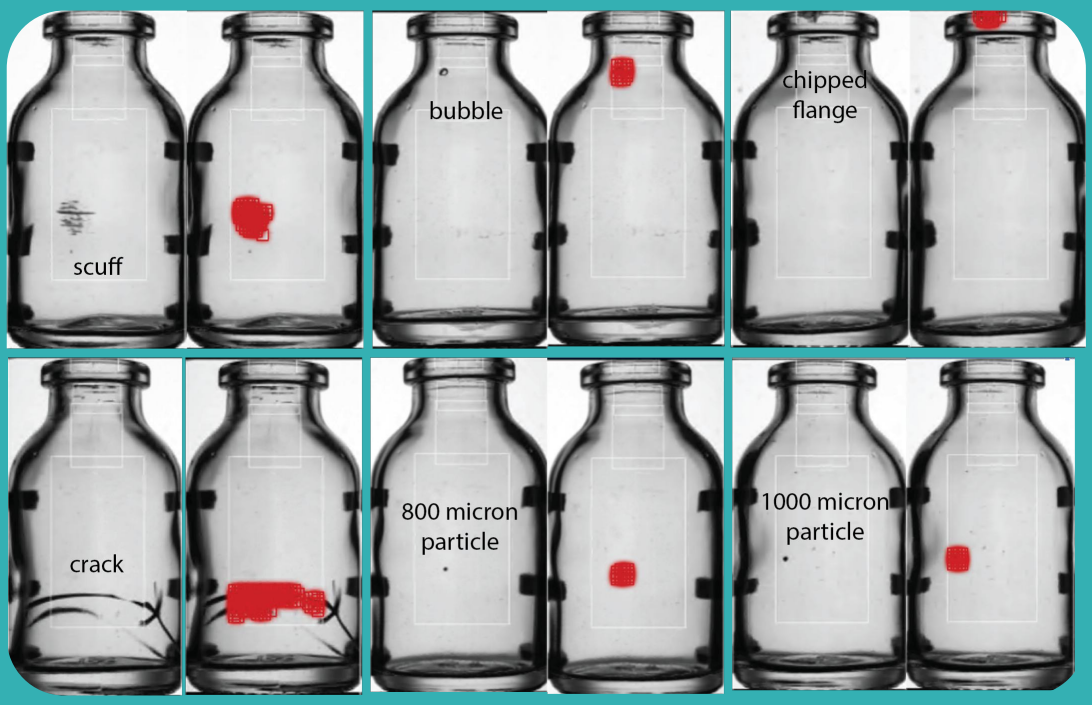
Case Study:

Replacing human inspection of powder-filled molded glass with

AI-based Inspection



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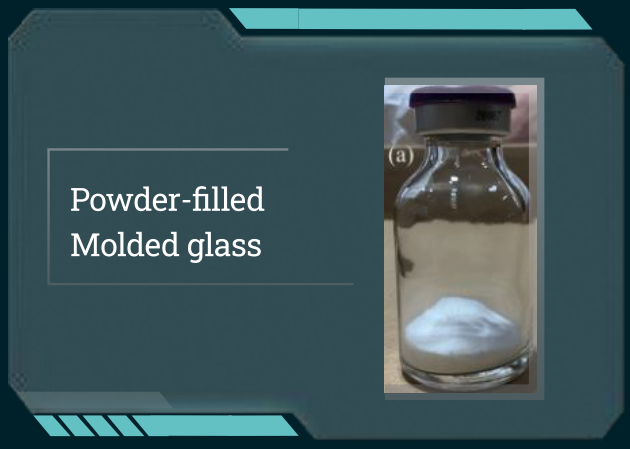
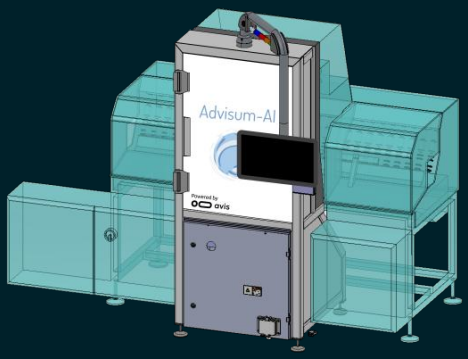
Case Study Summary

Challenge

A CMO recently failed numerous AQLs from semi-automated visual inspection and was looking for a solution to inspect their powder-filled molded glass container.



