Enterprise-Wide Data Collection and Bar Code Printing for Superior Supply Chain Management

A ZEBRA **BLACK&WHITE** PAPER



Zebra

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Executive Summary

Successful businesses run on information. Companies that can't provide information for their supply chain partners are at a competitive disadvantage. Many proven productivity tools like bar code shipping labels will still deliver benefits, but have become a requirement of doing business that do not provide the functionality or competitive advantages demanded by progressive supply chain management operations.

This paper will show how advanced bar code and related technologies can create sustainable advantages by providing the information required for modern business practices. It will address how bar code data systems improve the performance of enterprise software applications, summarize the general benefits of bar coding, and demonstrate how to improve productivity and save money by utilizing specific applications in receiving, production tracking, quality control, staging, and shipping operations.

General Benefits to Bar Coding

Participants at all points in the supply chain must produce and provide timely, accurate information or they will be dropped as suppliers and excluded from markets. Companies without good information carry excess inventory to ensure they can deliver what they have promised. Replacing inventory with improved information reduces storage space and labor costs, improves asset utilization, enables faster billing cycles, and significantly contributes to cash flow.

To gain more information and visibility into their operations, many companies turned to enterprise resource planning (ERP), supply chain, customer relationship management (CRM), and other management software. These applications can be highly effective, but are hampered when the data they require is not timely or can't be collected at all. That is why bar codes endure as the most widely used, cost-efficient and effective tools for providing accurate data to enterprise applications, and why future software performance improvements will rely on advancements in bar code and communications technology.

Scanning a bar code, which produces greater than 99.9 percent data accuracy, is a far superior method of entering data into a host system than key entry by word processing or manual record keeping with pencils and forms. A widely accepted study found that skilled typists make one error approximately every 300 keystrokes; error rates for less skilled warehouse and production workers are much higher. If a simple inventory application requires workers to write down a 10-digit product serial number, one in 30 records would be expected to be wrong. Because ERP systems reuse the same data for many different applications, seemingly innocent transcription errors on the shop floor can later cause big problems in inventory, planning and customer order tracking systems.

DePuy Orthepaedics, an orthopedic manufacturer, determined that each error in its shipping process cost between $35 to $55 to detect and correct. Since eliminating manual data entry with a bar code system for shipping operations, the Zebra customer has saved several hundred thousand dollars.

A System's Technical Objectives



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Businesses should actively seek to replace manual data collection activities with bar code systems whenever possible. Besides improving accuracy, bar code data collection is faster than manual, which improves labor productivity (see for yourself by comparing the time it takes you to read and transcribe a 10-character serial number with the time it takes to scan a bar code). Replacing paper forms with much smaller bar code labels produces media savings that frequently reach six figures annually even for companies with moderate levels of production tracking and shipping activity.

As customers flex their muscles to demand build-to-order and just-in-time deliveries from their suppliers, replacing the traditional build-to-stock model, tracking and control to the item level is becoming extremely important. A relatively small investment in a bar code tracking system will ensure scheduling and materials applications will deliver benefits, leveraging the investment in those more expensive planning applications.

The following specific examples will show how money-saving, new business processes are enabled through advanced data collection technologies.

Receiving Applications

The receiving dock still represents one of the best opportunities to make major productivity improvements, even for companies who automated with scanning and electronic data interchange (EDI) more than a decade ago. New business processes can take advantage of existing technology systems to provide substantial savings at little or no incremental cost.

For example, longtime Zebra customer General Motors now requires its suppliers to label shipments with GM 1724-standard labels, which include two-dimensional (2-D) bar codes, instead of with AIAG-standard B10 labels, which do not. The new labels include all the information previously found in the B10 format, but the 2-D bar code provides additional capacity for new information for use by the producer, logistics provider and GM.

Now, when a shipment is scanned on the GM receiving dock, in addition to recording the goods in the system, software directs workers to specific putaway locations, which may include direct delivery to the production line. This saves money by reducing materials storage space requirements and associated handling costs. GM expects to save millions of dollars per facility over time by improving the productivity of receiving workers and lowering raw materials inventory.

The additional data encoded in the labels also facilitates a higher level of lot tracking, which would enable recall of specific vehicles, saving millions in costs and damage to GM's reputation from a general recall. Other manufacturers in many industries are instituting similar programs to take advantage of two-dimensional shipping labels.

The GM label standard is open and free to users. Zebra supports the GM program and additional 2-D initiatives from the American National Standards Institute (ANSI MH10), Air Transport Association (ATA), Electronics Industry Association (EIA), Telecommunications Industry Forum (TCIF), Uniform Code Council (UCC) and the U.S. Department of Defense.

