Technology White Paper

Three Ways to Enhance Packaging Line Performance

Using Machine Vision Optical Character Recognition (OCR)

MICROSCAN®

Three Ways to Enhance Packaging Line Performance with Machine Vision OCR

This white paper focuses on optical character recognition (OCR) and its growing use in packaging lines for compliance with date and lot tracking regulations. Machine vision OCR helps manufacturers adhere to these mandates in an efficient and cost-effective manner, and can also improve line performance. Three common applications are described here:

- Ensuring code presence and verification of readability
- Tracking products throughout the supply chain
- Matching product labels to contents

Microscan Systems, Inc.

What Is OCR?

OCR, or optical character recognition, is a vision system tool that is widely used in the packaging industry. Like barcode technology, OCR is a data capture methodology. Its primary advantage is that it encodes information in a format that is both machine-readable and human-readable, while barcodes and 2D symbols are only machine-readable. OCR turns printed text characters from a digital image into a string of characters that can be decoded (read) by the system, and then moved through subsequent steps in the production process as defined by the control software. The simplest and most reliable method for optical character recognition relies on specific OCR fonts and templates that are designed for these applications. However, machine vision's powerful functionality incorporates teachable OCR systems that can be trained to recognize characters in a user-defined font – a useful feature given the wide array of available printing technologies and the range of printed characters produced by them.

A crisp OCR font (left) is the simplest and most reliable method for decoding, while more challenging marks such as the inkjet mark on the cap (right), typical in the food and beverage industry, can be read using teachable OCR systems.

The Need for OCR in Packaging

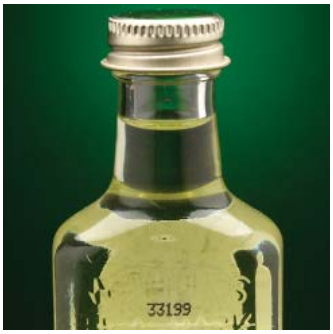
Lot codes, batch codes, and expiration dates have become necessary in the food, beverage, pharmaceutical and cosmetic industries, all of which have stringent labeling requirements to help ensure consumer safety and to prevent product diversion and counterfeiting. The capability of machine vision to read these text strings reliably, at high speeds, has become indispensible in today's manufacturing environment. OCR and subsequent data retrieval help to ensure the smooth flow of information throughout the manufacturing and distribution process.

Three Common Uses of OCR

Many manufacturers initially implement an OCR system for the sole purpose of compliance with standards, but they quickly realize the many advantages that machine vision can bring to their packaging operations. Automated vision systems increase throughput and eliminate human error to achieve optimal line performance. OCR not only helps to facilitate (and better yet, prevent) product recalls, but saves cost by reducing scrapped product and minimizing downtime.

With multiple proven benefits, quality monitoring by vision technology is used for a wide range of applications. Common uses of machine vision OCR include verifying the presence of marked characters on products or packaging, reading date/lot codes for product traceability, and matching labels to products.

1. OCR ensures code presence and readability - before products exit the factory



OCR can be used to confirm that every product is marked with the appropriate text string before exiting the factory.

One of the most basic tasks of machine vision is to verify that required text strings make it onto the product or packaging. For example, inkjet printers are commonly used for marking date codes, batch codes and expiration dates in the food and beverage industry, due to their ability to print variable information at very high speed. However, print quality can degrade over the course of process runs, resulting in inconsistent codes or no code at all. Without a system in place to confirm the presence of the code, a printing fault - such as a clogged nozzle, interference from debris, or depleted ink - may affect print quality, and this error could go unnoticed until later in the process. This results in increased downtime, costly re-runs or worse: if the product makes it out of the factory without a required code, it will need to be scrapped or recalled.

While OCR will *read* a code to determine its presence, another vision tool, optical character *verification*, or OCV, may be recommended for applications that require confirmation that a code will be readable after it leaves the plant. OCV based inspection is most often used to verify that the printed codes will be of sufficiently high quality to be legible throughout the supply chain in the event of a product recall – of particular concern in the pharmaceutical and cosmetics industries.

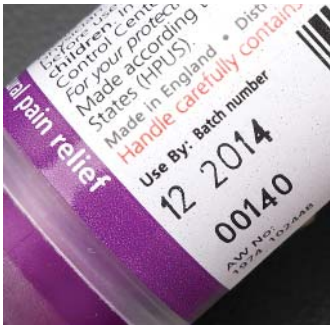
Absent or unreadable codes are unacceptable in highly regulated industries. Machine vision provides manufacturers with the peace of mind that their products are properly marked before they make their way into the supply chain.

2. OCR tracks products throughout the supply chain

Traceability through every step of the manufacturing process is critical in the food, beverage, pharmaceutical, and cosmetics industries, where manufacturers are required to comply with safety and anti-counterfeiting regulations. Global anti-terrorism measures have recently placed even more priority on product traceability. Items must be locatable at any given time within the supply chain, with clear data documenting where they originated and where they have been.

