VERISENS® APPLICATION DESCRIPTION:

BOTTLE CAP VERIFICATION

REQUIREMENTS

FIGURE 1: BACKLIT BOTTLE CAP

A manufacturer of a liquid product that is placed in bottles needs to verify that the cap is seated correctly. In production the cap is automatically applied to the bottle and a torque sensor verifies that the cap has been applied correctly. At times, the torque can be correct but the cap may not be completely closed. A machine vision sensor can measure the distance from the shoulder of the bottle to the bottom of the cap to determine that the cap is properly seated.

Figure 1 illustrates a bottle with a plastic screw cap. A light source is placed behind the bottle and cap so as to provide a silhouette to the vision sensor. Image acquisition will be triggered by a sensor detecting the presence of the bottle or by an encoder input from the conveyor, or both. Once the verification is complete, an output signal from the vision sensor can trigger a marking or reject device.

SETUP AND INSTALLATION CONSIDERATIONS

Figure 2 is a screen capture of the VeriSens® configuration software. There are four steps to setting up an inspection:

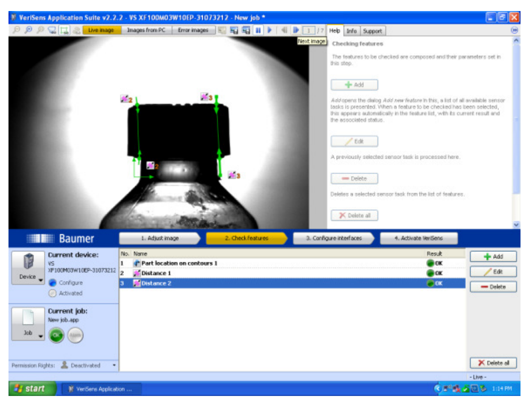

FIGURE 2: GOOD PART SHOWN WITH INSPECTION TOOLS

Step 1 is to establish proper part positioning and lighting. As described above, this part is back lit. The bottle *must be repeatable with respect to location* in in order for the inspection to be successful. Gross repeatability is achieved with the trigger input, fine location information is provided with software.

Step 2 is to select the appropriate software tool or tools to properly perform the inspection. Because part position is important for this application, a “Locate Tool” was selected to begin the inspection. This software tool finds the bottle first so that subsequent tools will be positioned properly.

The actual inspection is performed by two “Edge Tools”. In this application, these tools measure the distance from a shoulder on the bottle to the top of the cap. Figure 2 illustrates a “Passed” part; Figures 3 and 4 illustrate inspection results when the cap is opened ¼ turn and ½ turn, respectively.

