QUALITAS TECHNOLOGIES

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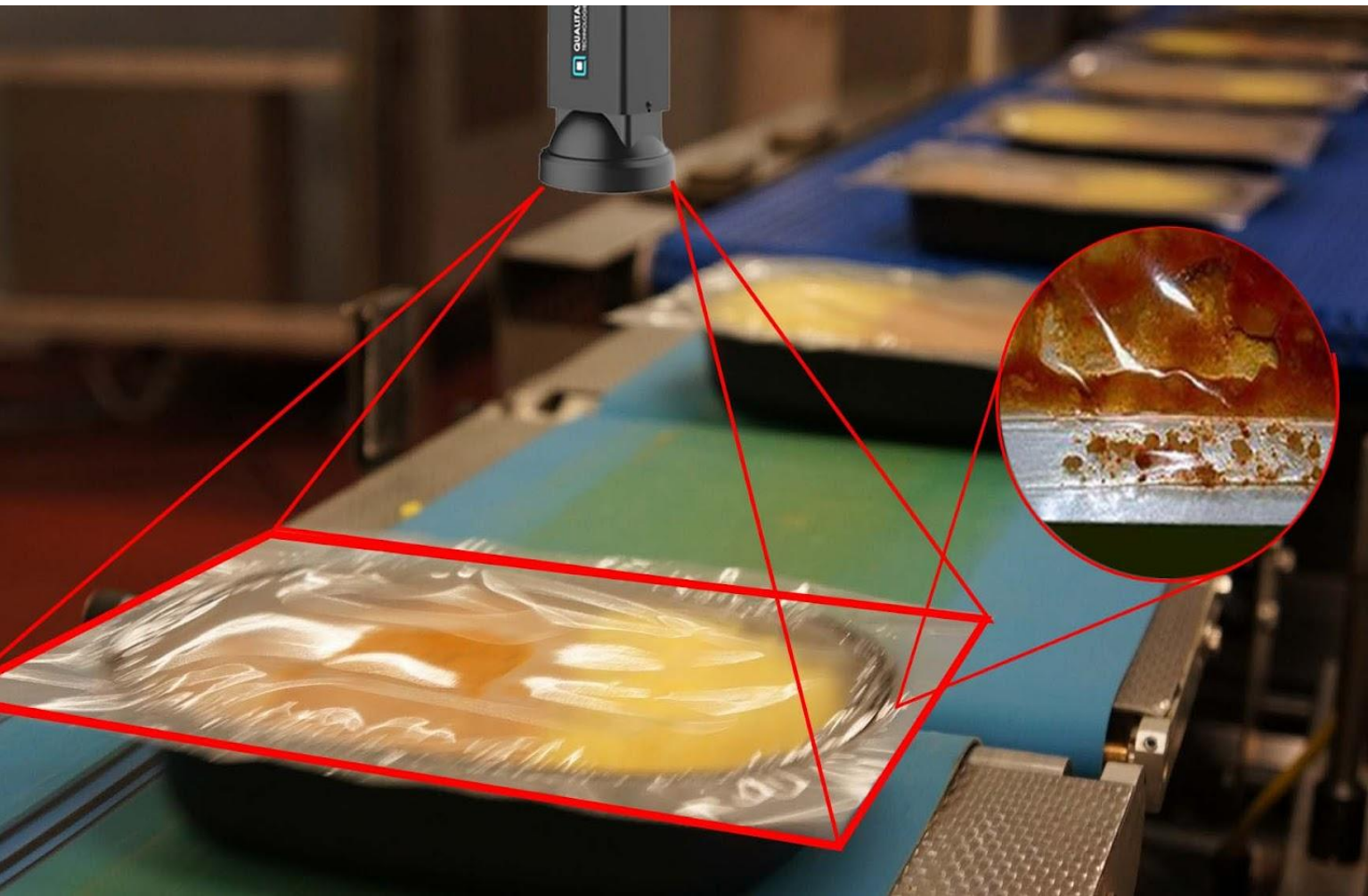
CASE STUDY

INSPECTING FOOD PACKAGING FOR AIR GAPS AND LEAKAGE USING AI AND MACHINE VISION



Overview

Food packages are kept air-tight to prevent contamination, damage, exposure to toxins. Therefore, visual inspection of the packaging has to be performed with a sharp eye. Traditionally, the inspection had been carried out manually. However, manufacturing industries have shifted their manual inspection to automated inspection with the help of Machine Learning (ML).

Client Requirements

To incorporate an AI-based vision system in order to automate the visual inspection process with higher accuracy and less average inspection time.

Here are some defects that need to be identified - Dents/deformed trays, Stains, Puffed packing, Bubbles in the sealing area, Wrinkles in the sealing area, Food in the Sealing area, and Food/oils leaks.