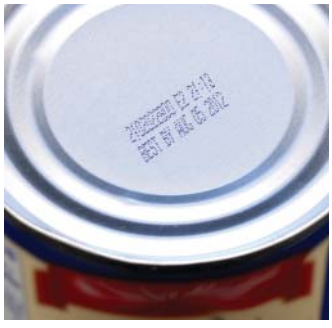
While product tracking is often considered a barcoding application, lot codes, batch codes, expiration dates and serial numbers can be read with OCR to follow a product through all phases of the packaging process - from the primary product label or packaging, to carton packing, to palletizing operations. An OCR application can be programmed to compare the actual text with an expected string, as defined in the database, and flag any missing or out-of-sequence serial numbers. Barcodes and OCR are frequently used together to achieve maximum reliability of the data collection process.

Reliable product tracking and data management of the production and distribution process is crucial in the event of a safety recall after the product has left the factory, and also plays an important role in preventing diversion of goods to so-called “gray market” vendors.



Batch codes track pharmaceuticals throughout the supply chain, facilitating the recall process and preventing product diversion.

3. OCR matches labels to products



OCR characters printed on the top of cans are used to make sure that the correct label is put on the can.

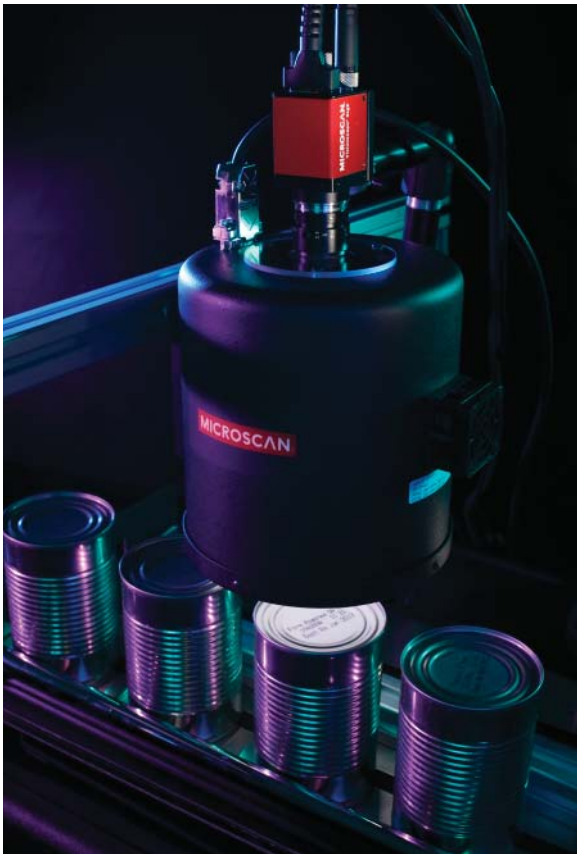
Manufacturers must accurately state the contents of a product on its label or packaging, or face severe consequences, such as government-imposed penalties, costly recalls, and diminished brand perception. One of the most common reasons for product recalls - mislabeling - has serious implications for both manufacturers and consumers, ranging from customer dissatisfaction to safety risks associated with allergens.

OCR can be used to ensure that otherwise unmarked products receive the correct label during the labeling process. Frequently, when products are placed in containers, they are done so with no labels, as “bright stock”. The only indication of what is inside the can, bottle, or container is a text string that identifies the contents. When it is time to put a label on the can, the system reads the characters on it to determine which product is inside the container, then instructs the system to apply the correct label to that product. OCR is highly effective in applications where multiple character strings, such as sequential numbers, are presented to the system. In applications where all of the contents are expected to be the same, optical character verification (OCV) may be recommended; in these cases, the vision system does not *read* the characters, but instead verifies that they *match* an expected string.

Machine vision automation eliminates human error due to fatigue and distraction, resulting in improved accuracy and increased throughput.

Conclusion

OCR is used throughout the packaging industry for reliable process control, helping manufacturers meet labeling requirements, protecting them from product recalls, and ensuring consumer safety. It is one of a number of valuable tools that machine vision can provide its users. In addition, vision systems can be used to align labels, inspect fill levels, read 1D/2D barcodes, and countless other tasks. Manufacturers are realizing that machine vision is not just a necessary overhead expense for meeting requirements; these systems quickly pay for themselves through increased yield and productivity, improved product quality, and enhanced brand perception.



OCR solutions from Microscan

Microscan has more than twenty years of experience providing OCR solutions to a broad range of industries. A global technology leader with extensive solutions for ID tracking, traceability and inspection, Microscan's line of 1D and 2D barcode readers, machine vision systems, and machine vision lighting is backed by one of the world's most robust patent portfolios and years of proven performance in the field. Microscan offers a number of products for OCR, including smart cameras, machine vision software, and 2D imagers with OCR decoding capability.

Supported by a highly skilled global integrator network, Microscan products are known and trusted by customers worldwide for their high precision and reliability in industrial automation and control applications, with solutions ranging from basic barcode reading to complex machine vision inspection, gauging, and measurement.

More information on Microscan is available at www.microscan.com.

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