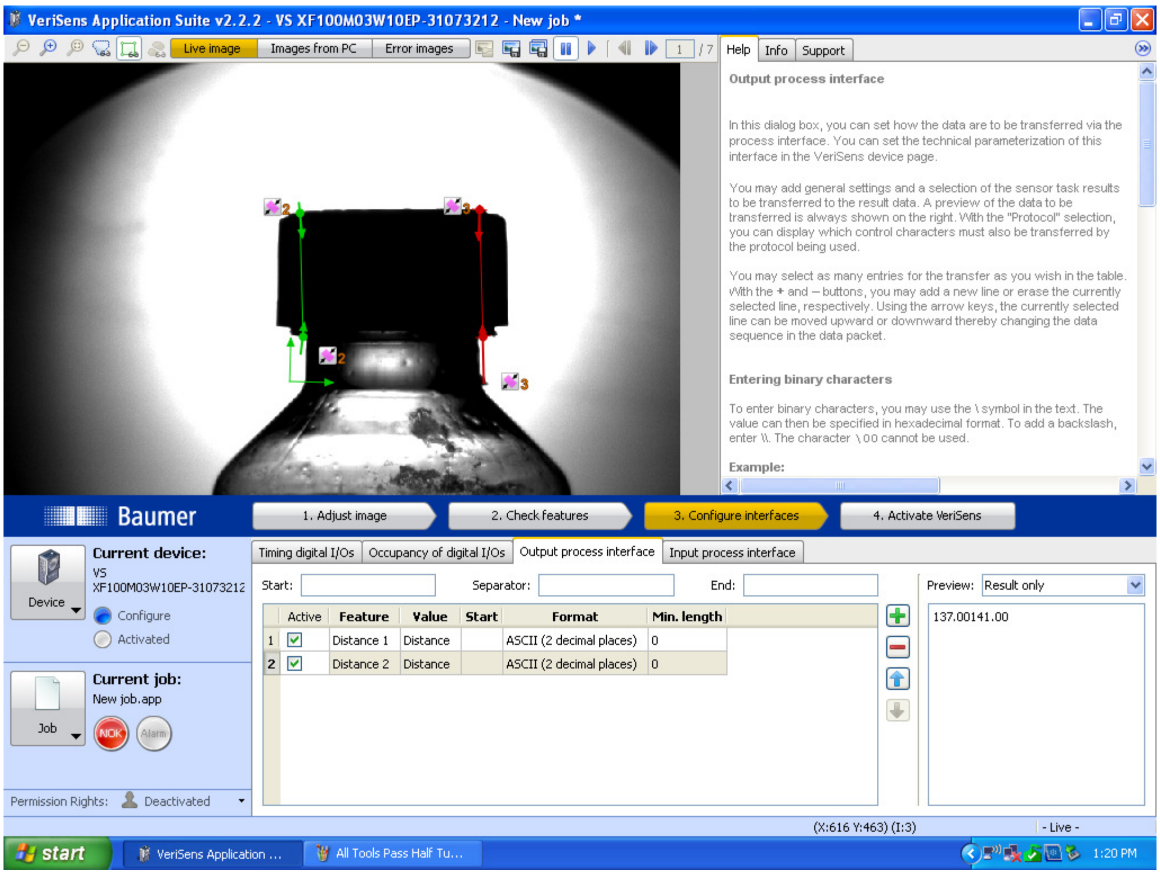

FIGURE 3: 1/4 TURN OPEN, INSPECTION FAILS

Of note is the accuracy of this particular sensor. The Field of View for this installation is approximately 4”. The sensor is a VeriSens XF100 with a pixel resolution of 752 x 480 pixels. Dividing 4” by 752 yields approximately 0.005 pixel accuracy. The Set point for a good part is <= 139 pixels (approximately .695”). Note in the results window (lower right) that a ¼ turn yields a pixel value of 141 pixels (.705”) on the right hand edge tool- the left hand measurement is still within specification.

