The Factory of the Future

A practical guide to harnessing new value in manufacturing.

ZEBRA TECHNOLOGIES

SEE MORE. DO MORE.

HOW MANUFACTURING SOURCING, SUPPLY CHAIN MANAGEMENT AND PRODUCTION OPERATES TODAY.

With around $900 billion of waste in global manufacturing supply chains*, it's clear there's scope to cut costs dramatically and create new value. As manufacturing regains favor with economic and political stakeholders worldwide, progressive enterprises are exploring ways to work more efficiently using asset information, system integration and process innovation.

There are, of course, the ongoing challenges. Product and supply chain complexities are unavoidable. Rising raw materials and energy prices require constant monitoring and reassessment. The global marketplace is defined by aggressive competition and pace of activity.

Small, hungry, local enterprises are often better-placed to compete on price than multi-national organizations trying to balance economies of scale with meeting customer needs in regional markets. Production lines have to be able to produce shorter-run products for specific markets and end user needs. And manufacturers may operate multiple sites in different time zones producing the same item.

The shift from capacity to capability

To streamline operations, manufacturers are looking to measure success based on production capability and flexibility rather than efficiency and production capacity. The trend is to move away from a make-to-stock manufacturing approach and mass production, and embrace more of a quality-driven, make-to-order approach to meet defined and specific customer needs.

As a part of this shift, plant floor staff are becoming more 'knowledge workers' than operators, not only having a technical understanding of the machines they run, but also having the analytical and decision-making skills to make adjustments to machine operation to support the most efficient means of delivering the products required.

*Source: IDC Manufacturing Insights

Living lean

There's significant potential to adapt existing processes and work with greater precision. Companies that follow lean principles, like building to actual customer demand – rather than adhering to forecasts – and bringing material to the plant only when needed as opposed to keeping stockpiles on hand, operate more efficiently.

Increasing efficiency, especially where materials handling, energy and labor costs are concerned, is far easier with visibility not only into individual processes, but also to a network of connected devices across the entire business ecosystem. Every point in the supply chain where visibility is less than complete can potentially harbour inefficiencies. Conversely, every visible asset or event that can be identified and placed in context can be potentially improved.

Wasted data

As the number of devices linked to manufacturing production processes has increased dramatically, so has the amount of data available. However, much of this information sits in disjointed data silos. In supply chain operations, warehouse management systems and inventory management systems are implemented at a local distribution center, with proprietary integration back to an ERP system. While some of this data may be accessible centrally, the actual asset tracking devices often lack real-time connectivity, giving only a historical view rather than a current perspective.

When this scenario is replicated across the enterprise, with innumerable devices running disparately, the inability to harness the data available is just another manifestation of wider system inefficiency.

By capturing the data, and turning it into actionable information that provides full visibility into the supply chain, enterprises can streamline their processes and move towards optimal production.

THE FACTORY OF THE FUTURE IS CENTERED ON VISIBILITY

The key for manufacturers is to know exactly what's happening in front of and around them. At the heart of the factory of the future will be data, visible, comprehensible and actionable.

This authentic, accurate, accessible data, point-in-time or real-time, gives status of machine, component or finished goods, enabling existing processes to be more precisely managed, and new value to be created.

To succeed, best-in-class manufacturers give their physical assets a digital profile that enables them to know the real-time location and condition of those assets, and timing and accuracy of the events occurring, throughout the value chain. Data visibility empowers you to orchestrate production and deliver to order, cutting out operator waiting time, reducing defects, and eliminating over-production.

With complete visibility of the relationships and interdependence between items, processes and people, and transactions taking place, enterprises can move closer to the goal of true manufacturing visibility.

Real-time process visibility leads to **enhanced business intelligence** that results in **more informed decision-making** and **more efficient manufacturing performance.**

MAKING DATA VISIBLE: KEY DRIVERS FOR CHANGE

Advances in production technology and innovative thinking are driving better visibility of objects, actions and events affecting the manufacturing supply chain. By incorporating these advances into your enterprise, you can see where inefficiencies are happening, and where a change of approach will move you towards operational excellence.

Strategic big data

Enterprises are looking at the advent of big data as a vast mine to gain deeper, more actionable insight into their operations and processes, and do more with less. The richness of big data is more than just the volume of data, but also the velocity and value of the data.

