

## Labeling & Vision System Reduces Cost of Applying and Inspecting Lenses

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**In response to the demand for a labeling system that is both time and cost efficient, SynergEyes Inc., has developed an innovative means of applying and inspecting product labels. This article will introduce this technology, exploring both how it works, and the benefits it offers.**

Labeling is a critical concern in the medical industry, especially in the contact lens market because one of the biggest causes of product recalls has been mislabeled products. Labeling is a particularly great challenge for [SynergEyes, Inc](#) [1]., because the company produces tens of thousands of SKUs, more than an order of magnitude greater than the typical lens manufacturer. In the past, the company manually printed, affixed and inspected the labels. “This was an intensive and exhausting job, and we had to manually inspect every label because the potential for error was high,” said Joe Collins, Vice President of Manufacturing and Research and Development for SynergEyes.

SynergEyes has dramatically improved the labeling process by installing an automated vial labeling and verification system (VLVS), developed and provided by code-in-motion LLC. The system uses a Cognex DVT XS image-based ID reader that reads an in-process 2D Data Matrix barcode label, decodes the information and sends it off to an integrated printer that prints a final product label. Using code-in-motion’s Patented “Touch & Go” rollers, the label is presented in full view to a Cognex DVT 554 vision system that rapidly inspects the printed data. If it passes inspection, the system then automatically applies the label to the vial. In the case of a failed inspection the operator is alerted through an integrated touch-screen PC to remove the label and print another for inspection.

“This unique automated system has reduced the cost of labeling our products by more than 90 percent,” Collins said. “Even better, since we began using the automated system, we have not experienced a single labeling error.”

### Difficult Labeling Challenge

SynergEyes, Inc. was founded in 2001 to deliver a hybrid contact lens that combines the superior visual acuity of a rigid gas permeable lens with the comfort of a soft contact lens. The revolutionary SynergEyes hybrid contact lens has a stable, high oxygen permeable rigid center that delivers consistent, crisp, clear vision, while the outer portion offers the all-day comfort of a soft lens.

The previous labeling process began when an operator went into the company’s

enterprise resource planning (ERP) system to pick out the SKU for the current vial and print a label. “We normally make hundreds of different SKUs in a single day, so the potential for error is very high,” Collins said. “We had to spend considerable additional time inspecting each vial to be sure we had the right label. Even when our company was much smaller, this process was difficult to manage. It would be virtually impossible now that we have grown to our present size.”

Collins looked at several different alternatives for automating the labeling process. “Most alternatives that I looked at were not suited for such a large number of SKUs,” Collins said. “I was also concerned about their ability to verify the label. On the other hand, code-in-motion was able to handle all of our SKUs and also provided a very foolproof method of ensuring that the correct label was on the lens vial. We were particularly impressed with the accuracy of the two Cognex vision systems that are built into their labeling system. The first image-based ID reader reads an in-process label to determine the contents of the label to print. The second vision system verifies the printed label has the correct content and acceptable quality level, before it allows the system to automatically apply the label to the vial.”

## Identifying What to Print

Users log into the system through a touch-screen PC. Each user ID is assigned to a security group that grants access to appropriate functions, such as those for operators, supervisors, or administrators. The user interface was developed from Wonderware’s In-Touch HMI (Human Machine Interface). A single, easy-to-use PC interface provides users with detailed system status and inspection results, as well as access to printer settings, camera images, system parameters, and system input/output values.

Vials reach the labeling system with a 2D Data Matrix barcode in-process label on their caps that is applied during the manufacturing process. This barcode contains all of the information needed to produce the final product label, including multiple lens characteristics, expiration date and lot number. The operator then loads the vials onto a ramp. The vials slide down the ramp and are individually released into an indexing starwheel. The first position of the starwheel is aligned with a Cognex image-based ID reader that reads the 2D Data Matrix barcode on the vial cap.

“We selected Cognex cameras for this critical application primarily because Cognex’s Intellect software gives us a much greater ability to develop and integrate multiple devices and controls into powerful scanning, printing, and inspection applications,” said Dan Popovich, Vice President of Operations for code-in-motion.

“From within the ID reader we were able to parse out 2D barcode values of about 40 characters into individual data groupings, such as expiration, lot code, and lens characteristics such as power and base curve. From there we could build and send out commands to a Zebra Technologies high resolution Thermal Transfer Printer that prints out a label specific to a contact lens. Meanwhile, we also programmed the ID reader to communicate to the vision system exactly what needs to be verified on that specific label. Using Cognex standard OCR/OCV functions the 554 verifies not only the presence of specified printed characters but also their quality

where print may be too dark or light.”

## **“Touch & Go” Patent Presents Labels for Inspection**

After the 2D Data Matrix barcode is read, a label specific for that vial is printed and dispensed onto a “Touch & Go” Roller Grid patented by code-in-motion. Labels are dispensed sticky-side down onto these rollers, which are specially coated so that adhesive will not stick to them. The roller grid with label is then moved into view of the Cognex vision system that inspects the printed label while it lies flat across closely spaced miniature rollers. Without the Touch & Go Patented Roller Grid, a much costlier, intensive design effort would be necessary to position the labels accordingly.

The patented Touch & Go roller grid is another differentiating aspect of this system because of its ability to “hold” the label on the adhesive side therefore exposing the “face” of the label (in this instance printed side) to the camera; the entire surface of the label is exposed for inspection while the label can be easily repositioned from one point to another.

