

Barcoding 101 for Manufacturers: What You Need to Know to Get Started



At a Glance:

- This paper highlights what manufacturers need to know to take advantage of barcoding to improve their business performance.
- The benefits of barcoding are improved accuracy, efficiency and traceability, along with an ease in adhering to customer or regulatory requirements.
- Implementing barcoding as part of an integrated cloud ERP solution enables manufacturers to optimize its benefits.
- Examples from real-life manufacturers highlight how barcoding helps improve operations for companies of all sizes and in many different industries.

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Barcoding, also known as Automatic Identification (Auto ID), is a method of encoding information into a machine-readable pattern of predefined bar and space patterns that can be quickly and accurately read by a scanner and a computer. Part numbers, purchase order numbers, lot numbers, or any other information can be encoded into a barcode.

The basic operation used in barcoding is quite simple. A barcode containing product data is printed on, or adhered to, a product. That code is read by a reader with a photodiode that can record the light patterns. The scanner then produces an electronic signal that exactly matches the printed barcode pattern, and sends the barcoded information to a computer where the data is decoded and recorded just as if it had been entered by hand. Barcoding is used for product identification and tracking in almost all industries, including manufacturing.



“Barcoding enables users to work faster and eliminates the need to correct data entry errors.”

Benefits

The benefits of barcoding include the following:

Improved Accuracy

Precise data produces accurate reports on any operational function of a company, leading to better quality products, improved decision-making, more accurate forecasting, and reduced costs. The typical accuracy rate for human data entry is 1 error per 300 characters. With barcode scanners, the accuracy rate can be as good as 1 error in 36 trillion characters. For most manufacturers the goal is 100 percent accuracy, and barcoding is the best tool to achieve that.

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Improved Efficiency

Barcoding enables users to work faster. Depending on the operation or application, there is significant time savings in using barcoding vs. using a keyboard. Barcoding also eliminates the need to correct data entry errors.

Consider the time required to record the receipt of ten cartons. It would take approximately two minutes or more to write down product codes and serial numbers compared to about ten seconds to scan the barcodes. Because barcoding captures data in real time, decisions can be made more quickly and this, in turn, speeds production. In addition, barcoding helps companies make more effective use of human resources. A shipping/receiving dock does not need a person dedicated to counting inventory if it is scanned as it is unloaded.

Improved Traceability

Since barcodes permit automated and more accurate recording of information, work in progress can be tracked precisely. Quite a bit of time can be spent tracking down the location or status of projects, folders, tooling, instruments such as gages, materials, or anything else that moves within an operation. Barcodes help users more quickly isolate quality, warranty, or safety issues while minimizing disruption to production. Users can better identify defects, reducing in-process costs and virtually eliminating the need for product recalls.

Ease in Adhering to Customer or Regulatory Requirements

Over time, manufacturing industries and large customers, such as the U.S. government, have developed product coding standards for their suppliers. Uniform barcoding patterns, or “symbolologies,” have been pre-established to automatically meet these standards.

Very often, regulatory agencies, or customers, impose the standards as strict requirements for their suppliers. The uniform coding and data collection enabled by barcoding ensure that correct product data is captured and relayed in a manner that is universally compliant.

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Best Practices

Today's manufacturers utilize barcoding in all areas of their businesses. Here are some examples:

- **Metalforming manufacturer improves shipping and receiving operations.** A multi-state metalformer uses scanners in its Shipping and Receiving operations to scan arriving material and departing products. Barcoding has replaced the company's previous manual processes and accelerated the department's operations, leading to improved supplier and customer satisfaction.
- **Automotive manufacturer enhances assembly checking and component tracking.** A provider of forged metal components to the automotive industry has been using barcoding to track assembly and locate parts in the production process. Employees scan incoming components and upload the scanned data. That data is then automatically compared with bills of lading to ensure correct assembly sequencing. As the parts undergo various stages of assembly, employees use handheld readers to scan them and denote their new locations.
- **Assembly supplier establishes direct part marking, gains new business.** An automotive assembly supplier had an opportunity to win new business from a customer that required encrypted direct part marking for all of its incoming parts. By launching a customized barcoding process, the supplier was able to establish such a process and obtain the business. Today, each part the supplier produces is identified by a unique serial number, and that number is encrypted in the barcode. The encryption offers counterfeit protection demanded by the customer which had, in the past, been required to pay warranty costs on the failure of (counterfeit) components that it hadn't actually manufactured.
- **Global manufacturer handles physical inventories in half the time.** A global supplier of vibration damping and sealing materials has been utilizing barcoding for several years. Among the advantages barcoding has brought to its operations is a speedier physical inventory process. Before it implemented barcoding, the supplier's semiannual physical inventories took two full shifts and at least 60 employees. Now that all products are barcoded and lift trucks are equipped with scanners, the entire process takes less than one shift,

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two trucks have been redeployed, and eight fewer employees are required to complete the process.