New technologies have the potential to gather and assimilate unprecedented levels of production data. This helps you to identify connections within information and make intelligent use of it.

The Internet of Things

The number of devices associated with business operations continues to increase. With the focus on better and more actionable business analytics, solutions that capitalize on the Internet of Things are rapidly gaining momentum, especially when they are Cloud-ready and accessible across the enterprise and beyond.

Actionable analytics

In real-time, you now have the ability to assess information not just to pinpoint trends, but also to act on them and improve performance as a consequence.

Internet of Things-enabled devices provide 'right now' visibility into supply chains, distribution centers, land and seaports. They also drive very tight process-driven tasks where instantaneous feedback and control are essential.

Businesses can use this data to optimize processes, reduce shrinkage, and provide better security and safety throughout the workplace. Deep visibility into mission critical operations provides the measurable metrics enabling the enterprise to make better-informed decisions and inspire innovation.

Integrated ecosystems

Where, historically, a diverse, disparate mix of fixed and mobile systems and devices have operated in silos, bringing together corporate and personal technology into a manageable whole creates efficiencies and delivers new value.

Connectivity and consistent visibility across operations, supply chains, and business partners streamlines processes and operations, driving better customer service and loyalty. Tighter processes mean faster inventory turns, reducing the need for on-hand inventory. Eliminating waste and improving asset tracking can boost product quality while reducing operating and capital expenditure.

The virtual plant floor

The virtual plant floor is an integration of all sites and systems supported by complete, connected supply chain visibility. This focuses on how an issue at one site can affect production at another, and how to overcome these problems.

AIDC SOLUTIONS AND HOW THEY DRIVE BETTER PROCESSES

AIDC (Automatic Identification and Data Capture) solutions and advances in technology enable manufacturers to see what's happening with all their operational events – assets, transactions and people – in real-time. When this visibility is aligned to single network connectivity, it creates an integrated production environment with data excellence at its heart.

Not only can you see where everything is, and what it's doing, but you can also see everything relative to everything else. Business decisions are made in full awareness, leading to greater efficiencies and more ability to fulfill customer needs precisely while meeting your own business goals.

These technologies include:

- Barcodes
- Radio Frequency Identification (RFID)
- Global Positioning System (GPS)
- Environmental sensors
- Real-Time Locating Systems (RTLS)

Barcodes

Used mainly as a means of tracking stock in retail stores, barcodes have been used in increasingly diverse settings for a wider range of functions. In manufacturing, barcode applications have spread throughout the enterprise to include warehousing, customer service functions, time, attendance, and package delivery, as well as the assembly line operation itself, helping to improve data management and accessibility, and reduce costs.

The benefits of barcodes

Improved data accuracy

Improved data accuracy is the single most common motivation for putting a barcode system in place. Companies with integrated barcoding systems that enable users to scan barcodes rather than type numbers commonly achieve 99% data accuracy. For companies in which data errors are a mere nuisance, the difference between 85% and 99% may not seem that extreme. But for manufacturing enterprises looking to optimize efficiency, the goal is 100% accuracy. Barcoding is one of the most cost-effective tools that these organizations have to ensure data credibility and reduce the impact of human error.

