Executive Brief

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How Machine Vision Puts the Focus on Quality Control

The global economy may fluctuate, but one big thing that holds steady for all businesses is competition. The constant pressure to stay ahead of the market drives companies to continually improve operations, lower costs, and increase efficiencies.

These challenges are in part why manufacturers increasingly are turning to the Industrial Internet of Things. Smart factories enable increased capacity and quality improvements—while saving time and money.

Process automation is enabling a level of accuracy and productivity that goes beyond human ability. And one critical area in the factory where automation is making a big difference is quality assurance.

Quality management significantly contributes to a manufacturer's brand and bottom line. One report shows that the costs of poor quality in a thriving company can be 10 to 15 percent of operations. An effective quality improvement program can reduce this substantially, thus making a direct contribution to profits.

This is where machine vision and deep learning are changing the game in factory quality control. These technologies enable inspection automation—for every product on the line. And this means consistent and accurate results.

"Machine vision can remove the human variable from the equation. It works 24 hours a day, seven days a week, and produces consistent results," said Sam Lopez, Director of Sales and Marketing at Matrox Imaging.

Combining deep learning with machine vision helps interpret product issues that lie somewhere between "clearly good" and "clearly unacceptable." By feeding a system many thousands of images and training it to learn what's acceptable and what's not, deep learning continually refines machine vision results.

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Streamlining Code Label Quality Control

Industry veteran Matrox Imaging tackles quality control challenges with its Machine Vision system.

The company's technology is used for industrial QC in a variety of ways. It can read and record product information such as text or barcodes, eject products that don't meet standards, or guide factory robots in their tasks.

One great example of the Matrox Imaging system in action is at Suntory PepsiCo's five factories in Vietnam. The company struggled with accurate scanning of printed manufacturing date (MFD) and expiry date (EXP) code labels, which often resulted in production delays.

> **"Machine vision works 24 hours a day, seven days a week, and produces consistent results."**
>
> **Sam Lopez, Matrox Imaging**

Sometimes the code was applied before the surface was fully dry, resulting in smudges. Or operator errors would lead to incorrect identification codes. These and other mistakes led to costly line stoppages.

To address these issues, Suntory PepsiCo asked its integrator Pacific Hi-Tech for help, and in response the Pacific Hi-Tech team designed and implemented a Matrox Imaging-based solution.

Since the system was deployed, code label images are instantly interpreted to determine if they are attached, the codes are correct, and whether the type is illegible or obscured. If a label is missing or unreadable, an integrated ejector removes the problematic product from the line without stopping production.

By quickly reading awkwardly positioned labels that the previous system had missed, and removing products with problem labels, the Matrox Imaging solution helped Suntory PepsiCo significantly streamline its quality process.

The Machine Vision Framework

The open and flexible Matrox Imaging Machine Vision system comprises three elements:

- Matrox Iris GTR—a compact smart camera with image sensing, embedded processing, and I/O capabilities for an all-in-one vision system.
- Matrox 4Sight GPm—a computer-based industrial controller built specifically for machine vision on the factory floor to handle multi-camera inspections.
- Matrox Design Assistant—an integrated development environment (IDE) that facilitates creation of vision applications using an intuitive, flowchart-based approach.

Matrox Design Assistant is the heart of the system, providing a framework for integrators and OEMs to develop customized vision applications. These applications are deployed on either the Matrox Iris GTR smart camera or the Matrox 4Sight GPm controller.

The Machine Vision solution follows a basic framework of acquiring and analyzing an image for specific results. These include locating, measuring, reading, verifying, and taking action based on these results, as shown in **Figure 1**.

With Matrox Imaging's system, integrators can set workflows using a graphic interface in Matrox Design Assistant instead of programming in C# or C++ code. System developers create a detailed flowchart outlining each step the machine vision hardware will take.

"The graphic interface lowers development time from months to a couple of weeks, or even a few days, depending on the process," said Lopez. "It also allows those without programming skills to do the design work themselves."

Matrox Imaging tools are optimized for Intel® processors. With Intel, Matrox Imaging solution software environments enable execution of customized deep learning models for previously difficult or even unattainable image inspection tasks. Now these tasks can be done in a highly efficient manner.