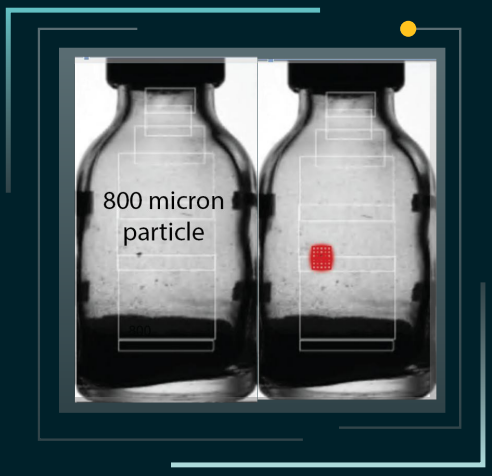


Solution

Deployable as a retrofit for SAVIs or as a standalone AVI, our unsupervised machine learning-based visual inspection system creates an inspection recipe by learning from the normal variation observed in 500 pre-inspected vials.

Outcome

A feasibility assessment was conducted, demonstrating a detection accuracy of over 98% and a 3% false eject rate for a customer-defined defect set, significantly outperforming human inspectors.



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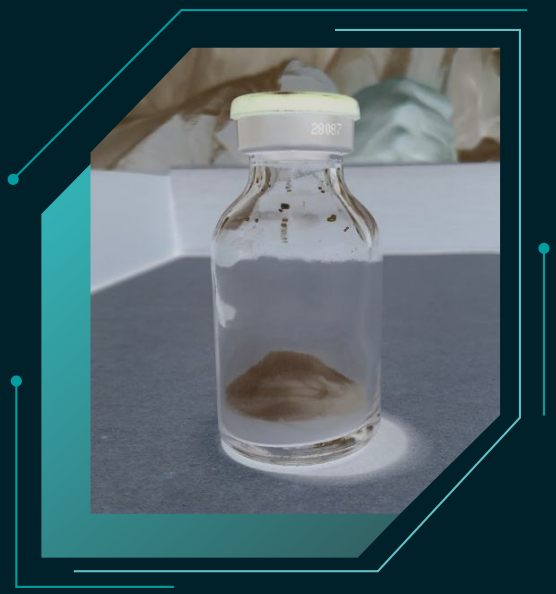
Failed AQLs from semi-automated visual inspection

The challenge was a 20-ml powder-filled molded glass vial showing significant variation in powder distribution within the vial and the usual variations typical in molded glass. The client, a CMO that is closely affiliated with a major pharmaceutical manufacturer, was using semi-automated visual inspection and had recently failed a series of Acceptable Quality Limits (AQLs) from missed defects. Each failed AQL resulted in thousands of additional production costs and tarnished their reputation.

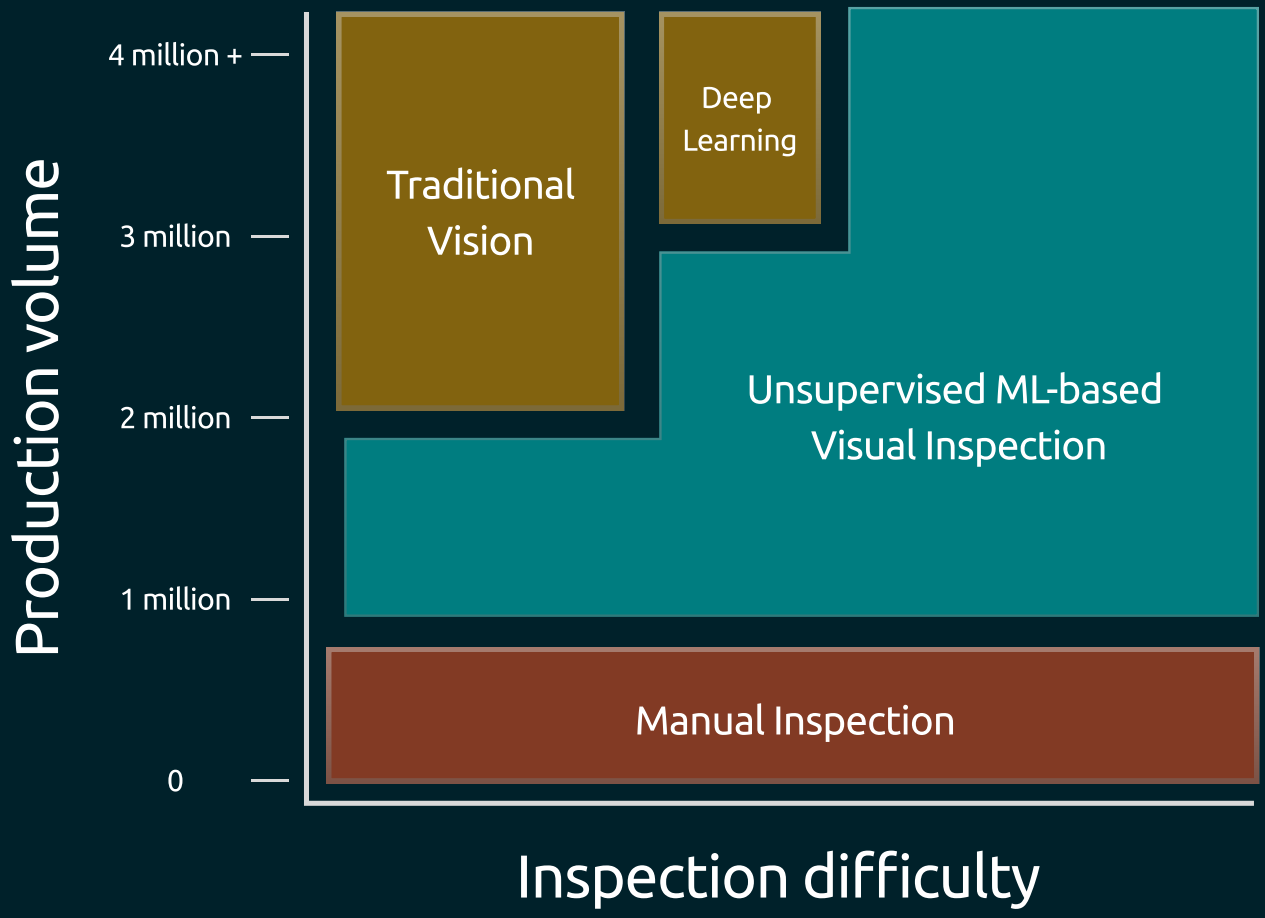
The notion of employing a traditional Automated Visual Inspection (AVI) system was quickly dismissed. Instead, the client wondered if an AI-powered solution could address this issue.