Efficiency benefits

Besides providing near-perfect accuracy, barcoding also enables users to work faster, without sacrificing accuracy. When factoring in the time it takes to correct simple data entry errors, it is easy to see the improved efficiency that comes with barcoding. In addition, by providing computer systems the capability to 'see' exactly what is happening, barcodes enable instant conversion from physical actions into digital transactions. This conversion of former manual tasks to electronic processes occurs in real-time, increasing efficiency and allowing management to make decisions based on current data and personnel to be employed in other, more productive areas.
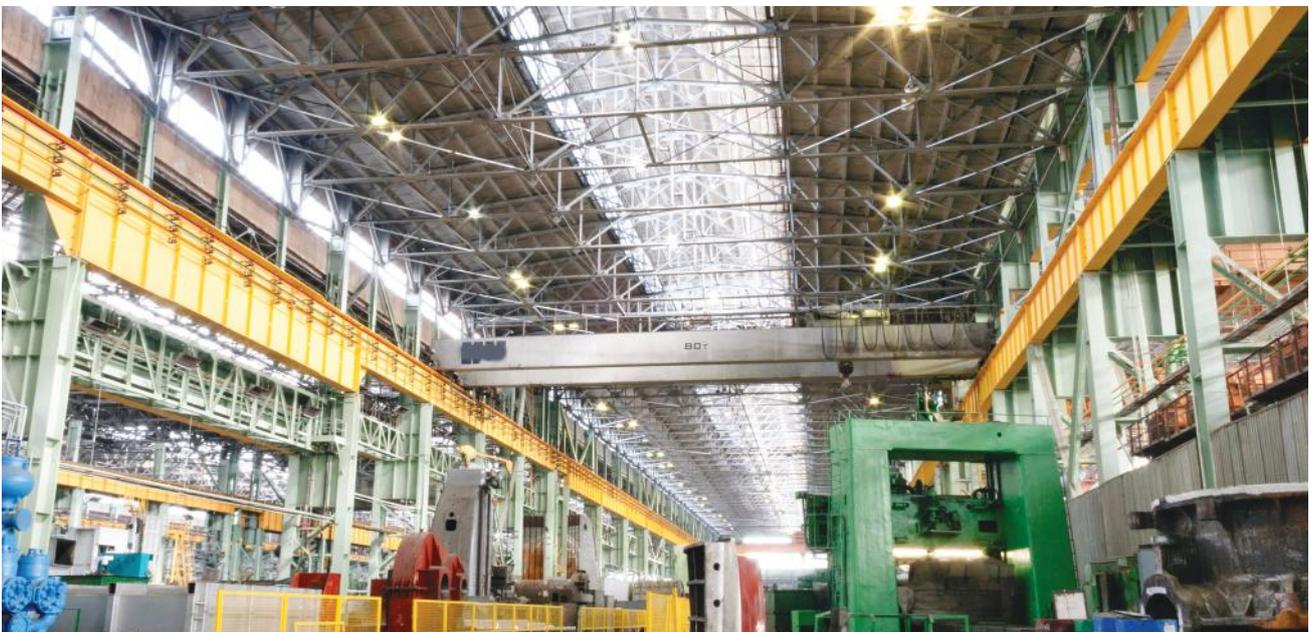
Consistency

Barcoding, particularly in fast-paced industrial environments, enables consistent and predictable operations for enhanced product quality by combining data management functions and preventing bottlenecks at data entry stations. Auto-ID systems usually operate at a defined pace, either self-determined by the printer's maximum speed or triggered by the action of another device.

For instance, in an assembly line, operations that were previously slowed by congestion at the point of data entry can now progress smoothly through a system of automated print-and-apply labelling machines and fixed scanners. In addition, employing standardized barcode symbologies and compliance labeling ensures that barcode information is captured and relayed in a way that is universally understood and accepted.

Improved inventory and asset management

In manufacturing, the barcode contains internal information such as production line number, date of completion, materials used, serial numbers and miscellaneous quality control information.
By scanning the label in the shipping department, the company can identify the exact inventory, in real-time, as well as the precise date and time that any product leaves the warehouse.

RFID

Manufacturing operations are increasingly adopting RFID tags. These carry an RFID transponder, commonly called a 'smart label' to complement the barcode and text on the labels. Unlike barcodes, RFID technology requires no line-of-sight between the object and the reader. This solution enables the identification and recording of entire pallet loads in less time than it takes to scan a barcode shipping label.

Besides improving accuracy, RFID and barcode data collection is faster than manual collection, which improves labor productivity. Replacing paper forms with much smaller barcode labels and embedded RFID tags produces media savings that frequently reach six figures annually, even for companies with moderate levels of production tracking and shipping activity.

As customers demand build-to-order and just-in-time deliveries from their suppliers – replacing the traditional build-to-stock model – traceability and data collection at the item level is critical. A relatively small investment in an RFID tracking system will ensure scheduling and materials applications will deliver benefits, leveraging the investment in those more expensive planning applications.

Simplifying materials management and streamlining production line applications

In terms of stock management, after an item's inventory routing instructions are encoded and labelled at the receiving dock, on arrival at the warehouse, users can use a mobile device to scan the RFID to record its arrival. The host materials control or warehouse management system (WMS) then directs the worker to the appropriate putaway location based on the item's size, shelf-life, and predicted consumption schedule.