Trapped Oil/Food In Seal

Wrinkle In Sealing Area

Puffed/Bloated Packaging

Bent Food Tray

HOW IS THE PROBLEM BEING ADDRESSED CURRENTLY? -

Each package is inspected manually for any defects. The process is time-consuming (4 to 5 secs/package) and error-prone.

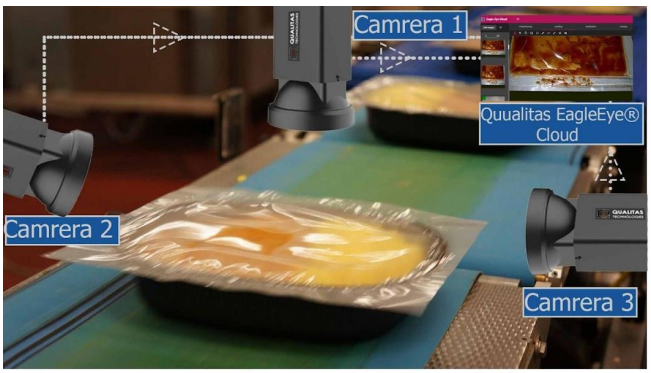
Manual Inspection Of Food Trays

How AI Can Solve This Problem?

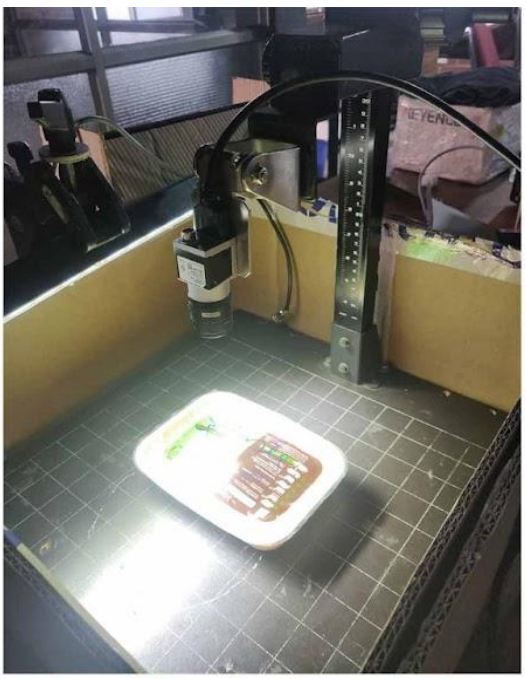
The solution development journey is divided into 4 parts which are Image Acquisition, Machine Learning, Solution Deployment, and accuracy Improvement.

Image Acquisition

The image acquisition setup is deployed at an inspection station of a moving conveyor. It includes *3 cameras* to capture images of the top and sides of the package. A calibrated intensity and color of illumination ensure the capture of pictures with clearly visible defects.



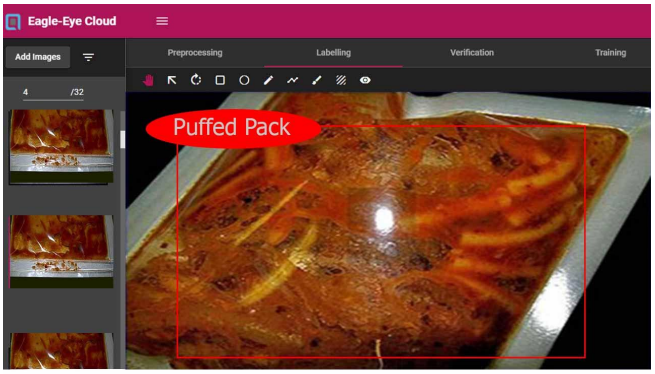
Factory Setup Of Image Acquisition Of Food Packets



Qualitas Demonstration Setup

Machine Learning

A solution is developed using the acquired images. Every defect is trained in QEC (Qualitas EagleEye® Cloud) platform using a simple point and click tool, creating models by annotating the defects. The process includes data labeling, validation, and verification to ensure higher accuracy of defect detection.



Data Labeling With QEC (Qualitas EagleEye® Cloud)

Solution Deployment

The trained model will then be deployed to the live production line to conduct a real-time inspection. A trained AI-based vision system is capable of detecting defects in real-time and display the results on the screen. These results are communicated to the PLC in order to take action like rejecting the defective products, stopping the production line, or raising an alarm.

Accuracy Improvement

In an ideal scenario, not all defects look the same every time. There may be a few defects that are not pre-trained. Therefore, accuracy improvement is required and done by retraining the model until all variations are trained to ensure no unprecedented defects are missed.

Conclusion

With the help of an AI-based machine vision system, the following potential benefits could be observed -

- Can achieve an accuracy of close to 99 percent for catching critical defects
- The inspection cycle time could be reduced from 4-5 seconds to 150-200 milliseconds