ThermoFisher
SCIENTIFIC

Laboratory software

SampleManager LIMS for advanced battery technology

Driving traceability and repeatability
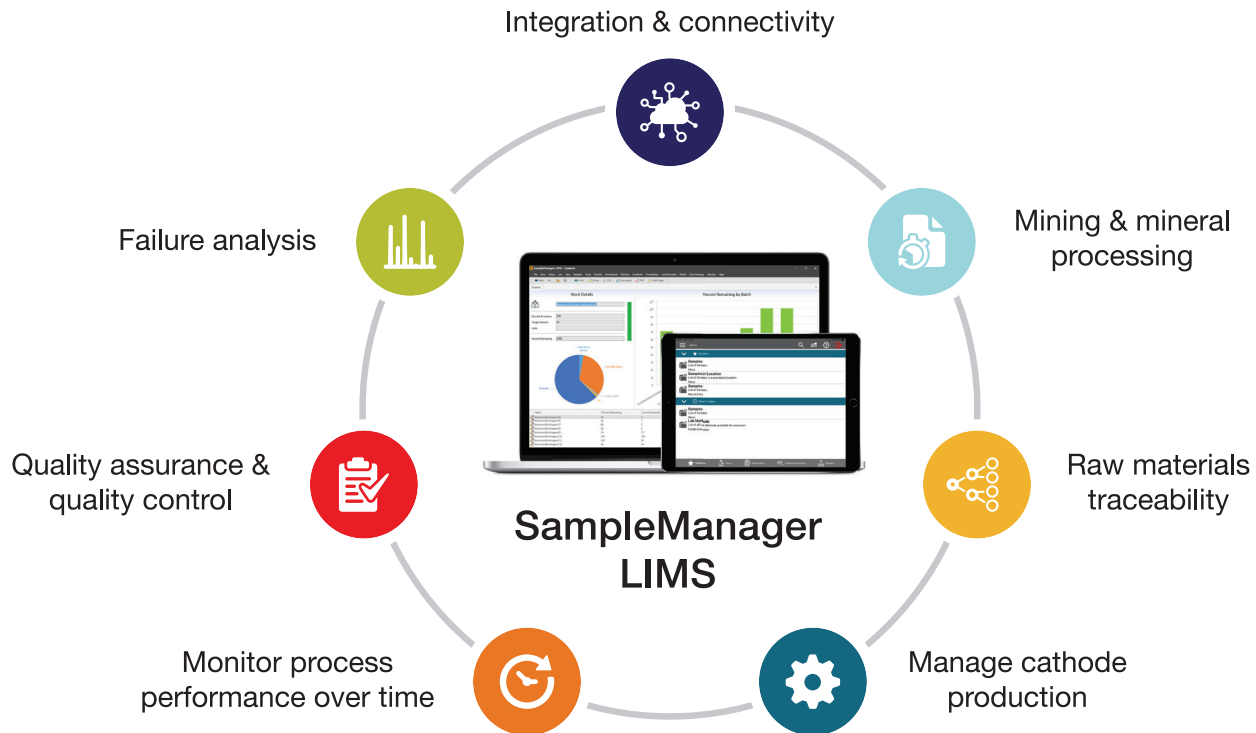through EV battery Quality Assurance

A proven and trusted solution for manufacturing QA

Lithium ion batteries are a ubiquitous feature of modern technology, playing a crucial role in everything from handheld consumer electronics to electric vehicles. As these batteries become increasingly more advanced, so do the manufacturing processes required to create them. Thermo Scientific™ SampleManager™ LIMS software offers a broad range of tools and capabilities to help you manage the production of advanced battery technology.
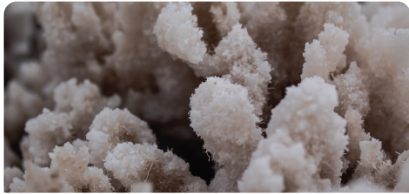
SampleManager software supports every part of battery manufacturing, from the extraction and processing of raw materials, to quality assurance in the production line, to the research and development of the next generation of batteries.

