

BAR CODE LABEL PRINTING AND ITS IMPORTANCE IN INVENTORY CONTROL IN THE SUPPLY CHAIN

Bar code printing has greatly risen in popularity due to the speed, ease and accuracy of automatic data collection. Bar coding increases productivity and tracking in all different types of industry, and is an important component of inventory control in the supply chain.

Wal-Mart is a top retailer and #1 on the Fortune 500 list. They have over 4,600 stores including discount stores, super stores which include grocery, and membership-only warehouse stores. Most of Wal-Mart's operation is in the US, but they are expanding internationally as well.

As a leading retailer, Wal-Mart utilizes over 300,000 SKUs. They operate with a large database, and because of a bar coding system, are able to update what is sold every 90 minutes. Wal-Mart and other retailers need accurate logistics and throughput in their supply chain to successfully keep their point-of-sale items in-stock. It begins with the bar code. With their thousands of products and suppliers, Wal-Mart presents a pretty compelling case for improved bar code operations. Bar coding is not as simple as just purchasing a printer and some software. Retailers must insist on pure bar code integrity from start to finish. Each company must determine if their vendors are supplying adequate bar codes that meet required specifications, or if on-site bar code printing is more practical for their operation.

Take time to measure the non-compliant bar codes in your warehouse and/or distribution centers. You need to determine the quantity of unreadable bar codes. If you have a supplier whose bar code is unreadable, you have a potential kink in your supply chain. It is crucial to demand that bar codes provided meet a certain tolerance. If a certain bar code consistently needs to be manually keyed, there is a 10,000 times greater chance of error. Operators may manually key bar codes when a code does not scan, or does not scan on the first attempt, but manual entry costs time and may introduce errors. Every time a bar code doesn't scan, it costs somebody money. If you are a bar code supplier and your printing technology is inappropriate for your application you have a potential kink in your supply chain. Consequently, if you are producing non-compliant bar codes, your distributor may assess fines and penalties to curb the problem.

The best way to analyze bar codes is to use a portable bar code verifier which examines bar code quality against traditional parameters and ANSI/CEN/ISO bar code print quality guidelines. All standard symbologies including EAN/UPC with or without addenda, Code 39, Interleaved 2 of 5, Code 128, Codabar, MSI, and Code 16K are typically included with each unit. To start, sample 5% of your bar codes to determine quality. This may lead to inspecting them all.

BAR CODE TECHNOLOGY

According to AIM, Inc. (www.aimglobal.org), since their invention in the early 1950s, bar codes have accelerated the flow of products and information throughout the global business community. Along with increased speed, quality bar codes substantially decrease error rates when compared to keyboard data entry. The error rate for manual data entry is 1 character for every 300 characters recorded; the error rate for scanned data is 1 character for every 300,000 characters recorded. With reduced costs and improved product management, bar code systems are critical elements in conducting business in today's global economy. Bar code technology encompasses the following:

- Symbologies that encode data to be optically read
- Printing technologies that produce machine-readable symbols
- Scanners and decoders that capture visual images of the symbologies and convert them to computer-compatible digital data
- Verifiers that validate symbol quality

There are many different bar code symbologies or languages. Each symbology has its own rules for character encoding, printing and decoding requirements, error checking, and other unique features.

Currently there are about 225 bar code symbologies, but only a handful are currently in use, and even fewer are widely used. The various bar code symbologies differ both in the way they represent data and in the type of data they encode. Some only encode numbers; others encode numbers, letters, and a few punctuation characters. Additionally, some offer encoding of the 128- and 256-character ASCII sets. The newest symbologies include options to encode multiple languages within the same symbol. This allows user-defined encoding of special or additional data, and through deliberate redundancies can even allow the reconstruction of data if the symbol is damaged.

The most common retail symbologies are numeric. UPC is widely used in the U.S., and EAN is the European version. The combination of numbers in UPC represent the type of product, manufacturer, and a check digit. This combination in a point-of-sale application prompts a price and description. The similar EAN symbology also provides a code for the product's country of origin.

THE GOAL: ACCURATE DATA COLLECTION

To achieve accurate data collection, either the bar code supplier must provide readable bar codes or the end user must have the software and printers necessary to produce them. With the advent of mobile computing tools and wireless print engines, the label printer has evolved into a mission-critical device for production. According to AIM, bar code printing applications fall into two categories—1) on-site, user-controlled printing, and 2) off-site, label supplier-controlled printing.

