RESHAPE

APPLICATION NOTE

Automated Colony Counting & Detection

Colony Counting for QC

APPLICATION

Comparison of Reshape and traditional manual colony counting

Why is it a critical need?

In QC microbiology, colony counting is a high-frequency, high-impact task used to confirm product safety, environmental monitoring status, and process hygiene (e.g., CFU counts, contamination checks, pass/fail decisions). Yet in many labs it is still performed manually, which introduces unnecessary risk into a workflow that demands consistency and defensibility. Manual counting is slow and labor-intensive, but more importantly it is vulnerable to human variability: differences between analysts, fatigue, shifting interpretation of ambiguous colonies, and inconsistent handling of plates can all lead to variability in results. QC workflows also generate large volumes of plates and repeated assays over time, making it difficult to ensure consistent documentation, traceability, and standardized decision-making across shifts and personnel. When counts directly influence batch release, investigation triggers, or deviation reporting, any inconsistency or weak audit trail becomes a serious operational and compliance burden – making automation a critical need for reliable QC performance at scale.

How does Reshape help?

Reshape enables automated, digitized colony counting designed to deliver the consistency, throughput, and traceability QC labs require. By combining controlled incubation, automated imaging, and AI-based enumeration in one workflow, Reshape applies standardized counting criteria every time, reducing analyst-to-analyst variation and improving repeatability across shifts, sites, and long-term monitoring programs. The system supports high-throughput processing (including scalable configurations like the Rack) while minimizing hands-on time and manual handling steps, which reduces operational bottlenecks and lowers risk of errors. Reshape also strengthens compliance readiness by producing structured, traceable datasets with plate images and in-image annotations that make results transparent and auditable. With barcode-based sample tracking, metadata capture, controlled access permissions, and export/integration options (including LIMS connectivity), Reshape helps QC teams move from manual, variable counting toward a standardized digital workflow that supports faster review, stronger documentation, and higher confidence in QC outcomes.

Introduction

The purpose of this application note is to highlight the workflow and value of Reshape's automated colony counting solution for QC microbiology teams.

Colony counting and detection is a widely used microbiological technique for estimating the bioload (e.g. CFU/ mL), tracking microbial growth and contamination across products. Despite their importance, colony counting is still often performed manually, making it time-consuming, operator-dependent, and difficult to document and trace.

Although automated tools exist, adoption has been limited by accuracy issues that cause inconsistent performance across media types and colony morphologies, reducing trust in the underlying AI models, and keeping manual counting as the default. Reshape's automated, digitized colony counting models overcome these barriers by delivering reliable, fully traceable counts, reducing hands-on time, improving reproducibility, and enabling faster, more confident decision-making.

THE CORE CHALLENGE

Colony counting is visually messy and operationally high-stakes.

While colony counting can appear straightforward, real-world plates are rarely clean or uniform. In practice, labs must contend with multiple media types and plate formats, each with different concentration calculations, as well as common artifacts such as bubbles in the media, condensation, discoloration, miscellaneous particles, merged colonies, faint or low-contrast colonies, and edge effects.

In regulated or QC environments, even small counting discrepancies can cascade into downstream safety risks, incorrect batch-release decisions, and significant financial cost. The most effective system, therefore, is not just one that performs well under ideal conditions, but one that remains accurate and consistent across the messy realities of real-world laboratory work.

Reshape starts with a foundational dataset that reflects reality.

Reshape trains its AI models on a large and diverse image foundation dataset comprising >73 million plate images (as of January 2026). The dataset includes images collected across a wide range of experimental variables, including media types, organisms, colony morphologies, growth densities, and incubation conditions. Through Reshape's in-house GigaLab and selected external collaborations, the dataset continues to grow by approximately 1 million images per week.

Rather than training a single monolithic model on all 73 million images, Reshape develops task- and output-specific models, each trained on carefully selected subsets of this broader dataset. Crucially, access to such a large and diverse image foundation enables rapid iteration: if a model underperforms, for example due to a specialized organism or media type, relevant data can be quickly incorporated and the model retrained and redeployed directly into the user's workspace. This allows onboarding and customization to happen in days rather than weeks or months.

