

# The evolution of automation in Warehousing and Logistics

How operations evolved — and how AI is driving the next leap forward

Infographic

START

## Manual labor

Warehousing was entirely human-driven. Workers manually moved products, tracked inventory on paper and relied on verbal communication and intuition to manage operations.

### Challenges

- High risk of human error
- Slow, inconsistent throughput
- Safety hazards from repetitive, heavy labor
- Little to no operational data

### How companies adapted at the time

To improve consistency and reduce fatigue, manufacturers began introducing basic tools like carts, manual lifts and checklists. These efforts focused on worker efficiency and task repeatability

1980

## Mechanical automation

This phase introduced machines that could assist or replace repetitive physical tasks—conveyors, forklifts, palletizers and fixed industrial robots.

These systems increased speed and safety but lacked data intelligence.

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### Improvements:

- Higher throughput
- Reduced labor dependency
- Safer work environments
- Standardized workflows

### How companies adapted at the time

Operations invested in semi-programmable automation and began organizing plant layouts to optimize flow. Most systems ran independently, requiring scheduled maintenance and manual monitoring.

2000

## Digital automation

With the rise of digital automation, this era brought central visibility. PLCs, WMS/ERP, robotics and visualization tools enabled businesses to digitize inventory, automate processes and provide better insights. This information helped companies monitor operational performance and KPI results.

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### Improvements:

- Greater accuracy and traceability
- Real-time status tracking
- Integrated reporting and dashboards
- Faster decision-making

### How companies adapted at the time

Companies deployed connected systems such as WMS and ERP platforms to gain real-time visibility into operations. They retrained employees to manage digital processes and updated standard procedures to align with automated systems, reporting and inventory control

2020

## Smart automation + AI integration

Today's operations are highly automated and advancing with AI, cobots, LLMs and real-time data to enable faster, smarter decision-making across the supply chain.

Core elements like adaptive robotics, sensor-driven insights, scalable cloud-edge systems and AI-assisted optimization are reshaping how facilities achieve greater efficiency, flexibility and resilience.

### Emerging trends:

- AI-driven decision-making
- Collaborative robotics (cobots)
- Predictive maintenance
- Data-driven analytics
- Digital twins
- Factory-to-cloud integration

### Example Use Case | Conveyor motor health monitoring

A high-throughput distribution center implemented anomaly detection on its conveyor system. Vibration sensors installed on motor housings fed data to an edge gateway running a machine learning model trained to identify early signs of wear.

**What was detected:** An increase in vibration amplitude outside of the expected range—subtle enough that it didn't yet impact throughput.

**Action taken:** Maintenance was scheduled during off-peak hours to replace worn bearings.

**Results:** Avoided a motor failure that would have caused **8+ hours of downtime**, preserved order fulfillment schedules and reduced reactive maintenance costs.

### Core trends behind adoption

- Predictive maintenance & condition monitoring
- Edge AI for real-time fault detection
- Sensor-based equipment intelligence
- Cloud analytics for proactive alerts
- Data-driven maintenance planning

## How Belden supports smart automation

Belden enables your move to intelligent operations through:

- Robust industrial networking – reliable real-time connectivity
- Edge compute infrastructure – fast local processing for real-time data analysis
- Scalable architecture – solutions that grow with your goals

## Ready to explore the next phase of your automation journey?

Let's connect on building a data-ready, AI-optimized operation.

Contact us 



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