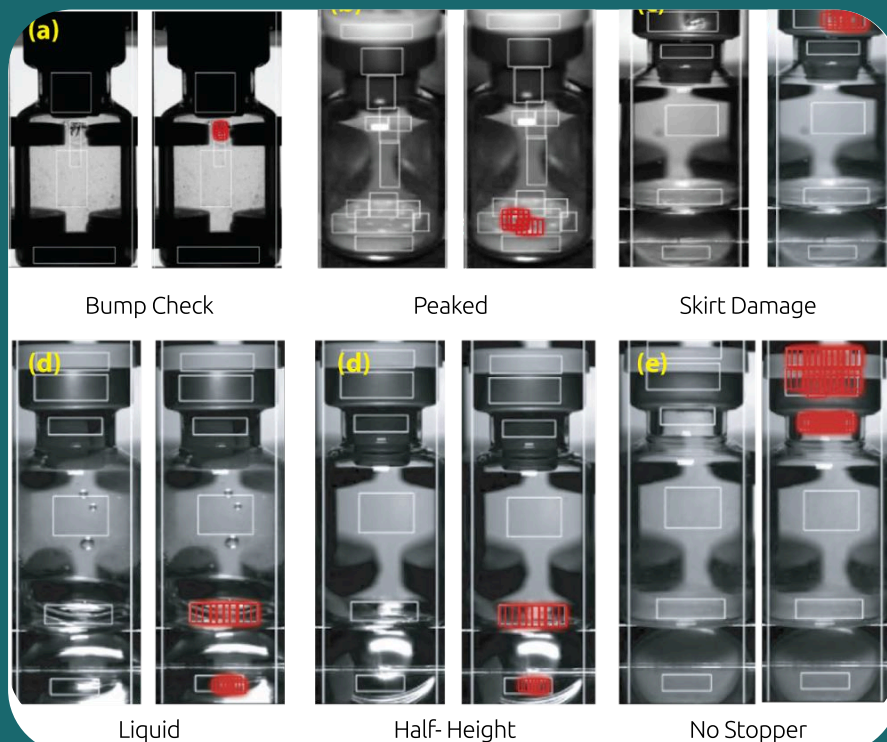


Case Study

Replacing human inspection of lyo cake with

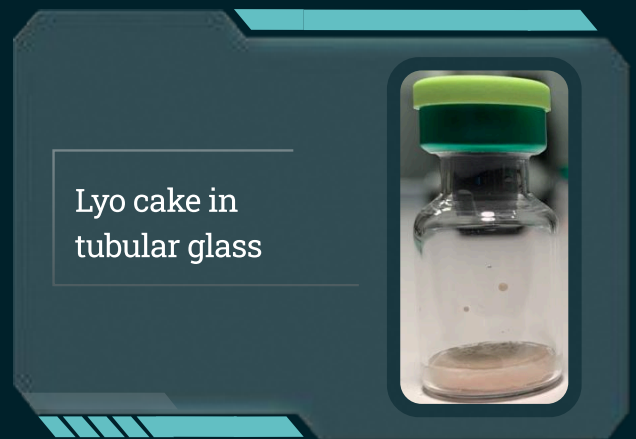
AI-based Inspection



Case study summary

Challenge

A pharma manufacturer needed to meet regulatory requirements for 100% visual inspection of 3-ml tubular glass vials containing lyophilized (lyo) cakes. Manual inspection posed challenges due to significant variations in the appearance of compliant units.



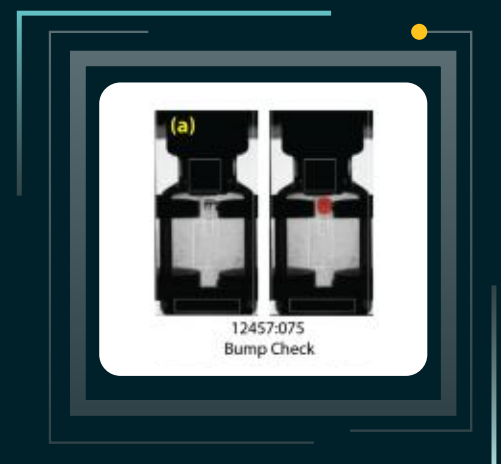
Solution

DAI-50 is the world's first AVI system built for difficult-to-inspect products. Powered by the AVIS platform, the DAI-50 learns normal variations in acceptable products, delivering unprecedented inspection accuracy with minimal false ejects.



