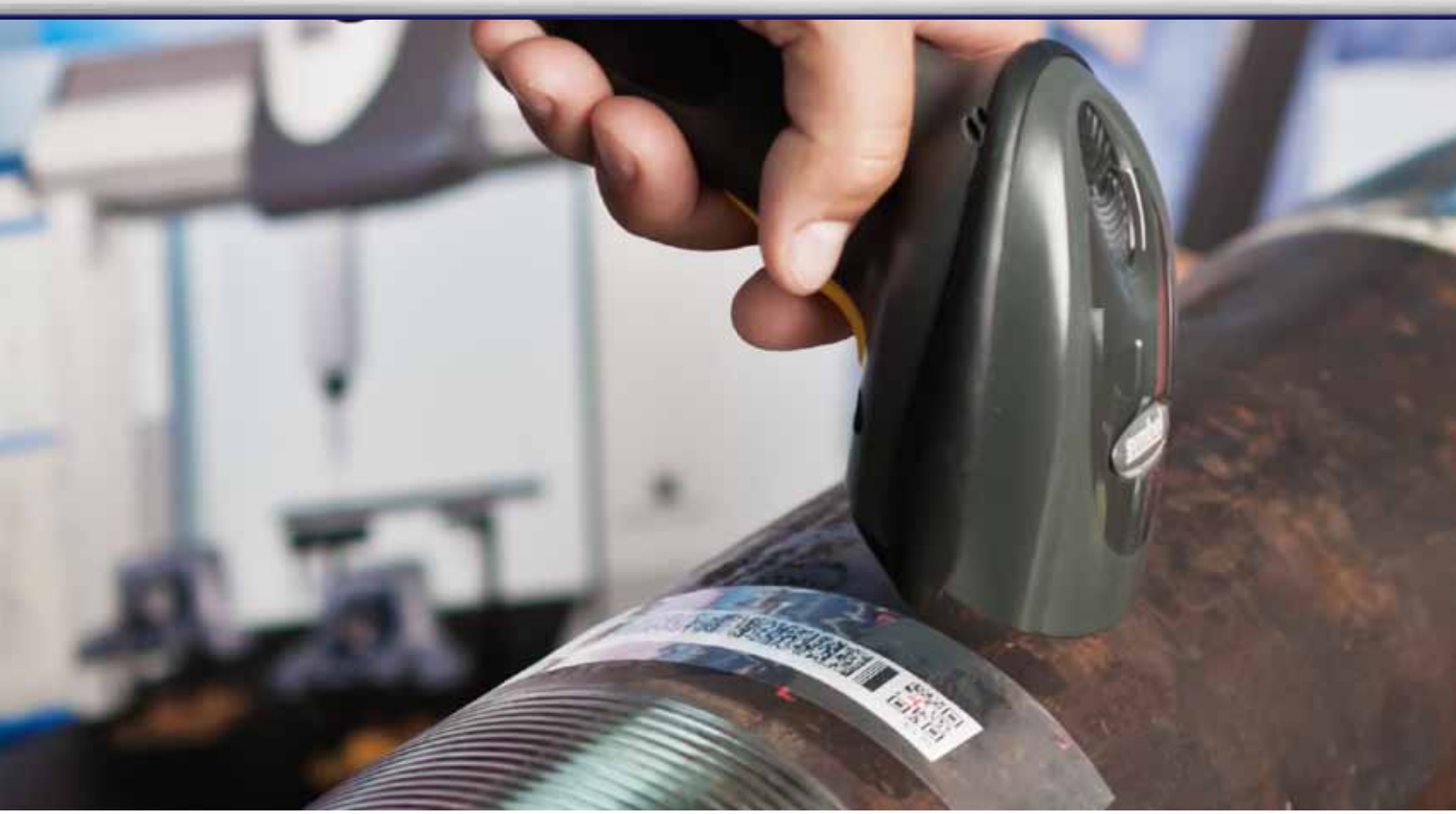


Scanning the Way to Productivity

by Cathy Hayat

Few could have guessed that chewing gum would usher in an era of streamlined production, reduced costs, and unparalleled traceability. However, in June 1974 a 10 pack of Wrigley's Juicy Fruit did just that as it became the first product scanned with a universal product code (UPC). Though not the catalyst for sweeping adoption of barcode technology across the manufacturing sector, the event is the most memorable with the pack on display at Smithsonian's Natural Museum of American History in Washington DC.