Some vials had a smooth powder formation, while others displayed powder adhering to the walls, clumps, or balls of powder. This wide variation and complexity posed a considerable challenge for human inspectors.

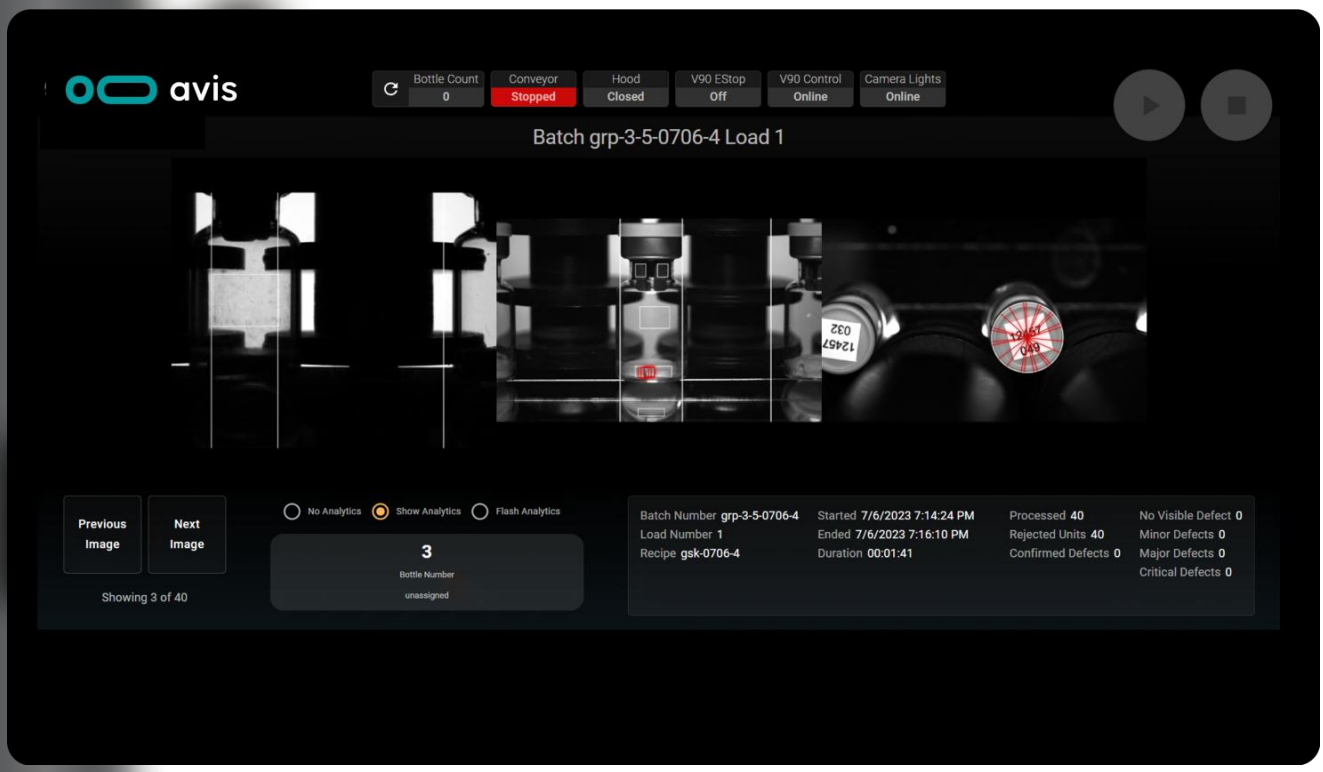
Using unsupervised machine learning to fill the gap in pharma visual inspection