Outcome

A feasibility assessment was conducted that demonstrated a detection accuracy of 90% and a false eject rate of 6%, significantly outperforming human inspectors.



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- 08 ■ Defect set used in the feasibility study
- 09 ■ Non-crack defects
- 10 ■ Crack defects

Missed defects from semi-automated visual inspection

The target product was a difficult-to-inspect 3-ml tubular glass vial containing a lyophilized cake with significant variation in its distribution within the vial. The client, a large pharmaceutical manufacturer, had recently acquired 8 semi-automated visual inspection systems to meet increased production demands. However, human inspectors faced challenges with this product, struggling to detect gross defects at a rate of 33 vials per minute.

To keep up with production and maintain high quality standards, an automated solution capable of handling extensive product variation was needed.



Some acceptable vials had a normal cake formation, while others exhibited a standing cake or surface irregularities. This wide variation and complexity posed a significant challenge for human inspectors.

Supercharge Inspection with the DAI-50

Created in partnership between Boon Logic and Dabrico, DAI-50 is the world's first fully automated visual inspection machine built for difficult-to-inspect products. The DAI-50 learns normal variations in acceptable products, delivering unprecedented inspection accuracy with minimal false ejects.



- **AVIS** AI-based visual inspection software by Boon Logic
- **DAI-50** Material handling and product presentation by Dabrico

DAI-50 powered by AVIS

- 1 Train without a defect set
- 2 Time to create new inspection recipe
- 3 Straightforward validation with explainable AI
- 4 Upstream integration compatible
- 5 False eject rate for difficult-to-inspect products
- 6 Cameras per inspection station
- 7 Variable rotation speeds for particle release
- 8 Specialized onsite staff not required for operation

