SEMICONDUCTOR

## Enhancing Precision with Automated Vision-Based

Problem Identified

In high-volume manufacturing, inconsistencies in hole positioning and surface quality often lead to assembly issues and increased rejection rates. Manual inspection methods were slow, inconsistent, and prone to human error, resulting in production delays and unnecessary costs. The core challenges identified included: difficulty in detecting subtle hole misalignments, incomplete surface visibility during inspection, and the need for both speed and accuracy in a high-throughput environment.

Solution Provided

A vision-based inspection solution was introduced to automate the process of detecting hole defects. The system employed multiple illumination setups to optimize image capture for both hole positioning and surface condition. By integrating advanced industrial cameras and intelligent image processing software, the solution was able to provide real-time detection and consistent results. This approach significantly outperformed traditional manual methods by eliminating human subjectivity and ensuring reliable data-driven quality control.
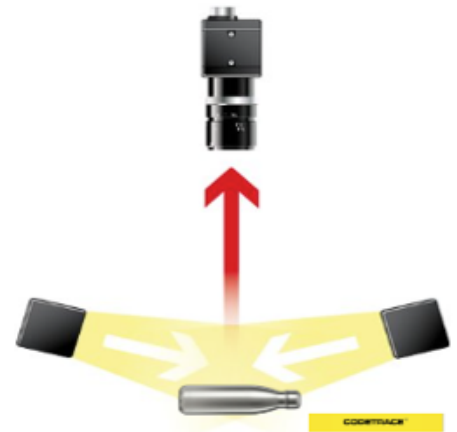
Results & Summary

The automated system successfully identified both the hole position and surface condition with enhanced accuracy under Setup A, where front and back illumination were combined. Compared to manual inspection, the solution improved defect detection rates, reduced inspection cycle time, and minimized false rejections. Production quality consistency increased by a measurable margin, leading to fewer assembly failures and higher customer satisfaction. The before-and-after comparison highlighted a clear gain in inspection efficiency and reliability.

This case study demonstrates how the implementation of an advanced vision-based inspection system effectively resolved a persistent quality challenge in manufacturing.