CONNECTED PROCESS CONTROL

EPICOR

Vehicle Assembly

CPC Revolutionizes Vehicle Assembly for the Digital Era

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Vehicle Assembly

Vehicle Assembly has come a long way since the days of Henry Ford.

Manufacturing innovators developed new ways to control and refine production processes and satisfy the demands of specialization, precision and automation.

However, different layers of the current manufacturing stack have introduced formidable technical challenges. Vehicle assembly is currently both costly and challenging to modify and achieve the quality, customization and variability demands of the modern market.

Complicating the situation is the state of the industry's existing PLC and HMI infrastructure—some of which has been in place for decades. These highly engineered systems are very inflexible, very costly and include cumbersome layers of tech that limit connectivity and compatibility with new parts and processes.

Essentially, the industry has innovated itself into a corner.

And while Henry Ford may have sidestepped some integral production challenges by limiting customization, that is clearly not an option today. Today, whether with automotive, recreational vehicles, buses and commercial transportation, military vehicles or even aircraft, complexity and customization are inherent and inescapable.

VEHICLE ASSEMBLY IS **CURRENTLY BOTH COSTLY AND CHALLENGING** TO MODIFY AND ACHIEVE THE QUALITY, CUSTOMIZATION AND VARIABILITY DEMANDS OF THE MODERN MARKET.

Digital Challenges

The search for seamless solutions that can overcome the existing tech inertia that plagues the vehicle assembly space is further complicated by the host of challenges presented by legacy systems.

Current solutions are not digitally compatible with current modern internet and IoT technologies. With a complex mix of products and a clear need for more traceability, process control and information sharing, current systems have significant limitations.

CHALLENGES FOR CURRENT SYSTEMS INCLUDE:

VEHICLE BOM VARIATION AND CHANGES
Managing complex vehicle variation and changes is difficult to accomplish with most PLCs/HMIs, as well as with the many layers of technology added over time to accomplish flexibility and speed of process changes.

TOOLING INTEGRATION
Tooling, such as torque tools, sensors, testers, etc., are typically interlocked through a PLC or no connection at all. Additionally, it is difficult to add new devices and in particular act on product variation and changes.

PLC COMMUNICATION
PLC integration and communication for process sequence control, BOM management, prerequisite checking, and data gathering is generally cumbersome and inflexible. Additionally, PLCs are not typically efficient for upper-level communication to IT systems.

CAPTURING AND LEVERAGING DATA
Data gathering is more difficult with traditional systems. PLCs or plant floor controllers are not really designed for modern types of data sharing. They are sometimes burdened by overly complex scenarios to capture data, or more typically, data is siloed and not collectively available.

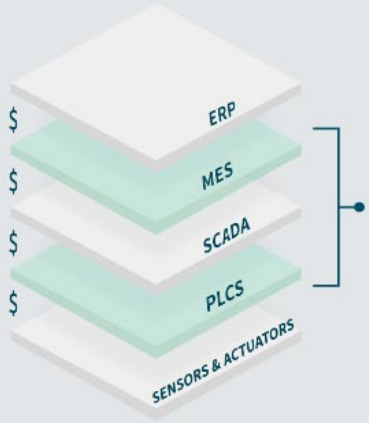
PAPER-BASED WORK INSTRUCTIONS
Instructions exist, but are often only available on paper or as a PDF on an offline machine. In many cases, they are simply ignored and not used.

PROCESS PLANNING AND RESOURCES
Because of siloed data systems, siloed teams, and limited resources, process and tooling planning takes a long a time.

REPAIR AND REWORK STRATEGIES AND DOCUMENTATION
Inflexible solutions with limited data gathering are further hampered by the challenges of repairing/addressing difficult-to-manage defects in a way that doesn't impact production.

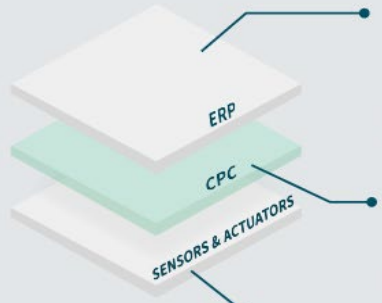
INTEGRATION TIMELINES
Long launch times for new vehicles and difficulty modifying systems with model year changes.