Dimensions: 97 in x 74 in

Container size: Up to 1,000 ML

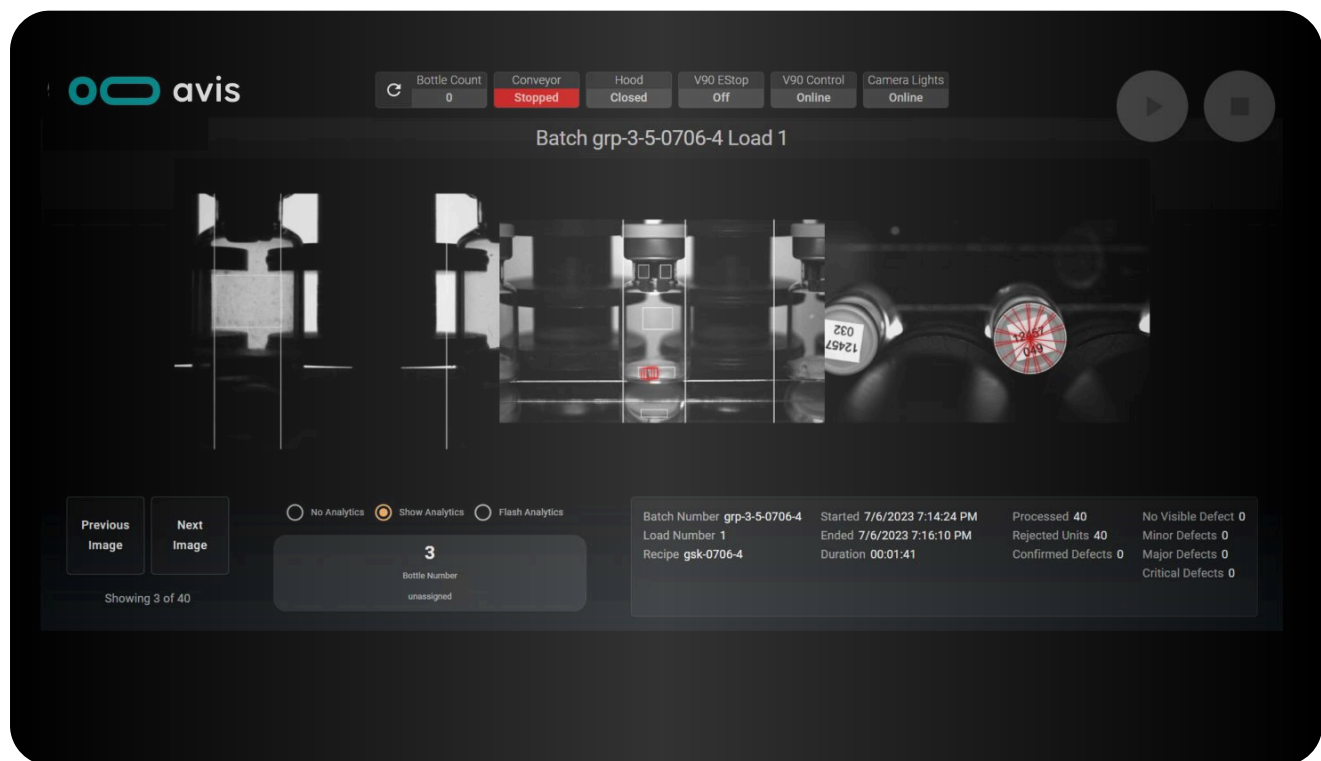
DAI-50

-
- <1 hour
-
-
- <5%
- 3-4
-
-

Traditional AVI

-
- Months
-
-
- >10%
- 2-10
-
-

Scalable inspection built around Cutting-edge AI



AVIS is ushering in the next-generation of visual inspection founded on unmatched inspection performance.

New recipes can be created from scratch in under 60 minutes without computer vision or AI expertise.

Support dozens of different SKUs on a single machine with rapid inspection recipe changeover.

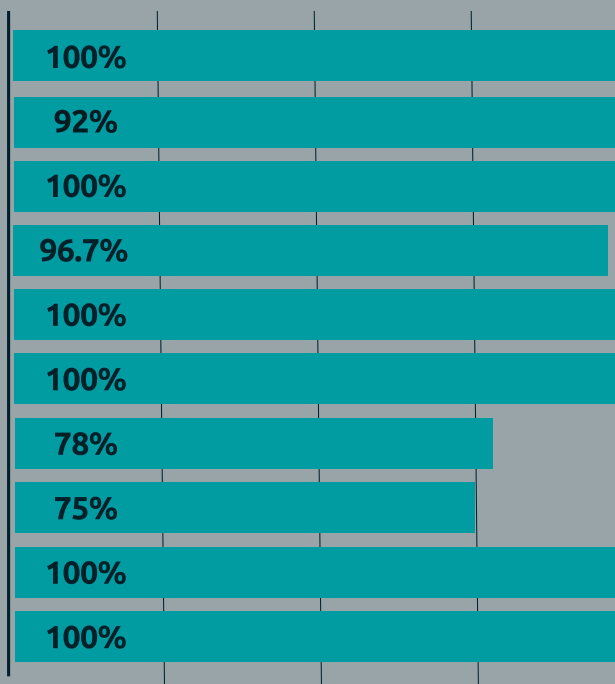
Explainable AI combined with reproducible and tunable detection thresholds make validation straightforward