Most businesses apply RFID and barcode shipping labels when finished goods leave their facility. The most efficient producers have learned that pushing their identification and tracking systems as far back into the production process as possible provides tremendous labor and material savings.

RFID and barcode systems provide a high return-on-investment by reducing data entry and processing time, improving quality, and boosting the real-time performance of enterprise software applications. Information today is a valued component of all manufacturing, distribution, and retail operations, thus presenting a form of currency in many business relationships. Companies that can document the product lifecycle and tracing history to the item level – while meeting industry and other regulatory mandates – can win substantial new business and build strong customer loyalty.

RTLS

Real Time Locating Systems (RTLS) deliver precise visibility of critical assets – supply chain, manufacturing, and human, in real-time. For enterprises with geographically dispersed sites, this means having end-to-end visibility and traceability of all containers, pallets, and packages. For manufacturers, it enables intelligent management and flow of all critical assets, whether in the facility or in the yard.

RTLS solutions can incorporate a mix of barcode, RFID, GPS and sensory technologies that mark, track and show the status of assets in real-time. Where passive technologies such as barcodes simply locate an item, the active RFID element of these solutions delivers both live location and actual status.

Simplify asset management

Controlling hundreds or thousands of assets throughout large indoor and outdoor production environments is a daunting challenge. RTLS allows operations to find assets in seconds, as opposed to taking hours using a manual process. Beyond the ability to locate a sub-assembly or final product on demand, operations can use the tracking data to optimize processes, workflow cycle time, and dwell time.

RTLS enables users to view the precise location of assets and eliminate time-consuming manual searches and audits. Location data integrates into existing enterprise resource planning systems, allowing enterprises to realize more value from their IT infrastructure. Also, real-time enterprise visibility minimises the need for equipment relocation. Instead of moving equipment to central locations, assets can be stored closer to the point of use, which increases speed of production.

Improve enterprise resource planning

Users can add RTLS and workflow rules based on their unique needs and collect metrics for analyzing processes, and identify areas that miss key performance objectives. Timely knowledge of asset movements helps speed up tasks and transactions, enabling accurate forecasting and improving asset value while reducing the order-to-cash cycle.

Whether tracking containers through a supply chain, optimizing manufacturing processes, or providing wide-area asset traceability, RTLS communicates the physical location of assets by zone, yard slot, and/or intelligent interactive graphical mapping along with historical visibility into the asset's location, with accuracy of within a few feet.

The optimal RTLS platform integrates hardware and software with existing BI and ERP solutions to help enterprises align their strategies cross-functionally. When coupled with passive RFID and barcode systems, RTLS enables you to track, locate, and manage critical assets across the value chain.

HOW AND WHERE TO USE AIDC

Warehousing

Use 2D barcodes, intelligent automation and RFID incorporating RTLS, GPS and sensoring to track and trace items as they move through the supply chain, and monitor the movements of employees and other assets. Enable full visibility into warehouse operations to increase efficiencies and reduce costs.

Inbound and outbound logistics

Use a combination of technologies as above to move freight in and out of crowded shipping and receiving areas quickly and accurately.

Asset management

Warehouses and manufacturing plants incorporate a mix of fixed and moving assets, and to operate efficiently, it's vital to know where everything is. AIDC solutions increase visibility, productivity and profitability by delivering real-time asset location and status.

Work-in-progress

Assembly lines move fast, and every piece – potentially thousands in complex operations – needs to be tracked. Real-time tracking and tracing of all parts moving to and from the assembly line enables streamlined production without delays, unnecessary downtime or excess labor costs.

Breakdown and putaway

Accurate labeling and tagging of all goods before putaway is essential for authentic lean production. Item-level 2D barcodes and RFID provide quantities of specific items, batch and serial numbers and other relevant information.

WHY ZEBRA?

Zebra's extensive portfolio of Auto-ID technologies, including 2D barcodes, intelligent automation and RFID incorporating RTLS, GPS and sensoring, turn the physical into the digital to give assets and operational events a virtual voice.

Layering these technologies across the enterprise gives you complete visibility of these assets. You can see their real-time location and condition, and monitor the timing and accuracy of the events occurring at every stage of the manufacturing process. This Visible Value Chain enables you to identify opportunities for leaner manufacturing and create new value with existing assets.

Find out more about the Factory of the Future, visit
www.zebra.com/manufacturing-