TYPICAL LAYERS ON THE PLANT FLOOR



TRADITIONAL COST BOUNDARIES
The cost of traditional layers on the plant floor can be extremely expensive and labor intensive—from hardware and integration costs to programming and data analysis needs.

CPC - THE NEW PLANT FLOOR



ERP SEAMLESS INTEGRATION
Easily integrate CPC with upper level systems: ERP, DMS and regulatory systems.

CPC SIGNIFICANT COST SAVINGS
CPC removes the need for HMIs, PLCs, SCADA and MES layers on the plant floor. It provides better functionality with significant reductions in initial and life cycle costs.

ACTUATOR / SENSORS IIO T ENABLED
Direct real-time connection to IIoT devices

The Digital/ Data Revolution

Vehicle assembly professionals now have access to the Connected Process Control (CPC) platform, which can help bridge the digital divide and address issues presented by legacy systems, aging infrastructure, and outdated technology.

The CPC solution is essentially a web-based platform that replaces most layers of the traditional automation stack: a cost-effective, game-changing solution for the plant floor. CPC makes it easier than ever before to standardize work instructions, provide process control and traceability, and monitor and enforce quality standards.

The CPC Advantage

A CPC platform enables vehicle assemblers to perform process control changes, IoT device integrations, and data gathering in a configurable environment on any PC with a web browser.

CPC FUNCTIONALITY/ CAPABILITIES INTRODUCE SEVERAL CRITICAL FEATURES AND ADVANTAGES:

PROCESS CONTROLS

» Limited need for PLCs and HMIs with this server and web-based system. A configurable environment allows for modifications to processes and tooling based on VIN proliferation. No programming is needed and changes can be implemented in minutes.

» Highly configurable rerun, retry and reject strategies designed to maximize throughput and ensure quality. For example, previously rejected VINs can be repaired in different footprints with more cycle time availability. Additionally, CPC will not allow a vehicle to be shipped with any rejected task.

» Synchronized build process across subsystems to match specific VIN builds.

» Easy-to-understand process configuration with web-based drag-and-drop changes which includes many task/element types such as torque, error proofing, operator decision, smart cameras, web cameras and many more.

» Traceability/genealogy where all serial numbers and lots of material are tracked and stored against the VIN. Additionally, store VIN pass/ fail data as well as process data like torque/angle, tester data, etc.

» Ability to check parts that are married from sub systems or suppliers to ensure parts are built correctly prior to installation on parent part.

» Many standard drivers for connection to commonly used tools and devices.

» Visual low programming tool for development of interfaces to legacy systems. This tool can run on servers or IoT devices.

» Configurable for multiple operators in a single footprint.

» Ensures all tasks are completed at each footprint before allowing vehicle to leave.

CRITICAL FEATURES AND ADVANTAGES OF CPC

1 PROCESS CONTROL

2 DIGITIZED INSTRUCTIONS AND/OR INFORMATION

3 CONNECTIVITY TO UPPER-LEVEL SYSTEMS

4 PART HISTORY AND GENEALOGY

5 BUSINESS INTELLIGENCE & ANDON BOARD

6 OVERALL EQUIPMENT EFFECTIVENESS (OEE)

7 PREVENTATIVE AND SCHEDULED MAINTENANCE

8 EFFICIENT PROJECT TIMELINES

The CPC Advantage *(continued)*

DIGITIZED INSTRUCTIONS AND/OR INFORMATION

» Expedites knowledge base, assembly accuracy, and training needs.

» Guidance can be targeted to individuals based on level of expertise. Less experienced operators can be given more guidance than others.

» Provides VIN- and/or BOM-based visual guidance for each operator, allowing all operators in a footprint to have individual guidance.

» Instructions can include images, videos, GIFs, 3D models and PDFs.