In reality, barcodes had been in existence since US patent number 2,612,994 for a 'Classifying Apparatus and Method' was issued in October 1952. Though the technology was slow to take off, it eventually made its way into several aspects of everyday life. Besides retail settings, barcodes are routinely found in manufacturing and assembly facilities. Companies adopting barcode technology typically custom design a system to fit their needs depending on what information they must capture. Surprisingly, few companies have carried the technology through to their quality control departments. The

application of barcoding technology to quality control unlocks the potential to improve quality procedures and help error-proof the final steps before products are shipped.

The Benefits of Barcodes

As industries learned long ago, having automated systems to interpret information dramatically improves data integrity while reducing the time needed to perform such operations. The benefits that barcode technology brings to industry are numerous, but generally may be classified into three main categories:

- **Decrease in data entry error.** GS1, a non-profit group dedicated to the design and implementation of global standards throughout supply chains, states that a skilled data entry operator will make one mistake in 300 keystrokes. Barcodes, on the other hand, reduce mistakes to an estimated 1 in 1 million keystrokes – well over 3,000 times the accuracy of a human. Since part numbers can easily be 10 to 20 digits long, at some point digits will get transposed and mistakenly added or subtracted. This corrupted information pollutes the database with non-standard inputs making statistical analysis difficult if not impossible.

- **Decrease in inspection time.** When a company has thousands of inspection part programs to choose from, time is wasted searching for the correct one. There is also the potential for human error leading to an incorrect program or revision level being selected. Scanning the part's barcode on the job ticket can instantly pull the correct program from memory.

- **Increase in traceability.** When barcodes identify components and materials, traceability is greatly increased. This also applies a level of accountability to not only the operator inspecting the part, but also to the machine that inspected it, the machine that manufactured it, and even the batch number of the material used in its creation. If there are any concerns at a later date, it is simple to single out the employee, equipment, batch, or even vendor responsible.

Implementing Solutions

Since all barcode technology uses a pictorial representation to relay data to a computer, it is essentially no different from a keyboard. Barcode scanners translate the information and act as a virtual typist inputting data at the rate of 40 to 200 characters per second. Therefore, when deliberating the potential solutions to introduce barcodes to the quality control department, an organization should consider all points of data entry. It should also consider the amount of information needed at each step of the quality control process. The data capacity embedded in each barcode varies by the technology used - The standard 1 dimensional 13 digit barcode system can produce ten thousand billion unique codes, but is limited to the 13 characters of actual input data. Two dimensional barcodes, such as QR codes, can contain about 100 times more usable information.

Each company may discover different uses for barcode technology according to their unique situation. Possible uses within the quality control department include:

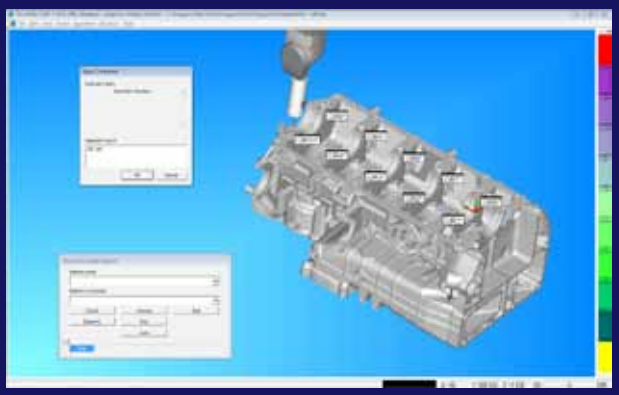
- **Prior to running the part program.** As mentioned previously, barcodes can be used on job tickets to encode a variety of traceability information related to that job. A company might choose to encode part numbers, operator employee numbers, operator instructions, and lot numbers. This information can be automatically added to input fields on the inspection report to ensure proper recordkeeping. Barcodes could also be used to identify a part program's filename to ensure the correct inspection routine is run. Metrology inspection software that allows for programmatic data input during an inspection routine such as PC-DMIS by Hexagon Metrology, is able to take this information and automatically begin the inspection routine.