- Food manufacturer improves traceability and cost tracking. A leading global manufacturer of frozen entrees and sauces barcodes its work-in-process inventory. The company produces more than 400 food products, each based on a different recipe. When an employee scans a barcode on a work order, it shows all the items required for that step in the product's recipe. The employee then scans the pre-measured and barcoded raw materials for the step to ensure that the product contains the right ingredients. This process is more efficient and accurate than the previous manual process. The barcode data also enables the company to improve its products' traceability and monitor production. Barcodes are also used for tracking of employees' hours in all departments, and in the distribution and shipping areas for warehouse pick lists. All of this data feeds into cost calculations on a real-time basis.



Industry and Customer Requirements

Manufacturers who embrace barcoding will need to familiarize themselves with the barcode symbologies required by their customers or industries, and even more important, they will need to select the best software or software system to meet their needs.

As mentioned earlier, there are a variety of barcode symbologies, or bar/space patterns, in use today and each has a different capability to encode data.

The UPC symbologies used in retail applications contain 12 numeric digits, for instance, and are considered the simplest form. General purpose Code 39 or Code 128 symbologies can encode variable-length alphanumeric data up to about 30 characters in length.

Data Matrix symbologies are the most advanced and complex forms. They are made up of two-dimensional matrices of black and white "cells" vs. bars.

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The most common uses for Data Matrix symbologies are for small parts and products as they can encode up to 50 characters into very small barcodes, readable at sizes as small as 2 or 3mm².

Most manufacturing companies that utilize barcoding follow symbology standards established by their industries.

Software Systems

Once they have become familiar with their symbology requirements, manufacturers need to select software systems to drive their barcoding applications. The software is what accumulates and processes the barcode information entered through the scanners.

Many existing computer systems are capable of interacting with barcode technology, or a simple barcode scanning device can be connected to computers in a network that can automate the input of barcoded data just as if it were manually keyed, creating stand-alone “island” barcoding operations. However, software can be very inefficient if it was not designed to work specifically with barcodes. Many applications have not been designed to use automated data collection and therefore won’t provide all of the benefits associated with barcoding.

That’s why it’s important that whichever enterprise resource planning (ERP) software system manufacturers utilize, they should ensure their system has been specifically designed to work with barcodes. In island systems, the barcode printer has no direct interaction with the rest of the manufacturing enterprise; but when it is part of a “barcode-aware” ERP system, the printer can take direction from other processes and print and encode data automatically when the server directs it to. Better yet, today’s manufacturer should consider utilizing a cloud ERP solution which includes fully integrated applications for virtually every operation.

Equipment Needs

ERP systems providers who focus on manufacturing are generally well-equipped to advise their customers which printers and readers they need to perform their barcoding printing and scanning, or to provide the equipment as part of their overall business agreements.

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There are three types of printers suitable for barcoding: laser, direct thermal, and thermal transfer. In addition to printers, barcode users also need to obtain readers. There are three types of readers available: fixed, portable batch, and portable radio frequency (RF).

Portable batch readers are the type of readers most commonly used in manufacturing. They store data for later batch transfer to a host computer. The most common batch reader is the “wedge,” which is attached through the keyboard interface, physically wedged between the keyboard and the computer or mainframe terminal as a second keyboard.

Barcoding equipment may be purchased separately. However, it is important that the levels of complexity between barcodes, printers and readers are closely aligned or they may not operate smoothly.

“The software is what accumulates and processes information entered through scanners.”

System-Wide Improvements

As barcoding takes hold in manufacturing, it is important for companies to be ready to take full advantage of it. For instance, once data entry on the production line is automated, can the company increase its production? If each product now has a unique barcode, can the company fulfill customized solutions? Once inventory is monitored in real time, can the company’s warehousing costs be trimmed? There are many hidden gains to barcoding that can only be experienced if barcoding is approached with the big picture in mind.

While barcoding has limited benefits when used to perform isolated functions, it has virtually unlimited potential when it is part of an integrated system supported by improved business processes. These are the main reasons manufacturers exploring barcoding are wise to consider the solutions offered by ERP systems providers like Plex.

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The best practices described in this document are the real-life experiences of Plex users. They reveal the ways that an integrated cloud solution can help manufacturers use barcoding to achieve quantifiable business results.

The Plex Manufacturing Cloud, developed by Plex Systems, is a cloud solution, that includes fully integrated barcode printing and scanning capabilities, including all of the functions described in this paper. Plex offers industry-leading features for virtually every department within a manufacturer, including manufacturing execution systems (MES) and quality management systems (QMS) for the shop floor, customer relationship management (CRM) for sales and marketing, supply chain management (SCM) for procurement, and ERP for finance and management. Plex's fully integrated model delivers a "shop floor to top floor" view of a manufacturer's operations, enabling management to run its business at maximum efficiency.

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About Plex

The Plex Manufacturing Cloud is the first and only cloud ERP built to meet the tough requirements of today's manufacturers. Hundreds of innovative companies, across industries including aerospace and defense, food and beverage, and motor vehicles, rely on Plex to operate their manufacturing businesses and generate profit from every inch of the plant floor. With insight that starts on the production line, Plex helps manufacturing companies see and understand every aspect of their business, enabling them to lead in an ever-changing market.