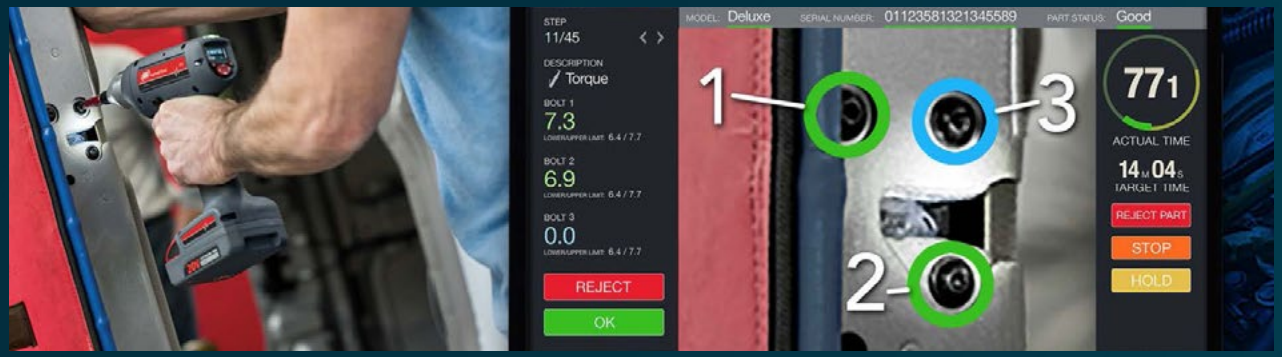
» Digitally display MSDS, PPE, or any relevant information at the station level, with immediate access for operators.

» Digitize traditional manual or paper-based data collection by integrating it into your process for items such as quality checklists, measurements, logs, and visual inspection captures.

» Tablets with only a web browser can be used for instructions, barcode scanning, image capture, and operator data input.

» CPC's embedded Work Instruction Editor (WIE) allows for easy work instruction creation without any specialized programming expertise. Additionally, users can deploy work instructions when approved.

» Integrates with Augmented VR where BOM-driven information and guidance can be projected onto vehicles or parts.



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The CPC Advantage *(continued)*

CONNECTIVITY TO UPPER-LEVEL SYSTEMS

» Easily integrates to upper-level systems for part consumption, verification that a sub-component can be used, maintenance data, material system calls, etc.

PART HISTORY AND GENEALOGY

» Collect data against a VIN on sub-components and marriages throughout the entire build process.

» Collect images at various stations and at end-of-line for quality checks and warranty claims.

BUSINESS INTELLIGENCE & ANDON BOARD

» Work-in-process visualization and status reporting by VIN or serial number.

» The addition of a shop floor Andon to display relevant real-time information, communications, and alerts. Numerous built-in web-based reports give team leads and management personnel access to historical and real-time data with insight to accelerate continuous improvement efforts.

OVERALL EQUIPMENT EFFECTIVENESS (OEE)

» Capture OEE data through a web interface or directly from machines.

» Station operators or machine automation can capture notes and reason codes for faulted stations.

» Extensive built-in OEE-specific reporting where users can drill down to specific problem machines and metrics. For example, a station may have availability issues with a specific reoccurring fault.

» Notifications can be sent for OEE states, such as if a fault occurs multiple times or if quality hits a specific value.

» Track real-time production targets and efficiency

PREVENTATIVE AND SCHEDULED MAINTENANCE

» Deploy digital standardized maintenance procedures, enforce best practices, collect granular process data and create a permanent digital record for asset management and regulatory compliance

» Reduce production errors, minimize downtime, cut labor costs and maximize asset life expectancy.

EFFICIENT PROJECT TIMELINES

» Traditional legacy systems were constrained by technology and the need to custom-program different layered technologies for new line or model changes. With the CPC solution, hardware and infrastructure installation are the only constraints. Likewise, with CPC, processes can be configured and tested well ahead of installation of hardware infrastructure.

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The Bottom Line

For many years vehicle manufacturers have led the way for comprehensive process control and data gathering innovation. However, costly and complex legacy systems had to be used to accomplish this. Over the last few years, web technologies and IoT devices have emerged to offer systems that are much more easily implemented and significantly more streamlined and powerful. The CPC platform allows vehicle assembly professionals to leverage these new technologies to their full capacity: to realize better process control, tracking, visual guidance, and data gathering—all as part of a much less expensive and resource-intensive solution.