Case study results: 90% defect detection accuracy with <6% false ejects

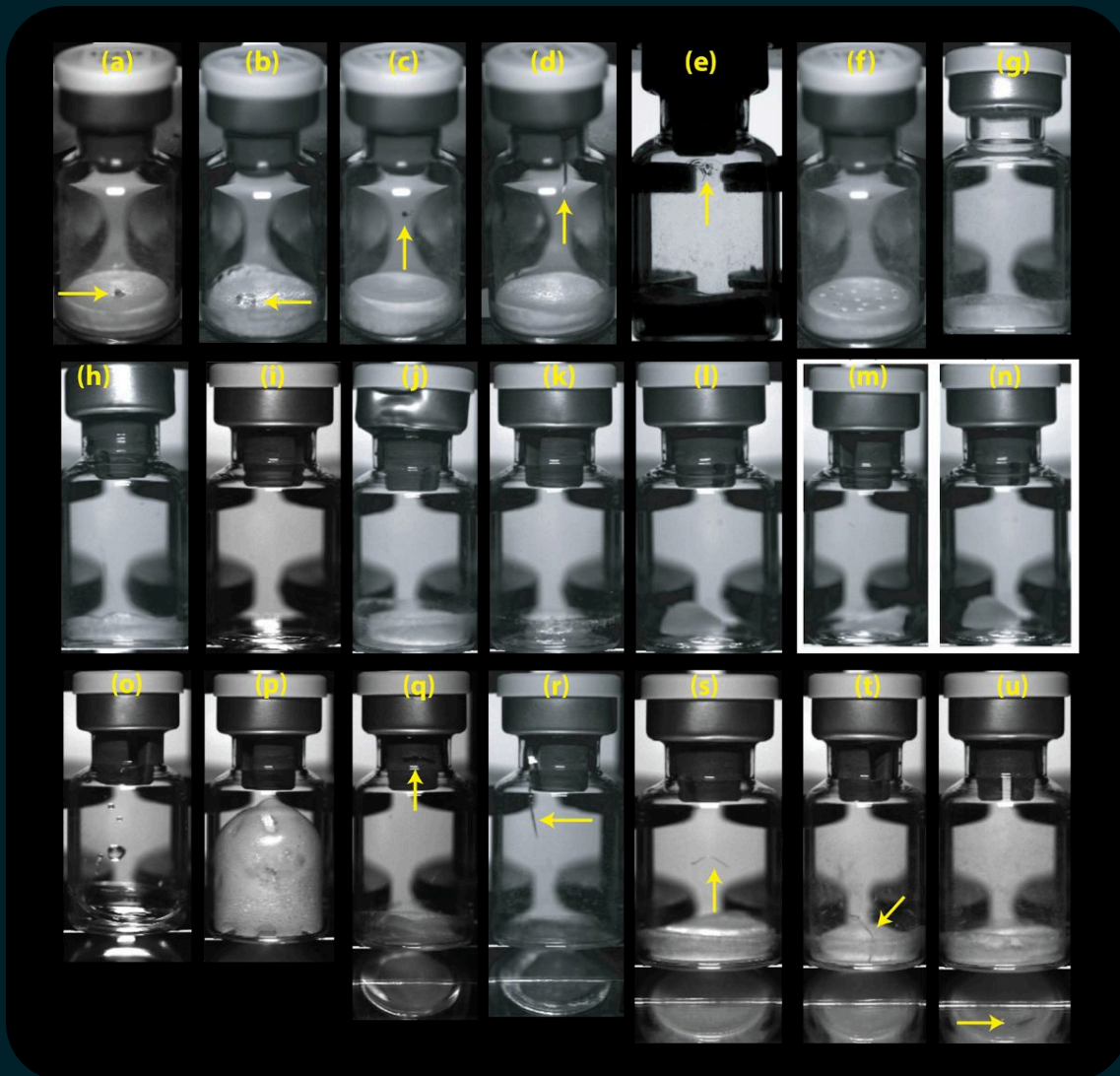
After a few hours of optimizing the camera and lighting positions and defining ROIs on the pre-inspected compliant vials, AVIS was ready to create its inspection recipe. Within 15 minutes, AVIS began processing uninspected vials, effectively rejecting defects and allowing compliant units to pass through 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 results demonstrated AVIS's capability to consistently identify 90% of defects while maintaining a false reject rate of 6%, exceeding the performance of human operators.

melted
particulate
half-height/moon
peaked
liquid
inflated
crack
bump check
crimp defect
empty, missing cap/
stopper

