

USE CASE

INSPECTION OF MAP SENSORS - DETECTION OF WELD AND CAPACITORS



CLIENT/INDUSTRY BACKGROUND

Our client is a German-based multinational engineering and technology company and was founded in the late 1800s. The company manufactures multiple industry parts and supplies for its clients.

Map sensors are used to determine the intake of fuel and air ratio for high efficiency with low consumption of fuel. These sensors are majorly used in automotive vehicles.

CLIENT'S PROBLEMS

- The inspection of detecting capacitors and welding in the sensors is detail-oriented and hence missing out in the inspection
- Skilled operators and training are required for the inspection
- Human operators take at least 5-6 seconds for inspection

PROBLEM IMPLICATIONS

- A map sensor is used for the perfect combustion of air and fuel. Defective map sensors can cause air-fuel ratio to either too rich (more fuel) or too lean. This leads to excessive fuel consumption, poor fuel economy, and possibly detonation
- Malfunctioned sensors will raise customer complaints and hence deteriorate the brand value
- Training to inspect the manufactured product increases the time of production and also TTM (To The Market) time

CLIENT REQUIREMENTS

- The client wants to automate the visual inspection of the sensors by detecting the capacitors and welds in them with their placements. A machine vision system is required to fulfill its requirements
- To reduce the manpower costing
- Reduced time for inspection for quick deliveries to their clients

CURRENT PROCESS

The production volume of the sensors is quite large and it is difficult to visually inspect all the sensors with the desired accuracy to maintain the quality standards. A few sensors from a bunch are picked and inspected and rejected if found defective.

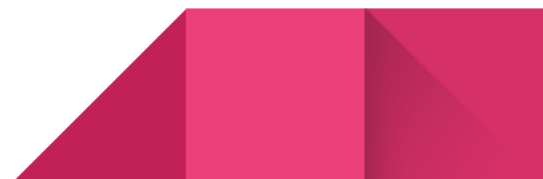
BUSINESS IMPACT

1. Losing business opportunity because of time taken in the inspection station
2. Increase in labor and training costs
3. Increasing in recalling and reshipping costs causing low profitability

SOLUTION USING MACHINE VISION

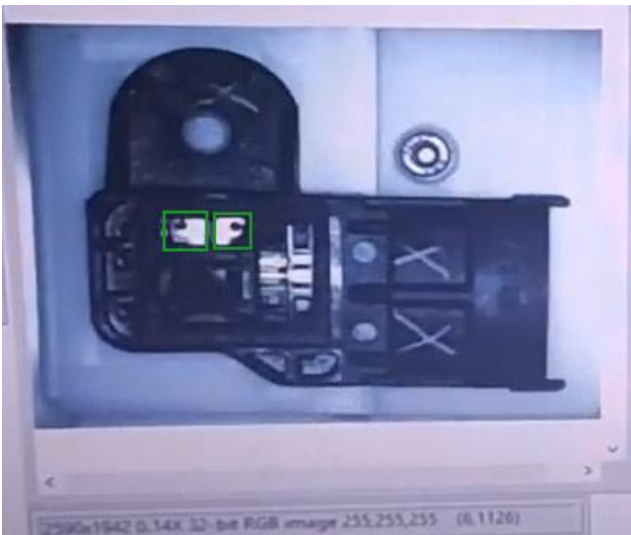
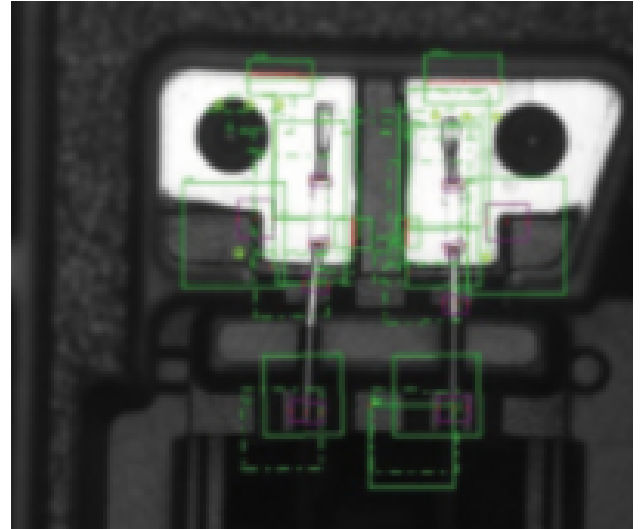
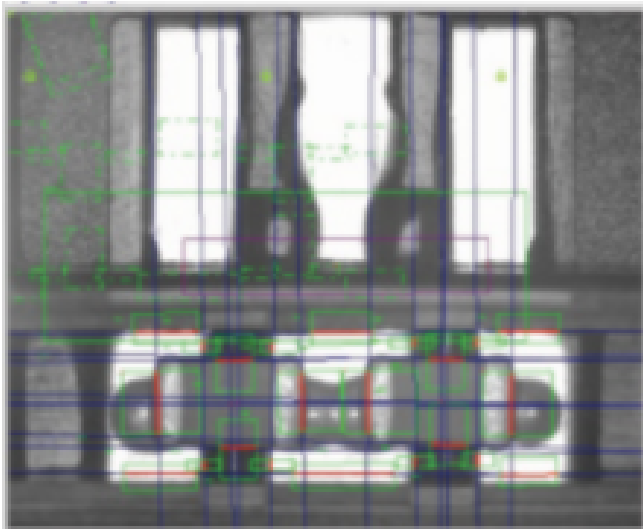
A setup of two cameras with appropriate illumination is set up to identify the presence and absence of capacitors and welds in the sensors. Images are captured and sent to the software ([Qualitas EagleEye® Platform](#)) cloud where the training is done using deep learning algorithms. Once the program is trained, real-time detection of capacitors and welds takes place, based on which the results are sent to PLC to take action.

An **AI-based Object detection module** will be used to detect the capacitors and weldings.



IMAGES

DETECTING CAPACITOR AND WELDING ON SENSORS IN QEP(QUALITAS EAGLE-EYE® PLATFORM)



Capacitor Placement Inspection 0261230217/335/245 NTC Weld Quality Inspection

Inspection Result: **Failed** (Left) / **Passed** (Right)

Total Parts Inspected: 1255 (Left) / 303 (Right)

Parts Passed: 1016 (Left) / 243 (Right)

Parts Failed: 249 (Left) / 224 (Right)

Results Log: Filetime: 04/03/2014 14:00

Output Values:

Left Cap X Shift (mm)	0.004
Left Cap Y Shift (mm)	0.316
Right Cap X Shift (mm)	0.032
Right Cap Y Shift (mm)	0.02
Left Cap TR (Degrees)	195.312
Right Cap TR (Degrees)	193.72

QUALITAS TECHNOLOGIES
Second Shift 03-Apr-14 2:33:33 PM

CONCLUSION

POC (Proof Of Concept) is conducted and the following conclusion is observed:

1. False acceptance is reduced up to 2-3%
2. Time taken to inspect a sensor is 1 second
3. Human intervention is reduced and hence the profitability



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