Application Story: Vision Inspection Station for Rubber Seal Assemblies

Tooling & Engineering Solutions is a custom machine builder with over 30 years of experience. Each tool they build is tailored to the particular needs of the individual customer. In this instance they were brought in by an automotive supplier in the rubber seal industry to design and build an inspection station for rubber seal assemblies.

Windshield to header seal inspection

This part seals the top of the windshield structure to the removable hard top on certain Jeep models. The part is an extruded section with a molded boot on either end. An operator is required to apply 3 pieces of adhesive backed foam, a piece of double sided tape with red backing, and a piece of rubberized adhesive with a blue backing.

The original goal for the customer was to simply verify that these items were on the part before shipping. The high gloss of the Red and Blue backing made color sensors unreliable because the placement of the two tapes was operator dependent and any wrinkles in the backing made it very difficult to achieve repeatable results.

Cognex Insight vision systems were used on each end of the part to detect not only presence of the colored backings, but position as well. A series of “brightness” tools were placed over the image of each piece of colored tape so that they could insure proper placement.

To complicate the set-up, one end of the part was on a floating nest to account for length variance in the part. The camera on that end was fixed, so the part moved relative to the lens. A Part Location tool was used to accurately detect the position of the part nest so that the vision tools always appeared on the part correctly regardless of position.

This project was implemented as a cost savings measure – any parts that were shipped with missing tape caused entire shipments to be placed in “containment” where hundreds of man hours must be devoted to visually inspect entire shipments before they can be sent to the customer. “As a result of the success of this project we were given a second inspection project” said Adam Dobson, Owner/Engineer at Tooling & Engineering Solutions. “This project is part of the original capital investment for a new vehicle to be released to production this fall.”

Glass Run Seals Inspection

This project was a final assembly and verification tool. The part is a rear door glass assembly where the Glass Run Seals are molded to a rubber encapsulated glass. The machine verified presence of a metal bracket, and a metal clip molded into the rubber. The operator applied a foam strip along the top perimeter of the glass, and placed a white paint mark above the molded in clip to facilitate assembly onto the vehicle.

"Again an In-Sight was used" said Dobson, "while a vision sensor, like the Checker could have worked, we felt the added flexibility of the In-Sight system would help guarantee a more reliable system."

The vision inspection of the process was to detect the ring of white paint that the assembly plant worker will use as an aid to install a screw in a later process, and the presence and position of the foam strip. A separate red LED light source was used along with a red pass filter on the camera lens to limit the effects of ambient lighting. An edge detection tool located the end of the foam strip not only verified the presence of the foam, but also its location.

The decision to use the In-Sight vision system despite the excellent contrast between the white paint mark and the black rubber paid off, because underneath the rubber is a thin metal clip. This clip must be completely covered by a thin rubber film (done in the mold). If this rubber is too thin the camera could see the metal clip. Using the In-Sight vision system not only could they detect the paint, but also the absence of rubber over the metal clip, this added an additional level of quality assurance by eliminating a second potential for rejected glass assemblies after shipment.

Working with Vision

Tooling & Engineering Solutions had no exposure to Machine Vision prior to undertaking the Jeep windshield seal project. "We quoted the job, with the intent of solving any problems in process; which is typical for a lot of custom work anyway" explained Adam Dobson. "ACS was offering a COGNEX training course a few weeks after we submitted our quotation, so we tried it out. After a day of training on the In-Sight system we knew that we had our solution."

Since taking the In-Sight training Tooling & Engineering Solutions has installed 4 In-Sight Systems and 4 Checker systems as well. "ACS has provided us with great support" claims Dobson "and we are finding vision inspection has added a new level of performance to our custom built solutions."