This approach is a key driver of Reshape's robustness. Models trained on narrow or static datasets tend to degrade as real-world lab conditions change, whereas Reshape's models are designed to evolve alongside experimental reality.

Counts without bias and subjectivity

Manual colony counting is inherently subjective and can yield highly variable results, even with rigorous training, due to differences in individual interpretation, fatigue, and environmental conditions. In contrast, Reshape's AI delivers consistent and repeatable counts by applying the same learned criteria to every image, every time.

Automated colony counting focused on accuracy

While several automated tools exist, many labs have struggled to adopt them due to limitations in accuracy, weak performance across different media types and colony morphologies, and a lack of confidence in the underlying AI models. This has often reduced the perceived return on investment and kept manual counting as the default.

With Reshape's automated and digitized colony counting models, labs can generate reliable colony counts with full traceability, reducing hands-on time while improving reproducibility and enabling faster, more confident decision-making.

MODES OF OPERATION

Endpoint and time-lapse workflows

Reshape supports multiple operational modes to match different QC workflows and throughput:

Endpoint imaging

Endpoint imaging is ideal for high-throughput colony enumeration when incubation time is predefined. Plates are imaged at a selected time point, and colony counts are generated automatically using standardized criteria. The High-Throughput Imaging Device (HTID) can count, detect, and sort up to 400 plates in two hours (walkaway time). The system provides consistent analysis and access to raw image data for added traceability.
For endpoint workflows, the Reshape Smart Incubator can image a full tray of 90 mm Petri dishes in five minutes. With an additional three minutes for tray exchange and job initiation in the Discovery Platform, the system can process up to 105 plates per hour. The Reshape Rack, consisting of five Smart Incubators, scales this workflow by up to 5x.

Time-lapse imaging

While the Smart Incubator also supports lower-throughput endpoint imaging, it provides additional value when continuous monitoring is required. Unlike standalone imaging systems, the Reshape Smart Incubator combines incubation with time-lapse imaging. This enables continuous, time-resolved monitoring of colony development under defined environmental conditions while minimizing manual handling. Time-lapse imaging supports early detection of contamination events and unexpected growth patterns.

EXAMPLE

Built-in validation testing

Method condensed

For the complete protocol, refer to our full method paper ISO 15214. To highlight the accuracy and validation of our models, Reshape evaluated the enumeration of Lactic Acid Bacteria (LAB) which is a common QC method in the food and pharmaceutical industries.

A strain of *lactiplantibacillus plantarum* was grown in Man-Rogosa Sharpe (MRS) broth (Sigman-Aldrich). A dilution series suitable for counting was plated on semi-selective MRS agar and incubated at 30°C for 72 hours in the Reshape Smart Incubator. The plates were imaged at 72 hours, capturing high-resolution photographs of the plates under controlled top and bottom lighting conditions. The platform then automatically identified and counted the colonies based on their size, shape and color. This automated process standardizes the assessment and counting of colonies, providing an objective and reproducible basis for calculating CFU.

Manual counting was performed by a group of trained personnel, where each plate was independently counted by a minimum of three people to minimize and account for inter-observer variability. A total of 122 images were included in the analysis.