"Intel delivers best-of-breed processors that provide the optimal computational power for a given power envelope," said Lopez. "They hit a sweet spot between performance and price. And Intel demonstrates a commitment to future-proofed and compatible products, with a clear developmental roadmap."

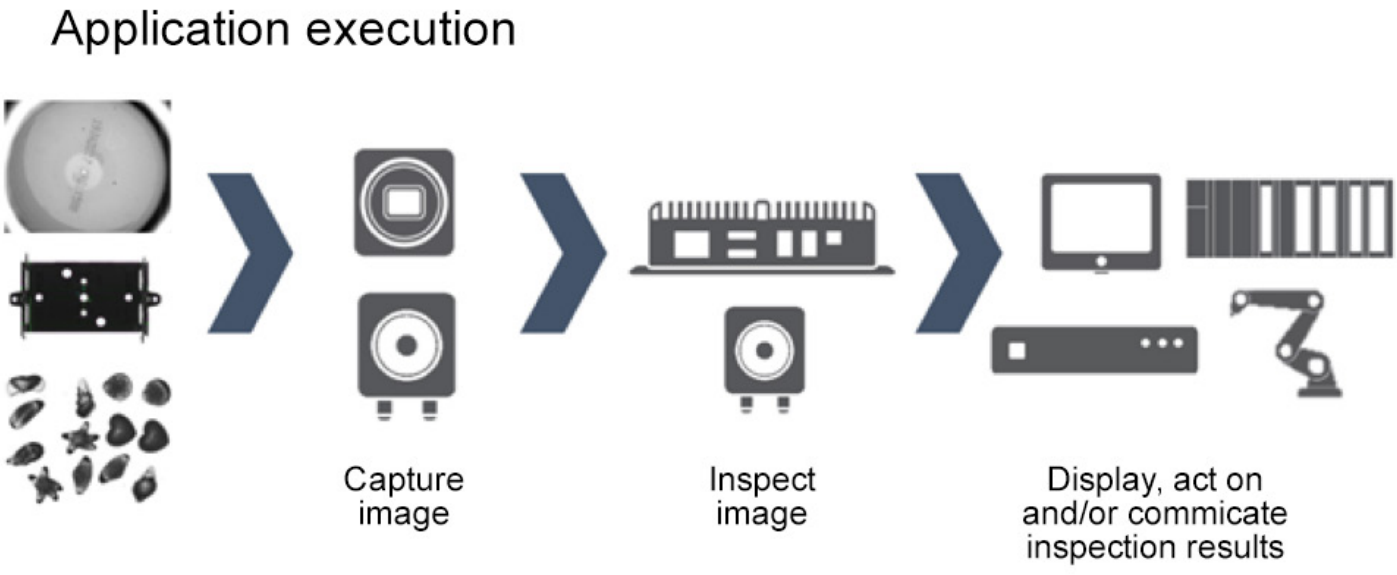

Figure 1. Matrox Imaging Machine Vision framework

Helping Robots Sort Cookies

Matrox Imaging computer vision and analytics go well beyond addressing packaging code label QC. For example, the solution can also locate and determine the position of objects and features.

In this case, the Matrox Imaging system enabled industrial robots to understand that sprinkles and nuts aren't product defects but contribute to a cookie's deliciousness.

That's what happens at a European factory where robots sort 80 different varieties of cookies. The robots not only have to determine which ones go where but reject those that don't meet standards.

Sorting cookies is challenging for a vision system because of shadows caused by the toppings and reflections caused by glossy icings. Shadows and reflections can skew image-reading results, and are considered a vision system's worst enemies.

Bosch, the system integrator, incorporated algorithms into the vision system's software to recognize shadows and reflections, as well as all the other variables the robots had to contend with.

Bosch created a flow telling the robots which cookies to pick up and how to place them right side up in the tray. It also directed them to check the cookies for doneness by evaluating their color and preventing them from placing broken or over-baked cookies into a package.

Quality control applications for machine vision are as many and varied as the products factories make. But in every industry, as manufacturers acquire reams of new images and deep learning technology continues to evolve, machine vision will become better at making the fine distinctions that pinpoint a specific problem or guide robots with greater precision. Today's factories have only just begun to realize the benefits of an automated process that will continue to evolve and improve over time.

Learn more about the Machine Vision system and other Matrox Imaging IoT solutions.

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