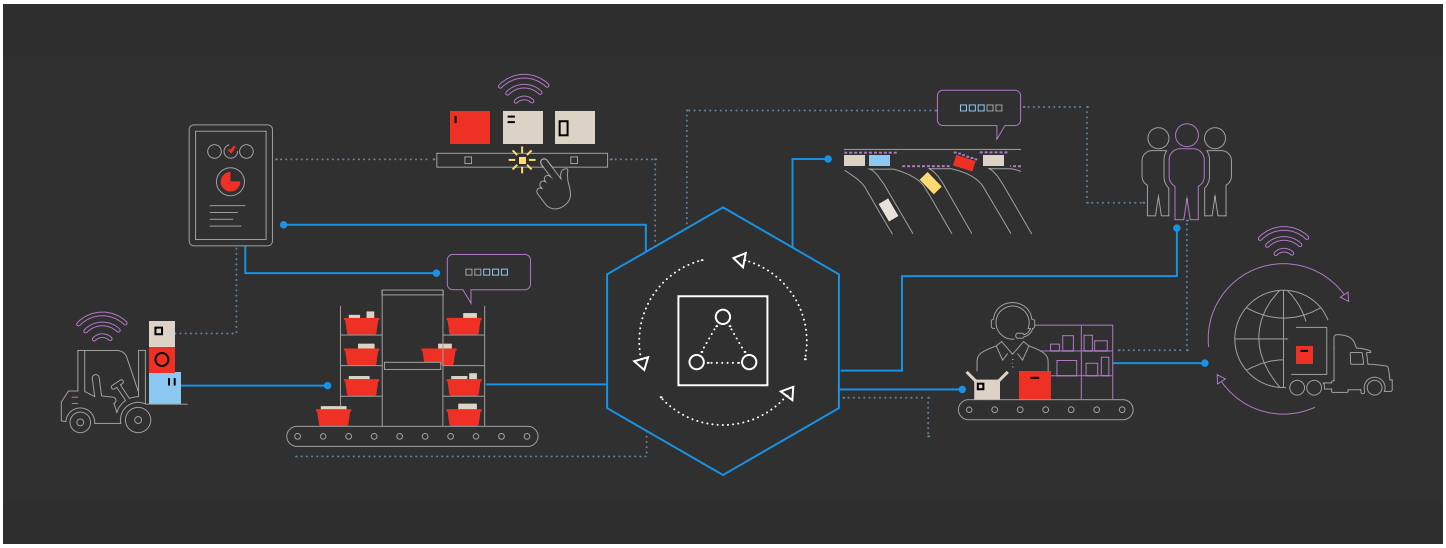


WAREHOUSE EXECUTION SYSTEM (WES)

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These robust software solutions address the full spectrum of modern order fulfillment with diverse automation and material handling requirements. A WES also enables dynamic, real-time decision-making for order prioritization and release execution, providing smart workflow allocation based on available capacity in downstream picking zones, or in order-consolidation processes like put walls or unit sortation.

While a WES is a breakthrough technology with significant potential, full systems can be cost-prohibitive for all but the large distribution networks and operations. Most small- and medium-sized DCs don't consider themselves ready for a WES, preferring to look for ways to achieve throughput and efficiency improvements with more limited upgrades to existing systems.



CASE IN POINT: HONEYWELL INTELLIGRATED'S NEW MACHINE CONTROL PLATFORM

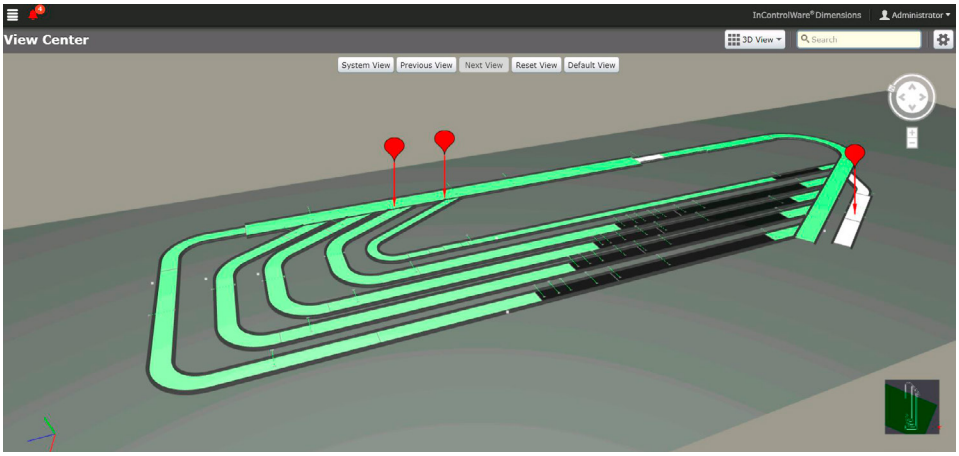
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> Honeywell Intelligrated has developed a next-generation machine control platform. Momentum™ Machine Control (aka MC4) combines all the capabilities mentioned herein to provide a high level of facility control. It can complement Momentum WES software as well as other warehouse execution systems.

MC4 overcomes the vulnerability of PC-based systems to full-system shutdowns by giving users the option of running distributed controls on an industrially hardened embedded controller with no moving parts. This increases reliability, reduces repair costs, and minimizes upgrade costs by providing a backward-compatible upgrade path. The distributed control option enables you to have planned or unplanned downtime in an area without affecting the rest of the system. A centralized control option is also available for upgrades of older, centralized sites.

Additional reliability is made possible by running MC4 on QNX rather than Windows. This allows for greater stability while reducing shutdowns for upgrades and security patches. In addition, the control architecture focuses on configuration instead of custom coding. As a result, projects can be implemented faster with a standardized code base that provides a more traditional plug-and-play experience.