Results

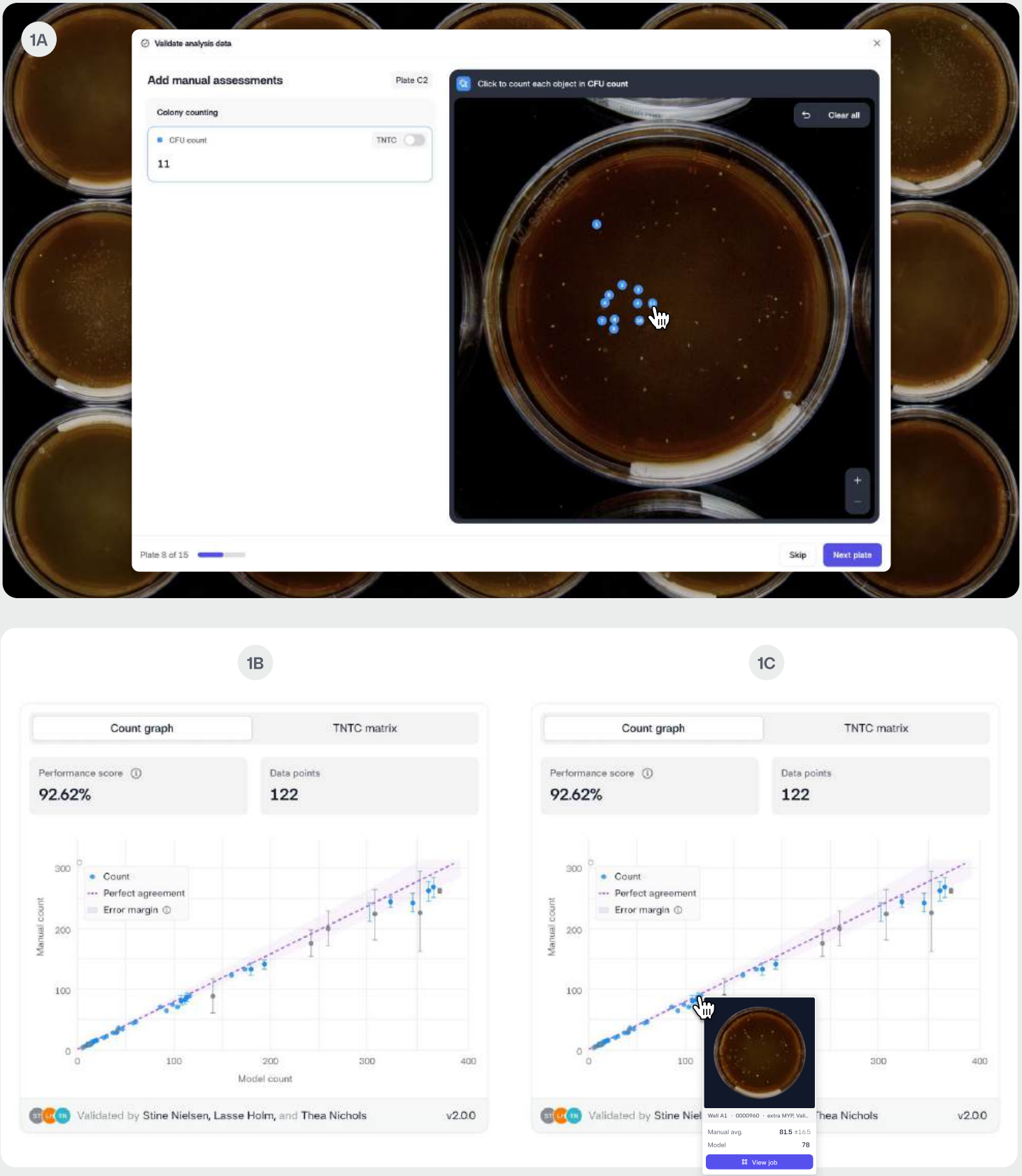

Figure 1A. The Reshape Discovery platform enables straightforward model validation by allowing users to input manual counts or perform counts directly within the platform. These human assessments are then automatically compared against model outputs to evaluate performance. **1B.** Correlation plot between manual and model counts. The dotted line indicates the theoretical perfect agreement (i.e. identical counts from the human annotator and the model), while the purple shaded area represents the accepted error margin. Each point corresponds to one of the 122 evaluated images. Data points shown in grey are included for transparency but were excluded from the final performance score due to high human-to-human disagreement. **1C**. Interactive visualization of the results. Users can hover over individual data points to access the corresponding raw images and review the underlying data.

CONCLUSION

Colony counting with full traceability.

In QC microbiology, colony counting is more than a routine step, it is a decision point. The accuracy and consistency of CFU enumeration and detection directly impacts batch release, contamination investigations, and ultimately product safety. Yet manual counting remains the default in many labs, not because it is optimal, but because existing automation tools have struggled to earn trust under real-world conditions.

Reshape addresses this gap by combining automated colony detection and counting with full digital traceability. By training models on a continuously expanding, highly diverse dataset and validating performance against real QC workflows, Reshape enables reliable enumeration even when plates are visually complex and operationally high-stakes. The result is not simply faster counting, it is more reproducible outcomes, stronger documentation, and greater confidence in every QC decision.

With Reshape, colony counting becomes a standardized, auditable, and scalable workflow, built for the realities of modern QC labs.