

Mirror Button Inspection System (MBIS)

Client: An Automotive Glass Manufacturer

Technologies Integrated

- National Instruments Vision Builder for Automated Inspections software (VBAI), V3.0.1.
- Prosilica high resolution monochrome camera.
- Mitsubishi PLC to VBAI.

Background

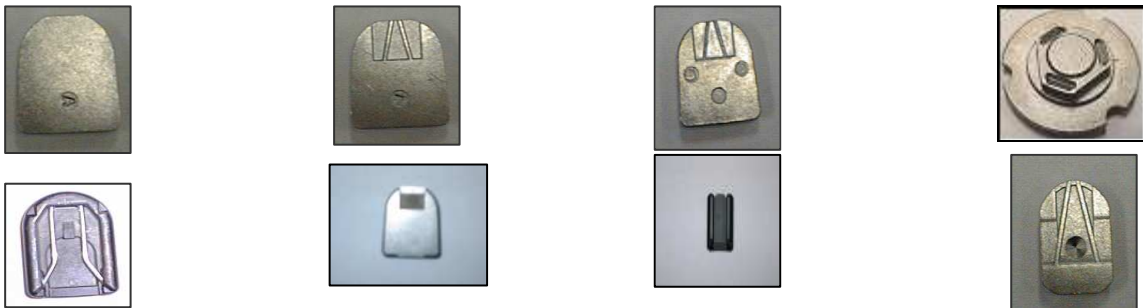
Our client is a manufacturer of automotive glass. They upgraded their current mirror button placement process to incorporate a PLC controlled by a four (4) axis servo controlled aligning system. Performance Automation (PA) was contracted to engineer and design a Mirror Button Inspection System (MBIS) to measure and report the placement of the mirror button position on automotive windshields. Correct placement is important to our client, and to their end customers including Saturn, Toyota, Ford, Chrysler, Mercedes, Honda, Acura and Subaru.

Project Scope

Performance Automation designed and engineered the MBIS using machine vision with a high resolution array scan camera. Also required are three (3) different lighting techniques (backlight, dark field ring light and bright field ring light) to accommodate all combinations of mirror buttons, mirror patches and glass curvatures. The LED lighting was controlled through digital IO and VBAI software. The camera and lighting system was attached to a FANUC 6-axis robot. The end-of-arm tooling was designed by Performance Automation.

There are several combinations of mirror buttons, mirror button patches and glass curvatures to be considered; each combination having its own unique placement criteria. The MBIS system needed to know which vision program to load for the windshield being presented. This had to be communicated via serial link from a Mitsubishi PLC to the VBAI software.

In the event the MBIS detects a non-conforming part, the MBIS communicates via digital I/O to the conveyor line PLC to initiate an alarm and stop the conveyor.



Mirror Button Styles

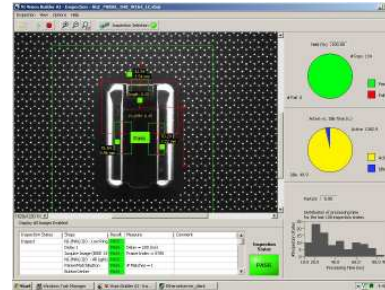
Performance Automation Deliverables

National Instruments Vision Builder for Automated Inspection (VBAI) software was the core technology. All parts that pass the MBIS station must be checked for mirror buttons placed within the intended location (referred to as the Mirror Button Patch). The placement tolerances are:

- +/-0.5mm of the intended location, in the machine direction.
- +/- 0.5mm of the target location, in the cross machine direction.
- +/- 2.0 degrees in rotation, for non circular mirror buttons.

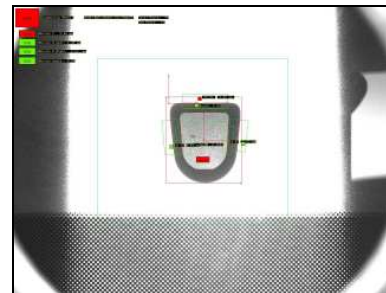
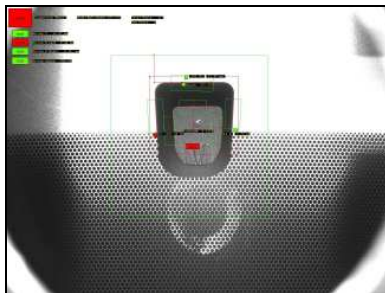


MBIS Image



Processed Mirror Button Image

The aligned glass was presented to the MBIS at approximately 1 part every 8 seconds. The MBIS was pre-programmed by PA for ten (10) different combinations of mirror button bases and mirror button patches. These 10 programs serve as templates for our client to add additional vision programs for new models of windshield glass. To date over 35 vision programs have been developed. The MBIS is upward expandable so the client can add new models in the future irrespective of the mirror button combination.



MBIS Analyzed Images

The MBIS contained a GUI with the following functionality:

- Select from available trained models.
- Select function to train a new model.
- Display last image inspected.
- Include ability to display reject images.
- Save all REJECT images.
- Save a time and date stamp for each reject image.

Additional Details

The MBIS contains physical I/O that was interfaced to the client's Mitsubishi PLC. The I/O performed the following functions:

- System online or "heart-beat" signal
- Inspection Pass
- Inspection Fail
- In addition to the serial link, a binary input of up to 128 models (8 bits) for alternative job change selection via PLC.

This client has since contracted PA to upgrade the MBIS system with Vision Builder V3.5, and add additional features.