

Multicamera system reads vial labels

Andrew Wilson, Editor, andyw@pennwell.com

System integrators have two options when inspecting the labels of bottled medication such as drug vials supplied to hospitals and pharmacies. To obtain a flat image of the label that can be read by optical character recognition (OCR) and barcode-reading software, each bottle or vial can be rotated in the field of view (FOV) of a single linescan camera to sequentially build a complete image.

Alternatively, multiple area-array cameras can image individual portions of the label that can later be stitched together in software. That approach has been successfully used by FP Developments (Williamstown, NJ, USA; www.fpdevelopments.com) in the design of an OCR/barcode vision system developed to inspect drug vials.

Says Dave Pflieger, network manager with FP Developments, “Vials are fed single file into the in-feed starwheel and transferred onto a rotary turret mechanism. The rotary turret ensures equal and exact spacing of each vial. As the turret rotates, each vial is presented to the four-camera array for image acquisition. A rotary encoder attached to the turret drive triggers the camera and lighting system” (see figure).

“To eliminate spectral reflection from the glass vials and highlight the label,” says Pflieger, “a cloudy

day illuminator from CCS America (Waltham, MA, USA; www.ccsamerica.com) is used in conjunction with red LED light panels. To trigger the illumination system as each part appears at the imaging station, a rotary encoder attached to the rotary turret feeds pulses to a PC-based I/O board.

As the lighting is triggered, four Scorpion CCD cameras from Point Grey Research (Vancouver, BC, Canada; www.ptgrey.com) positioned at equal 90o intervals around the vial capture four images of the label. Although the cameras can capture images at frame rates as fast as 30 frames/s, this speed is not required since the maximum inspection rate of the system is 600 parts/min.



To inspect vial labels, FP Developments has designed a system based on a series of rotary indexing tables (top). After individual vial labels are captured using four cameras, the images are unwrapped, stitched together and OCR and barcode inspection performed (bottom).

“Because the FOV of each of the cameras is 120°,” says Pflieger, “the four captured images can reconstruct a complete image of the label. After these images are transferred to the host PC, each is unwrapped using bilinear spline interpolation and stitched together using Omniview software from Cognex (Natick, MA, USA; www.cognex.com). Then, OCR, OCV, Data Matrix, and pattern-recognition functions within the Omniview package read the barcode and alphanumeric data on the vial label. The software also can perform other inspections, such as label skew, label damage, and pattern match. As the images are processed, they are displayed on a CTC touch-screen flat-panel display from Parker Automation (Cleveland, OH, USA; www.parker.com).

After each part is inspected, the rotary turret presents the next part sequentially. Parts are discharged from the rotary turret using a discharge starwheel that transfers the parts to a linear conveyor. Should any vial fail the inspection process, a PLC from Allen Bradley (Milwaukee, WI, USA; www.ab.com) interfaced to the system’s host PC triggers a patented reject mechanism. The discharge starwheel includes a reject confirmation system to ensure that the appropriate product was rejected. This reject confirmation function is critical to pharmaceutical processes.

“At present,” says Pleger, “the system is specified to test vials at speeds up to 300 parts/min, although the system can run as fast as 600 parts/min without any problems.” It was important that the system could be easily adapted to inspect vials of varying shapes and sizes. “To do this,” adds Pleger, “each of the four cameras in the system is mounted on a motorized screw drive that is controlled by the system’s PLC. Using the touch-screen flat-panel display, an operator can select a preprogrammed recipe for different size products.

At a cost of between \$200,000 and \$300,000, FP Developments pharmaceutical inspection system has been designed to be easily integrated into existing pharmaceutical production lines. “In the future,” says Pleger, “we may extend the capabilities of the system to perform particulate inspection of the contents of the vials themselves.” FP Developments designs and builds both standard and custom machinery and is capable of integrating the entire production line.

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Author(s) : Andrew Wilson