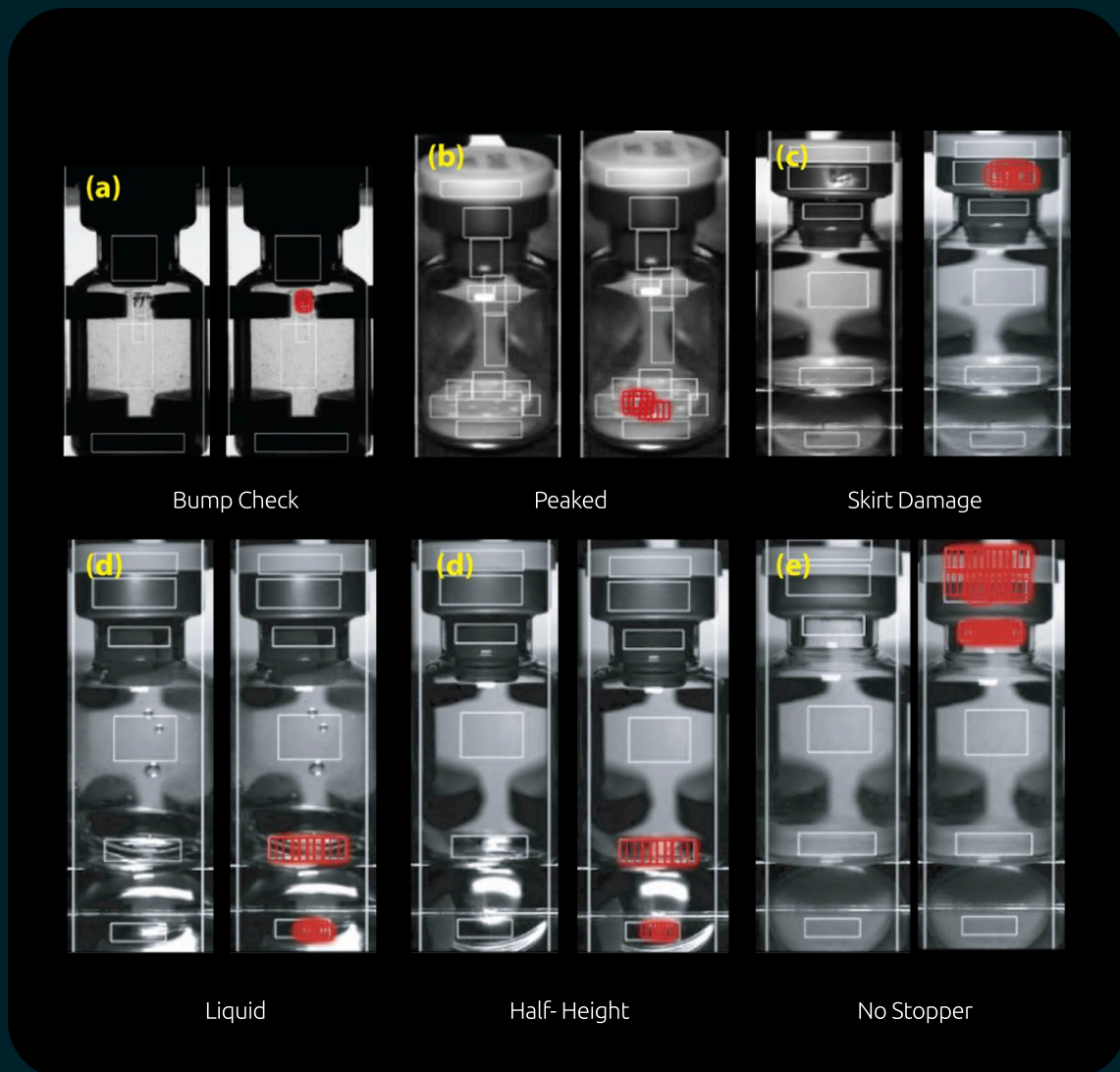


Defect set used in the feasibility study



- | | |
|--------------------------------|-----------------------------|
| (a) dark particle | (l) melted |
| (b) glass particle | (m) half-height |
| (c) embedded particle | (n) moon |
| (d) fiber/strand under stopper | (o) liquid |
| (e) bump check | (p) inflated |
| (f) peaked | (q) crack on neck |
| (g) missing stopper | (r) crack on shoulder |
| (h) missing flip cap | (s) crack on upper sidewall |
| (i) empty | (t) crack on lower sidewall |
| (j) crimp/skirt damage | (u) crack on base |
| (k) retracted | |