The business benefits this patented technology provides are cost savings and reduced mislabeling risks by allowing labels to be inspected before they are applied. If an uninspected label was to be placed on a vial, it would require additional handling (either removing of the label and then printing and reapplying a new label, or disposing of the vial altogether, which is an unappealing costly alternative). Neither option is a profitable proposition for any manufacturer, regardless of the price tag their product holds. Furthermore, if a mislabeled vial fell into the supply chain, it could result in customer dissatisfaction or potentially even lead to a very costly product recall. Code-in-motion’s system avoids these scenarios by inspecting before applying.

## **With or Without Scripting**

Cognex DVT vision systems utilize predefined SoftSensors to perform specific inspection tasks without scripting. SoftSensors are software agents that extract information from selected areas in the image. SoftSensors are one of three well-defined DVT vision system configuration levels (the other two include system level and product level programming).

The system level contains parameters that affect the functionality of the vision system itself. Parameters such as communication settings and trigger mode (internal/external) are examples of system level parameters. These parameters define global settings that do not change between inspections.

Each of the SynergEyes contact lens types requires a specific product selection that defines a specific SoftSensor layout to match the printed label layout for that lens type. Each inspection as defined by the inspection product, or job, needs to perform a number of tasks in order to be fully executed. These tasks are assigned to the SoftSensors. Cognex product-level programming is used for every inspection performed, and changes when the item being inspected changes.

Sometimes, however, applications require decisions based on information sent to or received from SoftSensors, and this can be accomplished with scripts. Scripts can perform a number of tasks including, but not limited to, accessing data gathered by SoftSensors, accessing and modifying product and SoftSensor parameters, establishing communications with external devices, preprocessing images before SoftSensors analyze them, performing mathematical calculations, and more.

## **Fast Label Inspection**

Through custom Intellect scripting, developed by code-in-motion, one camera tells the printer exactly what to print, and tells another camera exactly what to inspect. The entire process of scanning the 2D barcode on the cap, printing a label and inspecting that printed label takes only a few seconds.

Code-in-motion programmed custom scripts in the ID reader to read and process the 2D Data Matrix barcode on the vial cap. Their routines parse a barcode value of about forty characters into multiple commands for printing the product label. Specific commands are sent to a Zebra Technologies high resolution thermal transfer printer that prints labels on-demand.

Code-in-motion also developed additional scripts to communicate (from the cap barcode) the required product selection for the vision system, and also the required target text values for each of the many OCR/OCV SoftSensors that are positioned across the label.

The entire label inspection time takes only a fraction of a second. Without the SoftSensor regions, it would take much longer to read the text because one sensor would search the entire image looking for characters. In the illustration of the label, each SoftSensor has a target value that it will try to verify on the printed label. For example, one SoftSensor looks for the text BC which stands for base curve, and is a basic part of the contact lens prescription. The next SoftSensor reads the numbers just to the right of the BC. Another SoftSensor verifies that the correct label stock was loaded into the printer by reading the preprinted value in the upper left corner of 70001.

## **Rejecting or Applying the Label**

The labeling and vision verification system is controlled by an Allen-Bradley programmable logic controller (PLC). The PLC controls and orchestrates a variety of devices including pneumatics, a stepper motor for applying the labels, and an indexing starwheel that moves vials from an input chute, to a labeling position, and into an output chute.

If the label fails vision inspection, the operator is alerted through the touch-screen PC monitor. An ever present message log updates with an inspection failure notice. Additionally, the display shows exactly which character(s) on the label did not pass inspection, or if the wrong label stock was placed into the printer. This level of detail is a great aid to the operator if and when printing issues arise. This capability is

made possible through Cognex SoftSensor standard outputs and network communications integrated into the overall code-in-motion system.

If the label passes vision inspection, it is applied to the vial. A vacuum drawn tamp pad picks up the label off of the Touch & Go Patented Roller Grid. The tip of the label extends beyond the tap pad and is positioned just below a rubber roller (orange colored in the illustration). The label is lowered into light contact with vial, so that the rubber roller is lightly depressing the label onto the vial. Meanwhile, the vial is supported by two rollers within the starwheel. The rubber roller is rotated by an accurately controlled stepper motor until the label is fully applied around the vial.

### **Increasing Labeling Quality While Reducing Cost**

“Our new labeling and vision systems have dramatically reduced the cost of labeling our products,” Collins added. “The amount of labor required both for labeling and inspection has been substantially reduced. When we first started operating the systems, we continued with 100% manual inspection. But it soon became clear that thanks to the performance of the Cognex cameras no errors were being made.”

“We have operated two of code-in-motion’s labeling systems for almost two years now,” Collins said. “They have labeled hundreds of thousands of vials and have not made a single error. As a result of this outstanding accuracy, we have been able to reduce manual inspection to a very cost effective and reasonable level. The result is that the total cost of labeling the product has been reduced to less than 10% of our previous manual methods.”

“SynergEyes contact lenses are a high quality premium product,” Collins concluded. “We purchased this labeling and vision system to ensure that we have the highest possible quality label to match our product. We spared no expense to provide quality to our customers and we ended up reducing our costs at the same time. This is by far the best labeling system I have used in 27 years of contact lens manufacturing.”

### **Source URL (retrieved on 04/25/2015 - 5:56am):**

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### **Links:**

[1] <http://www.synergieyes.com/>