Sophisticated emulation and simulation capabilities make it possible to evaluate the efficiency of different configurations prior to implementation, optimizing the system and reducing its commissioning time.



The full suite combines the following machine control systems:

GENERAL CONVEYOR CONTROL

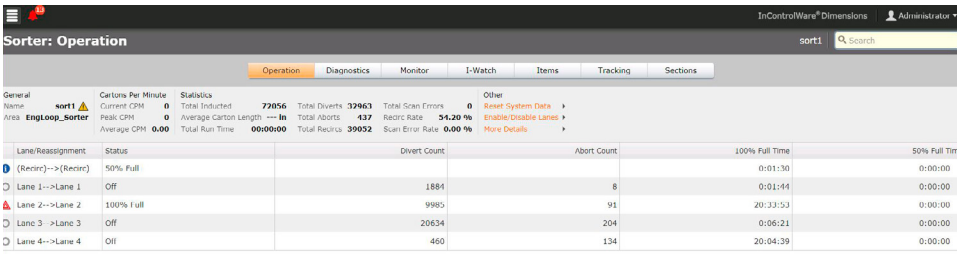
This system manages transportation and accumulation conveyors and handles any events or alarms associated with them. It also provides the following benefits:

- Reliable accumulation control to eliminate side-by-sides
- Increased productivity by reducing damaged packages and side-by-sides
- Increased sortation accuracy

SORTATION

MC4 IntelliSort® is designed to control a wide variety of sortation solutions, including pop-up wheel sorters, shoe sorters, single-sided, dual-sided and HDS shoe sorters. This enables the sorters to run at a much higher rate than traditional shoe sorters and decreases the risk of damaging product when it's diverted.

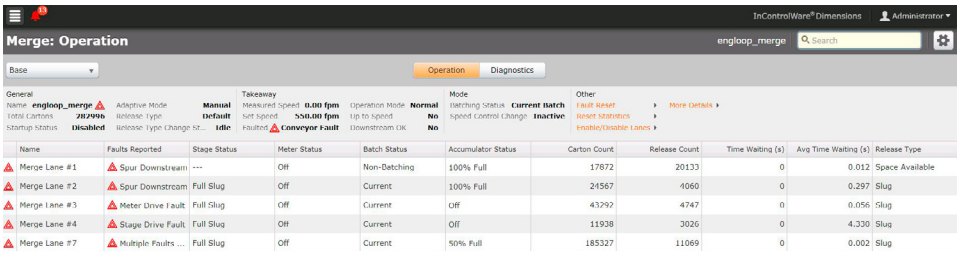
- Carton divert history
- Consolidate incorrect cartons or have them recirculate to keep production up
- Sorter shuts down if a fault is detected, preventing internal damage
- Accurately track cartons from store-to-door
- Sort lane status
- Configurable exception lanes



MERGES

MC4 can be configured to control standard sawtooth merges, 2-to-1 merges, and high-speed zipper and slugging IntelliMerge®. The system uses a hybrid merge logic with the ability to have multiple merge lane types feed a single merge bed, enabling slug lanes with zipper merge lanes or time-release lanes. In this way, lane types can be combined to fully utilize merges and achieve optimal throughput.

- Hybrid merge lane configurations
- Configuration centered
  - -Less custom code
  - -Shorter implementation time
  - -Wizards and validation tools



- Tailored release to fill air gap on merge take-away
- High-speed merges at rates up to 400 cases per minute
- Adaptive mode enables up to two IntelliMerge lanes to function as zipper merge lanes for higher efficiency during low-production operation

GAP OPTIMIZER

The MC4 gapper system is used to measure and adjust the spacing between cartons for improved sorter efficiency. In addition to a high-speed merge rate of 400 cartons per minute, this system maximizes utilization by enabling gaps as short as 1 inch between cartons.

- Allows users to control product gapping
- Embedded gapper requires minimal downtime and effect on production

Gapper functionality is also available as a standalone feature, which easily can be integrated into any PLC, PC or hybrid system.

DIAGNOSTIC AND CALIBRATION TOOLS

MC4 diagnostic and calibration tools can be used to set up and maintain sorters and merges. These tools allow a user to set, clear and verify calibration values for merges and sorters.

- Calibrate sorter diverts and tracking eyes
- Calibrate merge lanes and exit eye timing
- Stress-test diverts for performance checks
- Count shoes at each divert position for photo eye health checks

In addition, the diagnostic and calibration suite includes I-Watch™, a tool which monitors chain health for sliding shoe sorters. I-Watch tracks the amount of oil required to lubricate the chains, alerting the user when the level runs low or other maintenance is required.

ADDITIONAL BENEFITS AND OPTIONS AVAILABLE WITH MC4

Modular — Use only the elements you need

Faster implementation — Emulation and simulation capabilities reduce commissioning time

Web-based user interface — Provides easy access to the system from any computer

Visibility — Eases management of system resources and operations

ViewCenter integration — Optional 3D visualization HMI

Alarms and events system — Monitors issues with the integration of Embedded Services

OPC/UA capable — Monitors performance data and alerts the user when assets are at risk of failure

Energy management — Balances energy-efficient practices during day-to-day operation with maximum throughput at peak times

Easy upgrades and expansions — Shuttle, Voice PoC and GTO functionalities are among the modules in development for near-term release; integrate seamlessly with Embedded Services

CONCLUSION

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By providing a suite of control services in a single package, MC4 controls offer a more flexible and up-to-date user experience, plus superior efficiency. In most DC environments, the system can be implemented at a lower total cost than traditional PLC- or PC-based systems. MC4 also provides an attractive alternative for high-performance conveyor and sortation control to DCs.

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