ON-SITE PRINTING

On-site printing generally takes place at or near the point of use. The data encoded is usually variable, entered by an operator through a keyboard or downloaded from the host computer. The most common bar code print technologies for an on-site user are direct thermal, thermal transfer, dot matrix, ink jet, and laser. These different technologies offer differing levels of cost, resolution and media type which all need to be considered when choosing the right system for your application.

- **Direct Thermal:** Heating elements in the printhead are selectively heated for an image made from overlapping dots on a heat-sensitive substrate. This moderate priced technology prints a high resolution label, but the media may degrade in direct sunlight or high temperatures over time.
- **Thermal Transfer:** Thermal transfer technology uses a similar type of printhead as direct thermal printer, except for an intervening ribbon with resin-based or wax-based ink. The ink is heated and transfers the image from the ribbon to the substrate. This technology is a high cost method of printing, but the high resolution can be used to print on plastics and other media in harsh environments.
- **Dot Matrix:** A moving printhead with one or more vertical rows of hammers produces images by multiple passes over a ribbon. These passes create rows of overlapping dots on the substrate to form an image. Serial dot matrix printers produce images character by character, and high-volume dot matrix line printers print an entire line in one pass. This is a low-cost solution, but due to the lower resolution it may not work well with symbologies with a higher density.
- **Ink Jet:** This technology uses a fixed printhead with a number of tiny orifices that project tiny droplets of ink on a substrate to form an image made up of overlapping dots. Ink jet printers are used for in-line direct marking on product or containers and are an inexpensive option. The resolution is good and the only risk is the ink will likely run if exposed to high moisture.
- **Laser:** This image is formed on an electrostatically charged, photo-conductive drum using a controlled laser beam. The charged areas attract toner particles that are transferred and fused onto the substrate. This is a moderately priced solution with great resolution. Media may be required to be in a sheet or standard sized form versus a continuous running roll.

THE RIGHT PRINTER FOR EACH APPLICATION

Depending on the quantity of bar codes and the type of application, the user should use these definitions to choose the appropriate on-site printing technology. Consider a large dot matrix line printer or an in-line ink jet or thermal transfer printer for high-volume applications. Desktop dot matrix, laser, direct thermal, or thermal transfer are adequate for variable-demand print jobs. Choose a wireless direct thermal, or thermal transfer printer for portable and field applications.

SOFTWARE SELECTION

On-site printing involves purchasing label-design software in addition to the printer hardware. Bar code printers come with their own proprietary programming languages that support all the standard symbologies, and they are capable of printing simple data-static or serialized bar code labels on their own. However, labels that require additional formatted text, graphics, or multiple fields will require a separate label-design software package. With over 100 packages designed for a wide range of platforms and a wider range of features, finding an expert to assist you may be necessary. Using label-design software once required an experienced programmer, but now can be accomplished by non-programmers because of user-friendly graphical interfaces.

OFF-SITE PRINTING

Commercial label printers may use flexographic, letterpress, offset lithographic, retrogravure, photocomposition, hot stamping, laser etching, or a digital process to produce a consistently higher-grade label than those labels produced by on-site printers. If the content of the bar code symbol is known in advance, a commercial label supplier is generally the best choice. However, there are trade-offs. Commercially-supplied labels have to be ordered, stocked, and placed in inventory. A business with frequent product line changes and label changes will have to weigh the options carefully. Is it too expensive and difficult to inventory and stock all the various SKU inventory of pre-printed media? Additionally, pre-printed labels don't allow for user flexibility of customized bar code information.

WHAT THIS ALL MEANS

Do you really know what product inventory you have on hand? With accurate bar coding, that question can be easily answered. In a point-of-sale or retail application, bar codes contribute to speed, detailed descriptions and better stock management. In addition to retailers, manufacturers, warehouses and distribution centers, maintenance departments and security systems are all applications where bar coding can improve overall operation. Both suppliers of bar codes and distributors using the bar codes need to determine if on- or off-site printing works best for them. Lost revenue and the risk of fines for non-compliance are both strong arguments to demand perfection in bar codes. Ultimately, poor bar codes are detrimental to the flow of products through a company. It is crucial to identify any problems in the bar coding system and fix them.