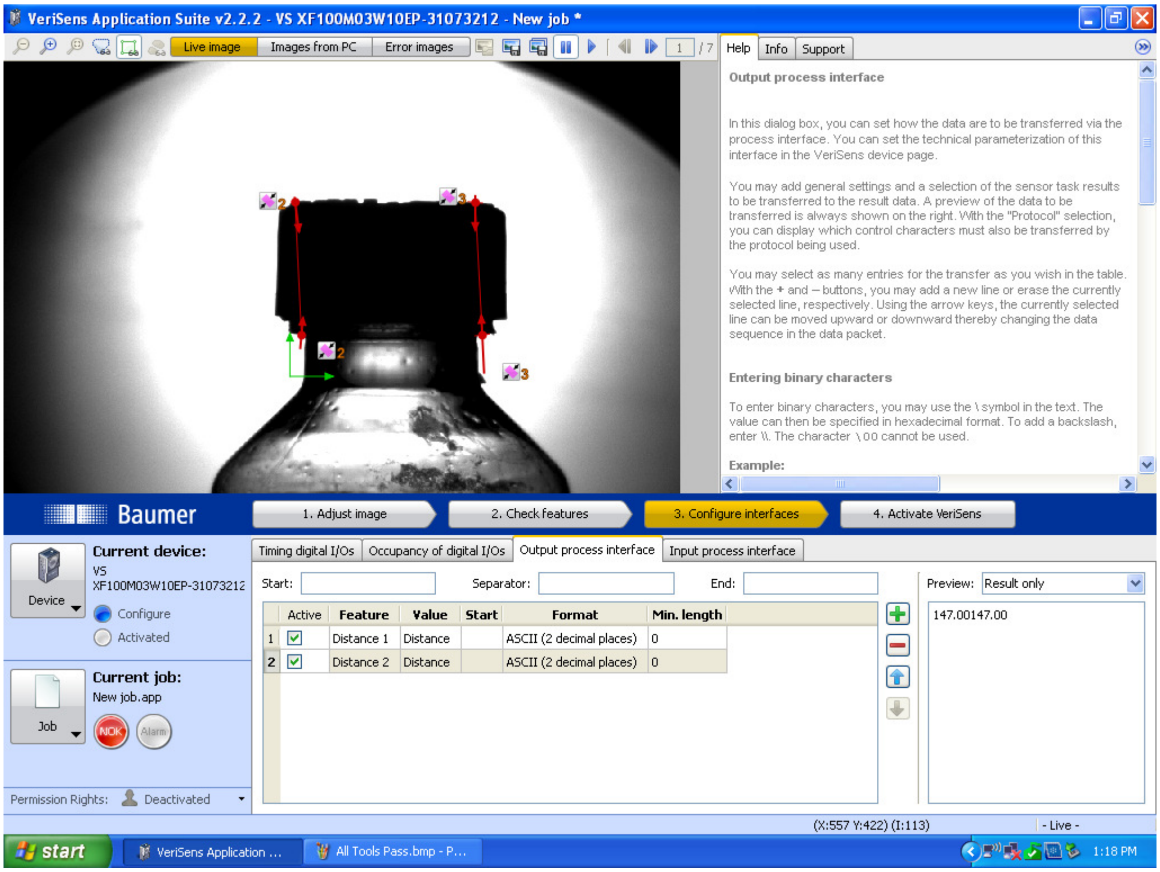

FIGURE 4: ½ TURN OPEN, INSPECTION FAILS

Figure 4 illustrates the values obtained when the cap is opened ½ turn. In this instance the measured distance from both tools, as shown in the results window, is 147 pixels (.735”).

The third step is to decide how the inspection results are to be handled. Some common options are to trigger a marker or reject device and to log the inspection data via Ethernet. Inspection speeds of up to 100 inspections/ second are obtainable with this device.

Step 4 is to download the configuration parameters to the VeriSens®. Once this is done, the sensor runs as a stand-alone device and the PC used to configure the device may be disconnected.

MATERIALS LIST- MAJOR COMPONENTS

A typical system would consist of the following:

- 1 Baumer VeriSens® XF100 vision sensor with cables
- 1 back light source
- 1 input device (proximity switch, encoder input or both)
- 1 controlled device (marker or reject station)
- Electrical enclosure with 24v Power Supply
- Engineering and documentation
- Installation and training

Suggested budget for above: approximately $3500

CONTACT

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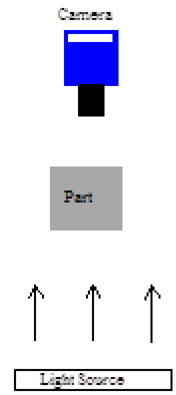
GLOSSARY



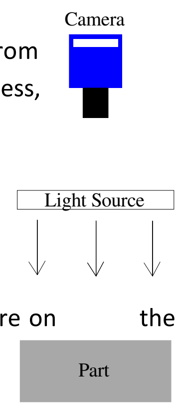
Back Lighting — Lighting technique in which the part to be inspected is between the light source and the camera yielding a silhouette.

Contrast — Measured in grayscale (Black = 0; white = 255).

A minimum contrast must be present in order to differentiate a feature from its background.

Edge Detection — A machine vision algorithm that detects the difference in brightness along a given region of interest.

Feature Extraction — The ability of machine vision software to separate a feature from its background and determine some attribute (area, brightness, etc.)



Front (or Top) Lighting — Lighting technique in which the light source and the camera are on the same side of the part to be inspected.

Optical Character Recognition (OCR) — The ability of machine vision software to determine the value of a string of previously unknown characters.

Optical Character Verification (OCV) — The ability of machine vision software to determine whether or not the value of a string of previously taught characters matches the current image.

Resolution Measured in Units of measure per pixel.

Field of View ÷ minimum number of pixels on the sensor. For example, a 1" FOV with a VGA sensor has a resolution of approximately .002"

Resolution = FOV/pixels Resolution = 1"/480

Resolution =.002"/ pixel