QUARTZ LIMS WHITE PAPER

Measuring the Work

Turning Granular Workflow Tracking into Operational Intelligence

For laboratory managers and operations leaders in failure analysis and materials characterization labs

Executive Summary

A laboratory that tracks each sample as it moves through the workflow accumulates a valuable byproduct: a precise record of where time is spent, where work is repeated, and who carried the load. Most labs never use this data, because their systems capture status changes for operational purposes but do not turn the underlying timestamps into metrics that management can act on.

This paper is about closing that gap. It shows how the same granular tracking that gives a lab real-time visibility can be extended into three categories of operational intelligence: turnaround time measured at the stage level, rework measured by frequency and duration, and effort measured and fairly attributed to the people who performed it. Together these answer the questions every lab manager is asked but few can answer with data: where is the bottleneck, why are we redoing work, and is the load balanced across the team.

The guiding principle is one that operations leaders already accept. If you cannot measure it, you cannot manage it. This paper explains what to measure, how a modern LIMS captures it without adding manual effort, and how Quartz LIMS turns that record into reports and dashboards.

From Status Tracking to Measurement

When a sample carries its own status and the time of each transition is recorded, the lab is no longer guessing about its own performance. Every movement from one stage to the next becomes a measurable interval. The challenge is not collecting the data, which the workflow generates automatically, but organizing it into metrics that drive decisions.

Three categories of metric matter most for failure analysis and materials characterization labs, where jobs are image-intensive and a single job may carry many samples on divergent paths. The table below summarizes them; the sections that follow explain each in turn.

Metric	What it answers
Stage turnaround time	How long samples sit between any two statuses, for example preparation to imaging, so the slow step is visible rather than inferred.
Rework frequency	How often samples are redone, segmented by reason, redo type, and the technician involved.
Rework duration	How long the redo cycle takes, measured from redo start to redo completion against the original sample.
Effort distribution	How much work each technician has performed, attributed by workflow step through configurable rules rather than estimated.
Throughput and load	How many samples each stage, instrument, or analyst is carrying, so workload can be balanced before it becomes a backlog.

Turnaround Time, Measured Where It Happens

Turnaround time is the most frequently reported measure of laboratory performance, and for good reason: it is what customers feel and what management is judged on. But a single number for the whole job hides the thing a manager actually needs, which is the location of the delay.

Stage-level timing metrics record the time spent moving from one status to another for each sample, for example from preparation to imaging, or from imaging to review. Aggregated across many samples, these intervals reveal which step is slow, whether the slow step varies by instrument or analyst, and how performance trends over time. A high overall turnaround time is usually a symptom of a workflow bottleneck, understaffing, or equipment constraint, and stage-level timing is what distinguishes between those causes rather than leaving them to guesswork.

Because the measurement is built from status transitions the lab already records, no separate time-tracking exercise is required. The metric is a view onto data the workflow produces on its own.

Rework, Made Visible

Rework is one of the most informative signals a lab produces, and one of the least measured. A rising rework rate is a direct indicator of a problem upstream, whether in method, training, materials, or instrument condition, and labs that cannot quantify it are effectively blind to a major driver of cost and delay.

Treating rework as a first-class, tracked event changes this. When a sample is redone, the system can capture why it was redone, what type of rework it was, who owned it, and the time the rework started and finished. From that record two metrics follow directly:

- Rework frequency. How often samples are redone, broken down by reason and by the technician or step involved. This turns a vague sense that the lab is busy redoing work into a specific, addressable pattern.
- Rework duration. How long the redo cycle takes, measured against the original sample. This quantifies the true cost of rework in time, which is the cost that competes directly with throughput.

Used well, these metrics support coaching and process improvement rather than blame. A reason code that recurs points to a method or training fix; a redo time that is climbing points to a capacity or instrument issue. The data tells the lab where to look.

Effort, Quantified and Fairly Attributed

Measuring turnaround and rework tells a lab how its process performs. Measuring effort tells it how its people are loaded, and this is where many labs struggle, because a raw sample count treats a quick inspection and a complex multi-step preparation as if they were equal work.

A work unit model solves this by assigning a configurable numeric value to the work done on a sample or job, based on rules the lab defines. Rules can weight work by job type, image count, preparation type, or other attributes, and they attribute the resulting value to the technician who owned the relevant step, such as preparation, imaging, or review. The effect is a measure of effort that reflects the real difficulty of the work, not just its count.

With effort quantified this way, a manager can see how load is distributed across the team, identify who is carrying disproportionate work, and balance assignments before imbalance becomes burnout or a backlog. Dashboards segmented by technician or shift make this practical and, used constructively, support coaching rather than surveillance.

One caution is worth stating plainly. A work unit model is only as fair as the rules behind it, and only as trusted as the transparency around it. If staff cannot see how their effort is counted, or if the weighting does not match the real difficulty of the work, the metric will be resented and gamed rather than trusted. The rules should be visible, agreed, and revisited as the work changes. Configurability is what makes this possible; it is also what makes it the lab's responsibility to get right.

Bringing It Together in Reporting

Individual metrics are useful, but their value compounds when they share one reporting surface. A reporting and charting layer that can build series from any of these dimensions, status owners, rework reasons and types, rejection reasons, job types, allocation groups, and work units, lets a lab move from a single question to a line of inquiry. A manager who sees turnaround climbing can segment by stage, then by instrument, then by analyst, then check whether rework in that stage is rising in parallel, all from the same data.

This is the difference between a system that stores history and one that produces intelligence. The records are the same; the reporting is what turns them into decisions about staffing, training, capacity, and process.

When Metrics Mislead

Metrics change behavior, which is their purpose and their risk. A lab that measures turnaround time without also watching quality can inadvertently reward speed at the expense of accuracy. A lab that measures effort without transparency can erode the trust it depends on. The goal is a balanced set of measures, turnaround, rework, and effort viewed together, so that improvement in one is not bought at the cost of another.

It is also worth being honest about effort. Metrics show what is happening, not why. They are the start of a conversation with the team, not a substitute for it. Labs that treat dashboards as a coaching and improvement tool see the benefit; labs that treat them as a scoreboard usually see the data quietly degrade. The measurement is only as good as the management around it.

How Quartz LIMS Implements This

Quartz LIMS is built for the image-intensive, multi-sample workflows of failure analysis and materials characterization labs, and it records the time of each state transition as samples move through the lab. It timestamps activity by job, session, sample, instrument, and analyst, which is precisely the foundation required for the stage-level turnaround, rework, and effort metrics described in this paper.

Rework is captured as a tracked event with reason, type, owner, and start and finish times. Effort is quantified through configurable work unit rules that attribute weighted values to the right step owners. And the built-in management reporting tools let a lab build charts and dashboards from any of these dimensions, configured to its own terminology and workflow rather than a fixed template. The result is the operating principle made real: a lab that can finally measure what it manages.

To see how these metrics would map to your lab's workflow, learn more at quartzlims.com or request a walkthrough with the Quartz team.