SampleManager software delivers:

- Complete sample management and batch traceability from raw material to finished good

- System and instrument integration to help maximize your technology investment

- Instrument calibration and maintenance records for ISO 17025 compliance

- A proven, workflow driven solution to drive repeatable and reliable QA testing

- Support with data integrity and compliance to regulatory standards such as ISO/TC 333 - Lithium, ISO 12405-2:2012, ISO17025 and ASTM


Integration & connectivity

Failure analysis

Mining & mineral processing

Quality assurance & quality control

SampleManager LIMS

Raw materials traceability

Monitor process performance over time

Manage cathode production

Digital tools enabling the latest advances in battery technology

Research and development
Manage battery samples and link to research tools. Use the Electronic Notebook (ELN) capabilities in SampleManager LIMS to record unstructured data
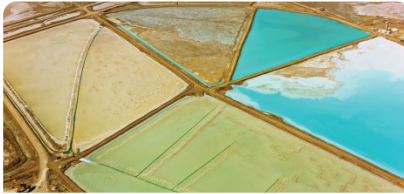
Mining and mineral processing
Continuously manage and track metallurgical samples to optimize performance, improve throughput and recovery, and drive sustainability and safety in mine sites
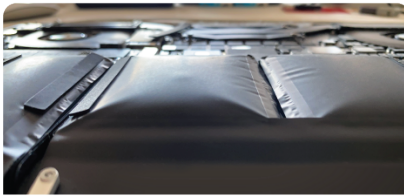

Raw material QC
Ensure the quality of raw materials for specific application or market regulations. Trace raw materials through to finished product

Production
Track and chart production performance over time to enable continuous improvement

Quality assurance and quality control
Manage instrument calibration and maintenance. Automatically capture results from instruments

Failure analysis
Manage cycle testing process with battery performance visualization capabilities

Configured to deliver for battery QA
By developing a configuration of SampleManager LIMS software specifically for battery Quality Assurance, a greater amount of functionality can be provided to users within a shorter implementation timeframe. The SampleManager LIMS Battery Solution aims to provide a head start for an implementation project in battery QA, to deliver what you need to cover your workflows and bring you much closer to go-live.

Configuring the LIMS rather than relying on customization makes the system far easier to maintain, support and upgrade in the future. We've developed the features based on our projects with leading battery manufacturers, creating workflows which adopt best practices to solve many common industry challenges.

Solving daily testing challenges

SampleManager LIMS enables the definition and tracking of testing sequence execution across a set of batteries to ensure fair, randomized testing and provide a consistent set of results:

- Sequential testing can be managed easily using pre-defined workflows to define multiple test sequences in a matrix

- Analysts can properly track the tests done and enable planning of tests and equipment required

- The system also provides the ability to define failure and success testing, so you can see what has failed and why

Solving long-term testing challenges

When a battery is undergoing a long test cycle, the test equipment is tied up and dedicated to that particular sample. The system therefore needs to track all electrical test circuits available for testing, and provide metrics and estimates for the test circuit sample loading. SampleManager LIMS enables resource planning and the ability to adapt on-the-fly to prioritization testing. This approach supports testers in predicting and planning for busy testing periods.

☑ Elemental impurity analysis	☑ Cathode material bulk composition measurement	☑ Organic / anionic impurity detection
☑ Electrolyte degradation product analysis	☑ Electrolyte organic solvent composition confirmation	☑ Battery swelling gases measurement

Automating laboratory workflows

Battery manufacturing workflows employ a broad range of analysis techniques to assure the quality of raw and in-process materials. In addition to these pre-production and in-process testing workflows, end-product performance testing is also required to assure quality and safety. Many of these tests generate large quantities of information, including results, instrument metadata and calibration data – all of which must be properly documented and made available to relevant teams to support an efficient, compliant production line.

