Application Case Study: Continental AG, Czech Republic Division

Smart Cameras Provide Additional Benefits to Auto ID Applications

Today's manufacturers need to do more with less. Tight margins, high quality expectations, and global competition have motivated manufacturers to automate their processes to improve quality and reduce costs. As an example, traceability systems that incorporate bar code readers are a standard in many industries, enabling users to document part genealogy throughout the manufacturing process and into the supply chain. Now, many manufacturers are looking to incorporate additional inspection capabilities into this process to address increasingly strict quality requirements.

A testament to the convergence of machine vision and Auto ID technologies, many manufacturers are turning to smart camera systems to meet their needs. Smart cameras provide the ability to read bar codes and perform inspection tasks with a single hardware solution. Beverage producers can check the cap alignment of a bottle in addition to reading a bar code; a PCB fabricator can read a Data Matrix code on a chip, while at the same time ensuring its correct placement on the board; pharmaceutical manufacturers can read bar codes and human-readable text simultaneously. With new models that feature small form factors and simplified integration, smart cameras have become an attractive option to manufacturers looking to add additional inspection capabilities to their line.

An example of this trend can be found in the factory of the Czech Republic division of the Tier One automotive supplier, Continental AG. The facility produces electronic assemblies for the automotive industry. Industry mandates require each part to be labeled with identifying data that is used to track it throughout the supply chain. Representative of the industry's initiative for ongoing quality improvements, one of Continental's end customers, a global automobile manufacturer, recently specified a new requirement to its vendor: verify the position and print quality of each label on its subassemblies for accuracy. To meet this requirement, Continental replaced its existing laser barcode scanner with a miniaturized smart camera that consolidates these functions in a single device.

A Vision MINI Smart Camera verifies the label placement on electronic assemblies in Continental's Czech Republic facility.

System Requirements

Previously, a pneumatic label applicator applied labels containing a logo, description, and code 39 barcode to Continental's parts. The stationary linear scanner was then used to read the serial number data encoded in the barcode. Additional inspection capabilities were required to accomplish the objectives that were outlined by the customer:

- **Objective:** Add additional inspection capabilities to barcode reading process to ensure label accuracy.
- **Project:** Replace existing barcode scanner with smart camera that reads barcodes in addition to checking label presence, placement, and print accuracy.
- **Solution:** Vision MINI provides required inspection capability and meets size, weight, and communication requirements.
- **Result:** Elimination of rejected shipments due to labeling errors, saving money for Continental and ensuring part accuracy for end customer.

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- Read both linear and Data Matrix codes
- Ensure label presence
- Ensure proper label position/orientation
- Ensure the accuracy of the printing on the label

Continental needed a solution that was cost effective and could be easily incorporated into its existing process. Human inspection was not a viable option because of its high cost and susceptibility to errors. The company worked with integrator Bartech s.r.o. to find a vision solution that would satisfy the new requirements, without extensive re-programming of the existing process. Continental's objective was to find a replacement for the barcode scanner that could communicate to a PLC via RS-232. Additionally, the hardware needed a small form factor and light weight to fit the limited space of an x/y gantry.

Solution Implementation

After extensive testing to find the technology that would best suit the needs of Continental, Bartech chose to replace the existing scanner with Microscan's Vision MINI smart camera. The small size of the product (26x46x54mm), light weight (57g / 2 oz) and RS-232 serial connection, combined with its library of vision tools, were key factors in the selection.

Implementation of the system took place in three phases. First, feasibility studies in Bartech's applications laboratory identified the key parameters of the application, including the software settings, hardware specifications, and lighting considerations. Although the smart camera has integrated lighting built into it, an external lighting source (a Nerlite HI-BRITE 45) is used to further enhance mark contrast on the monochromatic parts.

Once the hardware was selected, the system was installed on Continental's assembly line for evaluation, where the mounting configuration and communication protocols were defined. The communication was set up to emulate the former scanner, which allows for a smooth migration to the new technology without the need to reprogram the existing application in the PLC. Immediately following the printing of the labels, the PLC sends a serial trigger to the camera, which reads the barcode and sends the data back to the PLC over the RS-232 connection. Simultaneously, a separate command triggers the camera to locate the label on the part, verifying its presence, orientation and placement on the part. The vision system's pattern match tool checks to ensure print accuracy.

The last phase of the project was the final installation and commissioning of the new system. As a final step in the thorough set-up process, tolerances were identified and thresholds set to detect unacceptable parts. Comprehensive testing was done with both correct and intentionally flawed labels to verify that this function was working to Continental's satisfaction.

The vision software identifies label presence and placement using locate tools. A pattern match function confirms print accuracy.

Results

The implementation of this smart camera system made for a seamless transition to vision technology in Continental's assembly line, enabling easy replacement of the original laser barcode scanner without the need to reprogram the PLC. The system satisfies the stringent quality requirements of the company's end-user and since the installation of the system, rejected shipments due to printing errors and skewed, misplaced, or missing labels have been eliminated, saving money for Continental and ensuring that the end user has a perfect part at the right time.

Conclusion

Machine vision has become an attractive and cost-effective option for manufacturers looking to add inspection capabilities to their barcode reading process. New, miniaturized, and easy-to-use smart cameras are making the technology broadly accessible, appealing to companies that may have previously shied away from vision technology because of its perceived complexity. As the Continental example demonstrates, smart cameras offer a capable, easy-to-integrate, and cost-effective means of expanding Auto ID applications to meet increasingly strict quality requirements – proving that they are, in fact, smart solutions for today's manufacturers - in more ways than one.

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