RFID, Mobile Devices Emerge

In the future, some shipping labels will include a radio frequency identification (RFID) chip to complement the bar code and text on the labels. Labels with embedded RFID chips are commonly referred to as "smart labels." Unlike bar codes, RFID technology requires no line-of-sight between the object and the reader. This feature enables entire pallet loads to be identified and recorded in less time than it takes to scan a bar code shipping label. The U.S. Department of Defense successfully pioneered pallet tracking with RFID, and now several leading manufacturers and retailers are currently conducting logistics trials. Zebra was the first to introduce a commercially available RFID smart label printer/encoder. Today, Zebra's offerings include high frequency (HF) models to support low volume and wristband RFID applications as well as RFID print engines for print and apply systems and multi-protocol UHF printer/encoders which support EPC and other tag protocols.

Companies may also conduct spot audits and quality checks on the receiving dock before accepting a shipment or releasing materials for putaway. In this application, a worker will inspect items or send the item to a testing station and record results in a mobile computer. A mobile printer would be used to create a bar code label to track the item through testing. Using mobile equipment on a wireless network, workers can ensure the right label is applied to the right item and can include variable information on the tracking label, such as the order number or time of delivery. Modern mobile printers save labor time in this application because they save workers a deadhead trip to a central label location. One Zebra customer saved 182.5 labor hours per facility annually by using wireless printers to eliminate deadhead trips.

Materials Management

Case or shipment labels may not provide enough tracking detail for managing goods once they are entered into materials inventory, especially for companies that rely on inventory staging for effective workflow. With millions of parts to identify, locate, and move in and out of inventory, bar coding is essential.

In the best-case scenario, the item's inventory routing instructions are encoded and labeled at the receiving dock, as previously described. Once the item arrives at the warehouse, users can use a wireless computer to scan this bar code label to record its arrival. The host materials control or warehouse management system (WMS) then directs the worker to the optimized putaway location based on the item's size, shelf-life and predicted consumption schedule. Workers then store the item and scan a separate shelf label to verify the item's placement. Each scan leads the user to the next task and updates the host system.

If the inventory warehouse location information was not available for the incoming delivery when it first arrived at the loading dock, it is a simple operation to print that label at the warehouse entrance. Here, companies typically rely on a purpose-built bar code label printer that can withstand the rigors of an industrial environment.

After installing a system similar to the one just described, baker and snack food producer with national distribution reduced inventory and distribution costs 30% by gaining improved tracking over work-in-process and finished goods inventory.

Production Line Applications

Most businesses apply bar code shipping labels when finished goods leave their facilities. 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.

The baker referenced above provides an excellent example. Its bar code system enables it to track raw materials through to finished goods. When the baker discovered one of its suppliers had provided a bad batch of ingredients, the baker was able to determine the exact pallets had affected products and the specific stores they had been shipped to. The baker then contacted its customers for a targeted recall, avoiding the expense, embarrassment and associated damage to its reputation that a general recall would have produced. Bar code-based production tracking systems also can be used to automatically build audit trails and work histories to support ISO quality documentation requirements.

Lot tracking also enables companies to take advantage of efficient new manufacturing processes. Encouraged by the success of Dell Computer and other make-to-order manufacturers, many companies started initiatives allowing customers to custom configure their products, without special order charges or longer lead times. These programs often rely on flexible manufacturing practices requiring frequent production turns, new levels of work-in-process (WIP) tracking, plus more frequent, smaller shipments. Fortunately, second generation bar code systems provide the necessary functionality for these requirements.

One example is a large leading computer manufacturer company that uses several piggyback labels—smaller labels that can be peeled off of a single backing—on their WIP tickets to custom label each sub-assembly with matching serial numbers. Along the assembly line, users peel off the label related to their task from the WIP ticket and adhere it to the part of the system that they put together, such as a hard drive, video card, power manager, heat sink, etc. Besides ensuring that each computer receives the proper equipment, the matched serialization helps the manufacturer with quality control measures by identifying each step of the assembly process.

There are numerous examples of how applying bar codes to work-in-process (WIP) can drive automated routing and assembly operations and provide valuable production tracking, even for small components companies often think of as untraceable. The print resolution for bar code printers has more than tripled since the first models were plugged in. The application of this technology means that half-page work job tickets that travel with items can be replaced by tiny bar code labels placed directly on the item. Improved print resolution and the standardization of two-dimensional symbologies like Data Matrix and UltraCode enable users to pack a significant amount of information—including lot codes, operator ID, and time of production—onto components smaller than a postage stamp.

Consider a hypothetical company that identified three new production areas where it needed to provide WIP tracking to support its custom manufacturing initiative. The firm discovered two obstacles to creating tracking labels for materials in these production areas. First, the company had no way to access data from its materials planning system to provide the necessary information for its new WIP labels, because the software it used to create bar codes was designed only to make shipping labels. Second, one of the desired labeling areas was chemical cleaning station in a corner of the factory that had no computer access. Once again, features only available in advanced bar code products could solve these problems.