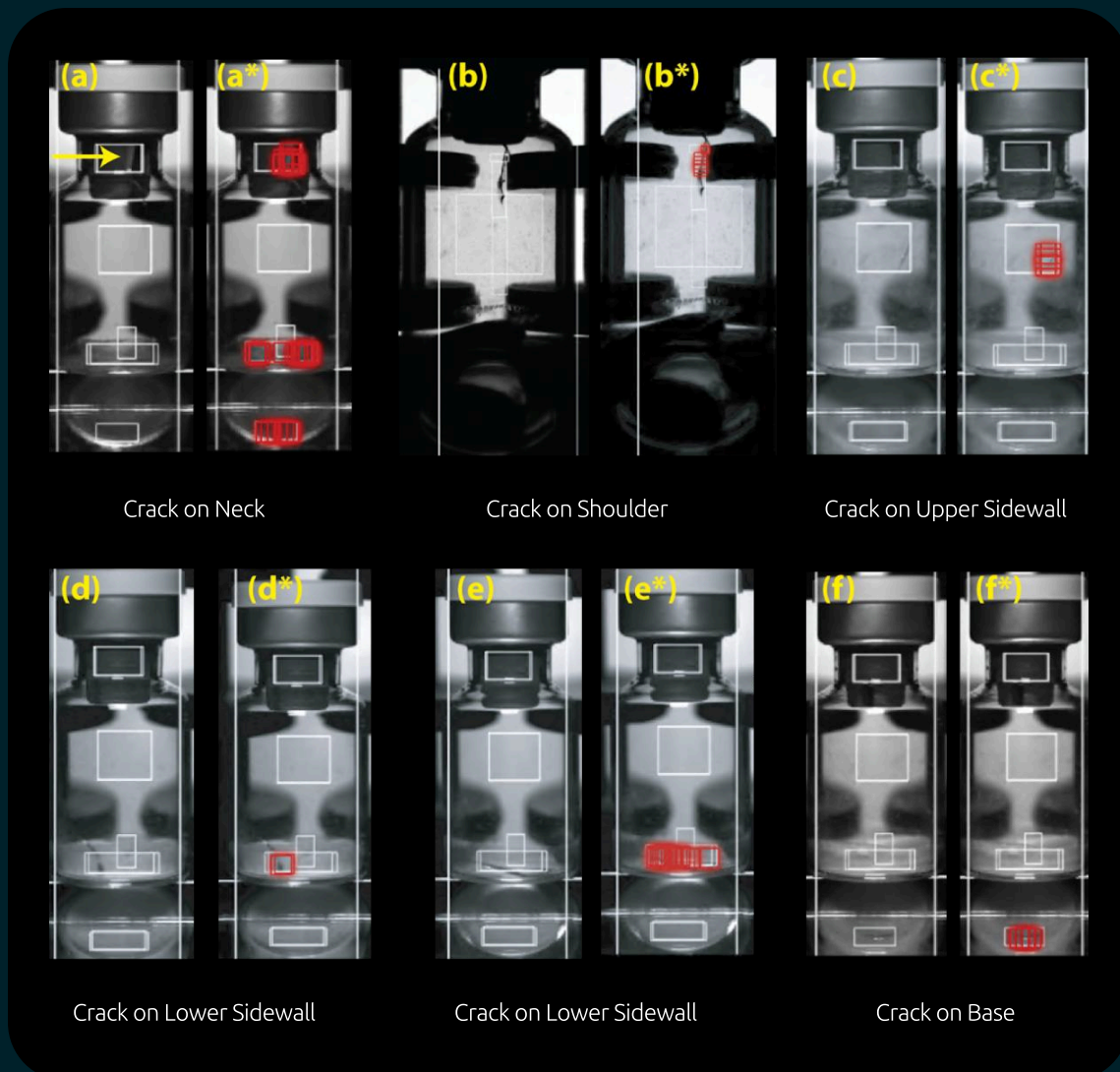
Non-crack defects



All static non-crack defects (dark particle, embedded particle, fiber/strand, peaked, missing stopper, etc.) had a 100% probability of detection (PoD).