This illustrates the gap in visual inspection capability for products that are too difficult for traditional automated visual inspection or whose volume is too low to justify the investment and the resources to qualify a production recipe. Genesis Packaging Technologies, Dabrico, and Boon Logic have teamed up to create AI-based solutions specialized for these challenges.



Unified Platform built around

Cutting-Edge AI



- New recipes can be created from scratch in under 60-minutes without computer vision or AI expertise.
- Suitable for a wide variety of product types and presentations.
- Explainable AI combined with reproducible and tunable detection thresholds make validation straightforward.

A new approach to AI-based visual inspection

Unlike other automated visual inspection systems, AVIS harnesses the power of the Boon Nano, the world's fastest and most accurate anomaly detection algorithm. What sets AVIS apart is its innovative approach compared to other AI-based systems that rely on Deep Learning.

AVIS doesn't train using pre-labeled defects; instead, it needs only 500 pre-inspected complaint vials. By training on the normal rather than the abnormal, users can readily create inspection recipes from scratch within a single day, utilizing the abundance of compliant vials coming off their production lines.

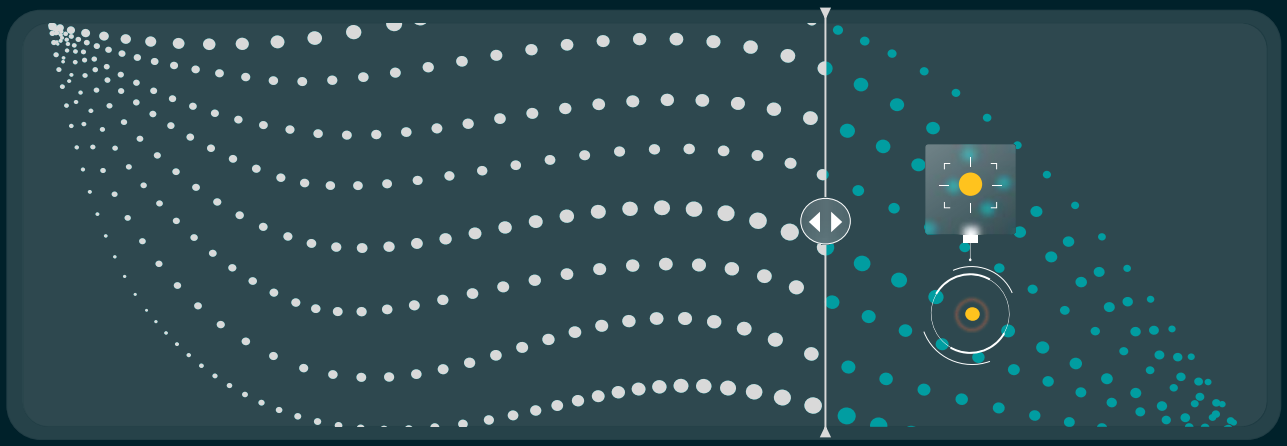
Furthermore, this approach eliminates the need for manual model engineering and fine-tuning, thereby reducing the total cost of ownership of the system and the resources required to support it.

Other Anomaly Detection

// Focuses on the abnormal

Boon Logic's Anomaly Detection

// Focuses on the normal



Four steps to create a visual inspection recipe with AVIS in <60 minutes

RECORD

Create a recording of 500 compliant vials

CONFIGURE

Select regions of interest (ROI) for top, side, and bottom cameras and AVIS creates individual models for each ROI

TRAIN

AVIS learns all normal variation within each ROI. This typically is complete in less than 15 minutes.

RUN

AVIS uses its reference model of normal variation to detect defects which are then previewed and saved within the AVIS HMI

Detection results: 98% defect detection accuracy with less than 3% false ejects

After a few hours of optimizing the camera and lighting positions and defining regions of interest on the vials, AVIS was ready to create its inspection recipe. Within 15 minutes AVIS was processing previously untested vials, rejecting defects and passing compliant units through to the outfeed table.

Using a customer-defined defect set and additional compliant units not used in the training, we were ready to measure the accuracy of AVIS. The test outcomes revealed AVIS's capability to consistently identify 98% of all defects while maintaining a false eject rate of 2.7% exceeding the performance of human operators.