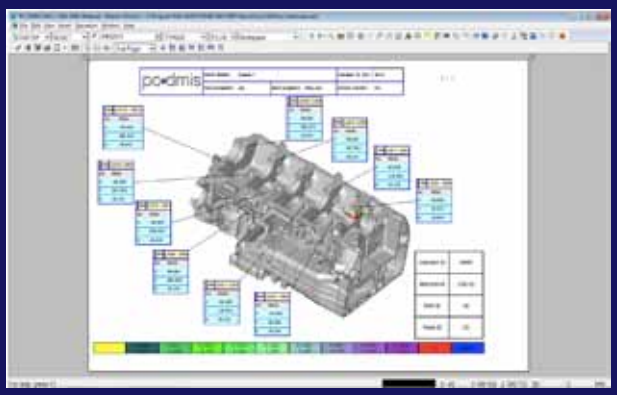
- **During the part program.** If a company is using QR codes or other 2D barcode technology, they have the capability of having nominal values stored within them. When the individual part or its bin is scanned, the theoretical x, y, and z values are instantly pulled. Normally this data is either hard coded into the software or the operator manually inputs the values. Using barcodes and program input fields, the user interface form can be automatically populated when the code is scanned.

This feature is beneficial to a facility that has several new parts that require parametric programming. Previously the operator had to manually enter each new nominal value before the program was run. Now the values can be entered into a spreadsheet which is then copied and pasted into a barcode generating program. The resulting barcode is affixed to the part's bin and contains all required information as well as the identification of the parts program. A scan of the barcode uploads the data to PC-DMIS and the inspection routine begins automatically.

- **After the part program is run.** Barcodes may also be placed on the parts themselves, using labels or pin stamping for example, to include information on measured features. If a concern surfaces at a later date, the component may

Parametric programming is a part programming technique that can be used when a "family" of parts exists. The family could fit a set of parameters - for example: all parts are the same shape but different sizes or the same casting with different hole-patterns. One master inspection plan is created and can execute a variety of measurement tasks based on parameters that are entered during program execution. The program can be branched or parametrically adjusted via data input which could either be manually entered by an operator or scanned via a barcode reader. Parametric programs often use a customized graphical user interface to simplify operation and increase efficiency and accuracy. Employing barcode technology in this instance would input all the necessary data without any user involvement other than scanning the barcode when prompted.





be scanned and the original measurement information will be revealed. Because of the original data integrity, the scan can also break information down to trace the materials, lots, vendors, machinery, and employees involved with the part's creation. This is particularly beneficial to the aerospace, automotive, medical or energy industries where traceability must be documented for safety and recall purposes.

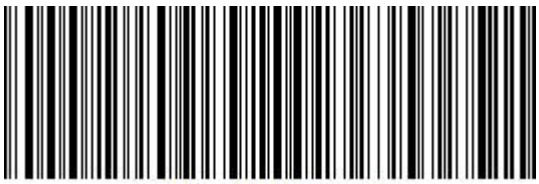
The Next Step

Using barcode technology throughout a manufacturing or assembly facility makes good business sense. With all the benefits it offers, it understandably has become one of the most widespread technologies in supply chain management. For a company that currently uses barcodes to track inventory, it is a small step to carry it through to their quality control department. Since each facility is unique, expert consultation should be the first step in discussing the potential upgrade. A company such as Hexagon Metrology's applications services group that has experience with barcoding hardware technology, user interface programming, parametric part programming, and typical application of barcoding to the quality control function is essential to a successful project outcome.

As the 60 year anniversary of the barcode's patent approaches, the world has taken great steps forward in reaping all the benefits it has to offer. The pack of chewing gum that changed the world was just the beginning of the revolution that changed the supply chain. As organizations apply barcode technology to their quality control departments, they will undoubtedly realize decreased errors, increased speed, and traceability. In a sense, their world will never be the same again.

What is 2+2?

Scan the barcodes below with a smartphone or a hand scanner for the answer.



1D Barcode

2D Barcode

Can't read the codes?

Visit **www.HexMet.us/decoder** for the answer.

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