SampleManager LIMS helps to automate lab workflow and process testing, from research to quality products and recycling process management. It provides EV battery manufacturers and researchers the ease of use to enable efficient productivity.

Automated laboratory workflows, from research to quality products and recycling process management

Characterization and failure analysis	Bulk process control, quality by design and material rejection	Process control and in-line inspection	Failure analysis and rejection	Inspection and characterization

Thermo Scientific™ SampleManager™ LIMS provides manufacturers and researchers ease of use to enable productivity

Battery manufacturers rely on SampleManager software

Manage cathode production processes

Automate sample login throughout the cathode production process using Sample Point Scheduler. Each sample is associated with the test limits for each analysis as defined in your specification. Results are checked against these limits on entry and immediately flagged if they are out of specification. Incidents can automatically alert stakeholders or request retesting.

Track process performance over time

Statistical Quality Control (SQC) module monitors process performance. The software charts how process data is trending in real time. Use the trend editor to build your trend analyses. When results fall outside specification limits, SampleManager LIMS can automatically alert a process or operations manager.

Ensure data integrity and regulatory compliance

SampleManager LIMS software is built for compliance in manufacturing QA/QC, supporting customers using the latest technology and is developed, designed and supported in an ISO 9001 environment. The software drives repeatability in testing processes to ensure reliable results. QA testing is easily managed from raw materials through to finished battery product, connecting to production systems to enable continuous improvement to production processes and rapid product release. Secure systems access and capabilities comply with the latest environmental and industry regulations such as ISO 17025 and GMP, but also those regulations specific to standardization in the field of lithium mining and processing, including ISO/TC 333 - Lithium, ISO 12405-2:2012/4:2018, UL Certification and ASTM.

Powerful data analytics

SampleManager LIMS features a set of out-of-the-box dashboards, displaying key laboratory and business insights, including resource availability, stock information, location status, and lab performance in a clear interactive format. Connections to Tableau and Power BI deliver powerful knowledge from data stored in SampleManager LIMS.

Innovative technology

The technological capabilities of SampleManager LIMS aim to enhance the scientific experience for analysts using the software. The solution is available via a web client, desktop client, or a mobile app. Thermo Scientific™ SampleManager™ XR (Extended Reality) software enables users to follow SOPs and record readings and observations without interruption to their work, using a mixed reality headset. Barcode scanning and voice commands can also be configured to help you move through processes hands-free.

Facilitate failure analysis testing

Use the Laboratory Execution System (LES) and Analyst Notebook in SampleManager LIMS to facilitate battery cycle testing/failure analysis. An LES method digitally steps users through the cycle testing process, capturing critical data as the test is performed. The Analyst Notebook then graphs the captured data, illustrating how battery performance changes over time. Analyst Notebook pages are easily exported for reporting.

Connect the lab to the business

SampleManager software provides complete connectivity to manufacturing execution systems (MES), enterprise resource planning (ERP) systems, chromatography data systems (CDS), and more. SampleManager software also supports bi-directional connectivity to lab instruments, helping streamline test execution and automate results capture.

In good company

Product quality is driven by traceability from raw materials through to final product, and repeatability through all production processes. Manufacturers worldwide rely on SampleManager LIMS to drive reliable, repeatable testing through all their QA processes. SampleManager LIMS eases complex testing schedules in battery production, and enables manufacturers to reduce spend on raw materials through visibility and accountability.