Dynamic defects had <100% PoD as the defect's visibility is dependent on how it passes through the SAVI. This variability also affects human inspectors and is compounded by the innate lack of consistency of human visual inspection.

Crack defects

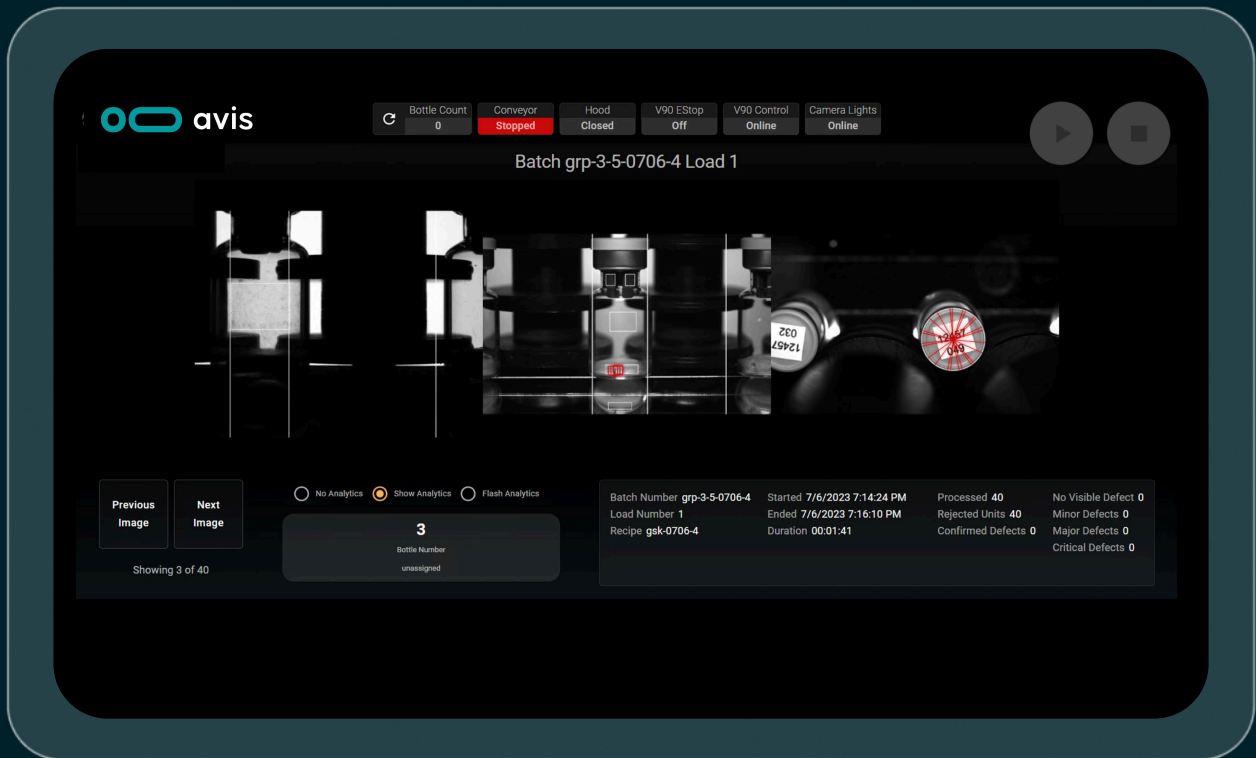


The vials with crack defects were categorized by crack location: neck, shoulder, upper sidewall, lower sidewall, and base. Some vials also had significantly deformed lyo cakes, leading to secondary AVIS detection for the deformed cakes. Cracks on the lower sidewall or base were often obscured by the deformed lyo cakes.

Additional crack-defect vials were created by heating with a torch and cooling in cold water, which often compromised the lyo cakes by liquefying, charring, or otherwise damaging them.

Level-Up Product Quality with AVIS

Tired of failing AQLs? Watch the demo and discover why other manufacturers are replacing human inspection with AVIS.



WATCH A DEMO

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