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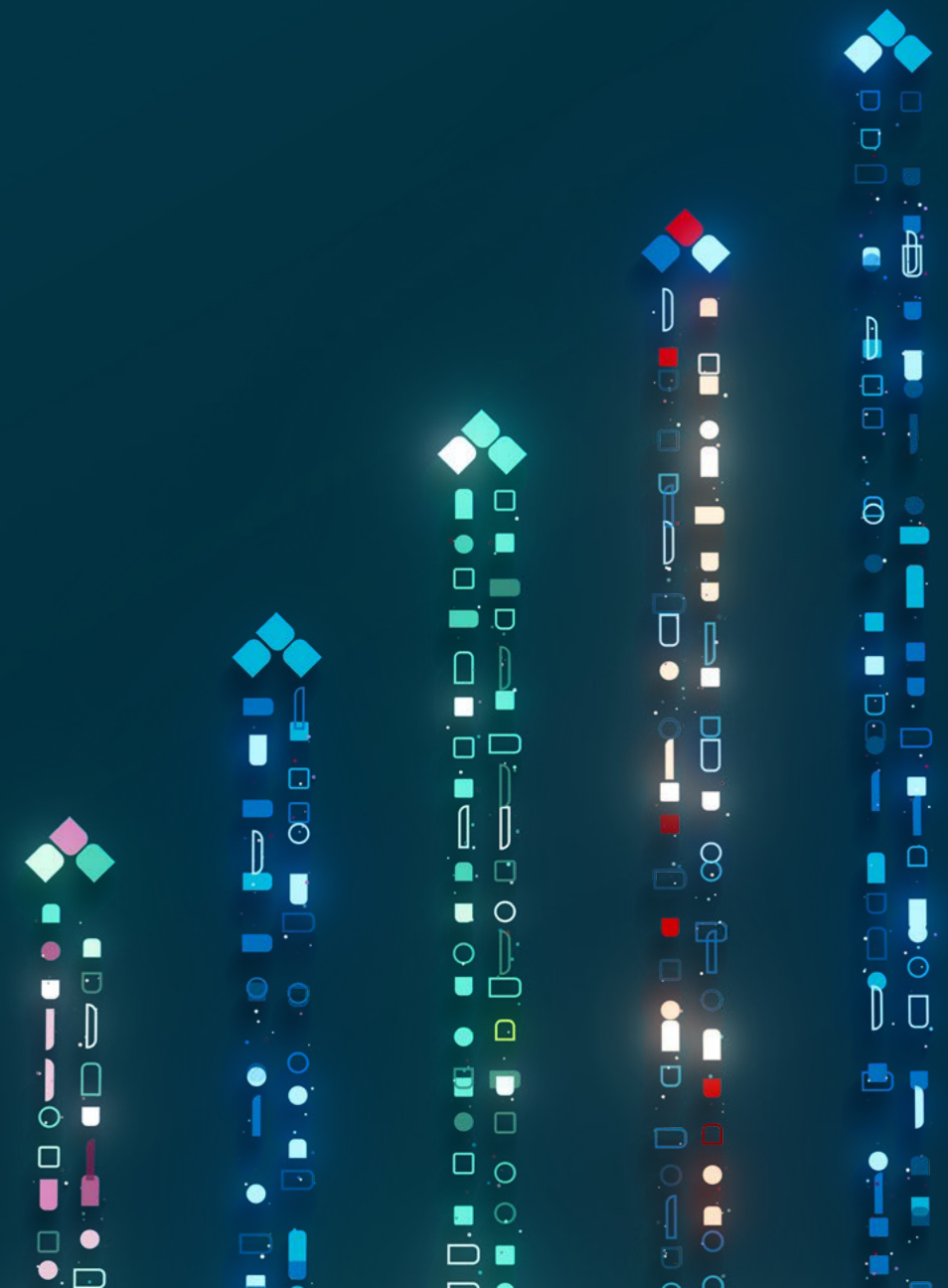

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