A broad portfolio of tools and instrumentation

Thermo Fisher Scientific offers a broad range of tools and instruments for the production of advanced battery technology. Our systems touch every part of battery manufacturing, from the extraction and processing of raw materials, to quality assurance in the production line, to the research and development of the next generation of batteries. Find out more at **thermofisher.com/batteryanalysis**
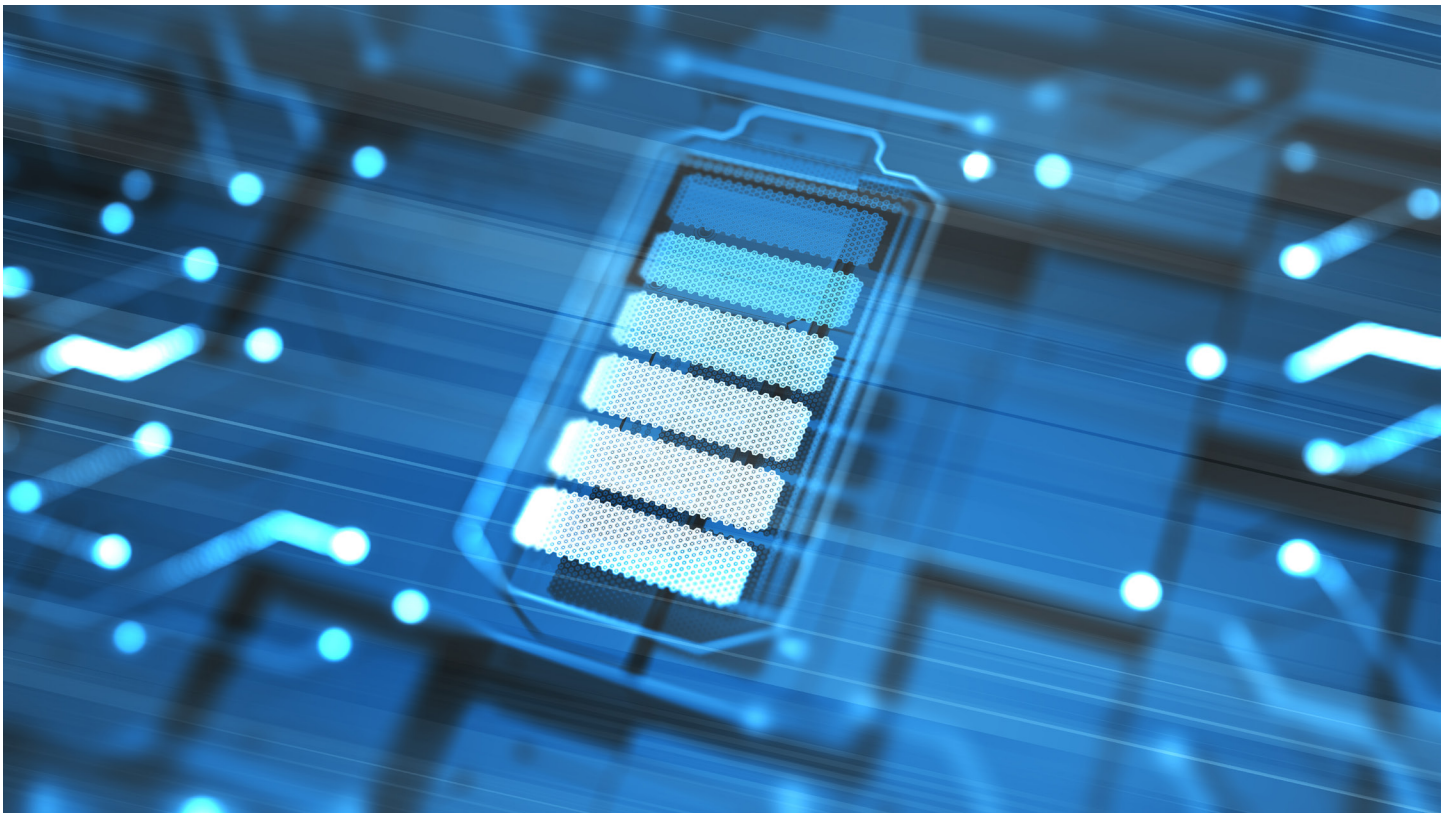
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