Advanced label generation and management software uses open technology and has certified interfaces to the most popular enterprise applications and platforms, including SAP and select Oracle applications, and any application that can support XML output. This enables printers to extract enterprise data on demand to produce labels without the time and expense of using middle-ware or developing custom interfaces.

Software solves the problem of printer data access. Wireless networking solves the problem of physical access. The latest bar code printers have native wireless support, so they can be operable anywhere in a facility with a wireless network. Many existing Zebra printers can be converted to wireless models by installing the ZebraNet® Wireless Print Server. Zebra wireless print solutions can support multiple leading wireless networking technologies including 802.11b and g and related security protocols..

Quality Control

The same practices and technologies used to track items through various production stages can also be applied for sample tracking and quality control. When defects are detected, item- or lot-level production tracking enables companies to minimize the number of items for scrap or rework, which can produce substantial labor and materials savings.

Until recently, circuit boards were tested at the end of the production line so the quality control agents could determine with absolute certainty the line on which they were produced, when they were assembled and what comprised the assembly. The agent could even look down the line to see which employees had a hand in the production.

The adoption of clean-room production and wave soldering has antiquated this quality control process. In clean-room settings, there is simply no room for a quality control station at the end of the line, plus the testing equipment often violates the sterility of the clean-room environment. Wave soldering production is so rapid, the mere positioning of a quality control agent at the end of the process would undermine the efficiency gained by the new technology.

Using an advanced bar code print system, the board's production history and test results can be encoded and printed in a 2D bar code (Data Matrix symbology is commonly used in the electronics industry) and applied to the board for lifetime tracking. High-resolution printers (usually 600 dpi or greater) are able to compress the required information into a tiny bar code with flawless scanning accuracy. Another option is to use smart labels. Text and bar code data on the label is static, but the RFID chip is rewritable. Users could use a bar code to provide item-tracking information, and store production and testing data in the chip, adding new information at each work station. The entire production life of the component--from sub-component procurement to production quality control—can be accessed with a single scan. The tracking label can also include customized graphics and logos with razor sharp clarity.

Staging & Shipping

Shipping operations can be improved using the same equipment currently used to produce shipping labels by modifying the system to take advantage of improved production tracking procedures. When production lots or specific items are tracked through manufacturing, ERP systems can associate them with a specific customer order (this is required in build-to-order environments).

A plastics supplier to the automotive industry changed its labeling system to create shipping labels when items were produced, instead of when they were picked for shipping. This seemingly small change immediately removed a consistent bottleneck in its order fulfillment operations that frequently threatened to delay customer deliveries. The new labeling system also automatically provided data the company used to prepare EDI advance ship notices (ASNs). Thus the company improved customer service while reducing the labor required to prepare shipments.

The system could also be used to update CRM systems in real-time, so service representatives may promptly and accurately answer customer inquiries. Increasingly, companies are placing their order shipment information on a self-service Web site for their customers to access.

Each day thousands of outgoing shipments include a bar coded compliance label mandated by the customer. Future shipments may be identified with smart labels bearing traditional label data in text and bar codes and duplicated in a chip that enables unattended identification, verification and sortation at different points in the supply chain

Advanced Control

When companies use advanced applications such as those described in this paper, bar code printers become mission-critical components of their operations. Because printing and tracking technology becomes embedded into production and supply chain processes, printing disruptions can become business disruptions. Another emerging application—remote printer management—can minimize printing disruptions.

The ZebraLink™ remote printer management tool lets system administrators perform diagnostics, resolve error messages and check the status of networked printers without physically visiting the devices, even from different facilities. For example, if a printer runs out of labels, it can send a text alert to an operator or administrator. Printers can communicate with people using a PC, mobile computer, organizer, cell phone or pager on a wired, wireless or wide-area network. Administrators may also use their devices to proactively check on printers to monitor media use, performance, workload and other factors. Many alert messages can be resolved through the ZebraLink connection without the administrator ever visiting the printer. These advanced control features maximize uptime and performance, lowering the total cost of ownership of the print system. For more information see The ZebraLink Solution white paper on Zebra's Web site, www.zebra.com.

Conclusion

Standard bar code systems provide a strong return-on-investment for users by reducing data entry and processing time, improving the data quality and the performance of enterprise software applications, and reducing the need for preprinted forms.

Advanced bar code printing systems, supporting two-dimensional bar codes, smart labels, enterprise interfaces and wireless connectivity, can provide the real-time, accurate data that information-based business systems need. Information has become a valued component of all manufactured goods and is used as a form of currency in many business relationships. Companies that can document production histories, demonstrate their ability to deliver when needed and provide customers other visibility into their operations win substantial new business and enjoy strong customer retention. Contact Zebra Technologies to learn more about how your company can improve efficiency and cut costs by using the latest bar code techniques.

Notes

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