

Automated sample management and analysis

Sample collection and sample movement

ARL SMS Automation Systems

The challenges with analyzing aluminum samples in laboratories

The challenge for laboratories monitoring aluminum production process control whether it is for primary aluminum producers, aluminum foundries, or large aluminum scrap recycling foundries is that these processes typically involve huge numbers of samples due to the different process steps involved.

For the **primary production of aluminum** out of alumina, the electrolysis reduction process is used. This process requires the use of big electrolysis plants with hundreds or even thousands of electrolytic cells to produce pure aluminum. All cells need to be regularly monitored. This includes monitoring for process effects on the cells using XRF and XRD technologies. Additionally, it is important to confirm the good chemical composition of the aluminum metal prior to further processing in the foundry. This can be achieved through the use of spark OES (optical emission spectrometer) for fast and accurate elemental analysis at trace levels for all relevant elements. Moreover, **larger aluminum foundries and recycling plants** have to deal with high sample numbers since many types of furnaces and casting processes are involved.

Aluminum laboratories face additional challenges during the analysis of production samples. A large number of samples are expected to reach the laboratory at the same time.

Aluminum samples are taken from the electrolytic baths and the holding furnaces where liquid aluminum is produced in a continuous production process. Liquid samples are poured into a sample mold to form solid aluminum samples ready to be analyzed. The large number of electrolytic baths in the production plants makes the sample-taking process last a few minutes.

Once the samples arrive at the lab, they need to be analyzed in a continuous, routine way. Operators need to identify the samples, prepare the sample surface, and start the analysis in the OES analyzer, among other tasks, to ensure traceability and a quality check of the samples. Many manual tasks during the process make this activity prone to errors and as well lead to inconsistent result.



Automating aluminum laboratories

Automating sample collection and sample movement ensures the quality that end customers expect from production. The main advantages of automating aluminum laboratories are:

- **Faster analysis results:**

Automation systems can take over the sample movement amongst the different parts of the process. Starting with the registration of the samples, where complete sample batches can be entered into the automation system with the use of a FIFO belt (First-in-First-out). The robotic arm will take one sample at a time and process it according to the step-by-step process defined by the laboratory. Processing steps could include sample preparation, sample weighing, sample marking, etc. The strategic physical location of every element and machine involved in the process allows the automation robot to optimize the transfer time between every single step.

- **Consistency in analysis:**

By eliminating human factors, an automated system ensures that the whole process remains constantly the same, independent of time of the day, operator skills, or other external factors. Adding this reproducibility and repeatability to the process guarantees traceability between samples.

- **Efficiency of the process:**

An automated process will improve the efficiency of the laboratory by delivering faster results, which would translate to increased production volume, reduction of bottleneck, etc. Moreover, it will enhance the optimization of lab resources, where operators can focus on more value-added tasks.

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Network Registration Terminal

Test : 111
Children : AA_222
Bool1 : Yes
Bool2 : No
Four : 222
Sample Prepared? : Prepared

- Sample ID = : AA_222
- Sample ID OK? : YES

Choose Long List : 10
10
1000
101
102
10;3

Cancel Previous Enter

13-09-2023 | 10:34:33.580 | SMS6 01 | Process Activity | General Info:
13-09-2023 | 10:35:02.678 | SMS6 01 | Process Activity | General Info:

New Network Registration Terminal for remote sample registration

- Single and batch registration options
- Improved registration workflow flexibility
- Touch screen or keyboard/mouse control
- Modern intuitive layout resulting into less error prone
- List filtering options, e.g. grade, operators, etc.
- Several access options, e.g. operators, lab managers, etc.

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Network Registration Terminal

Single Batch

Batches

Select All

B001-005 PB001 PB002 PB003 PB004 PB005 PB006 PB007 PB008
B001-010 PB009 PB010
B006-010
C102-104
C102-107
C105-107

Run

Batch sample introduction

- Intuitive customizable batch registration
- Faster sample registration
- Graphical representation of real sample batch
- No need to access SMS computer for batch registration

Automating samples analysis

The benefits of automating sample analysis are:

Compatibility with different sample input systems: Samples can be placed into a linear or a spiral transportation belt, (Figures 1 and 2) which will be designed for the specific sample number demand. This allows operators to place all samples coming from the production plant into the same batch, including different sample types and priority levels, decreasing the time and potentially increasing the sample input throughput this task takes in manual mode.

Hardware options:

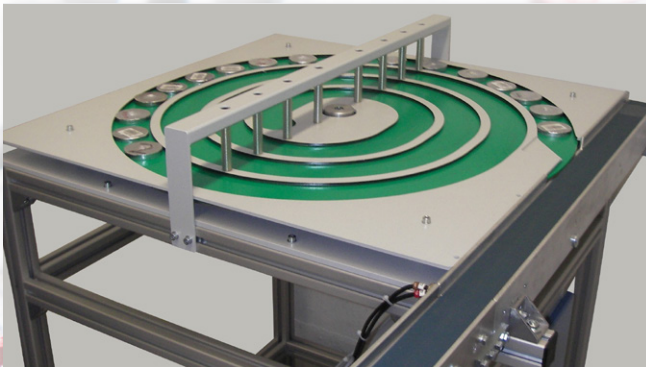
From sample input to registration, Thermo Fisher Scientific offers a broad selection of hardware options to ensure the operators can optimize the process and ensure an easy transition to the automated process.

Optimized software orchestration:

Thermo Scientific™ ARL™ SMS Software allows for a high level of configuration complexity, where the process can be mapped and accommodate the needs of the laboratory. Software options such as the SCT (Setting-up, Control, and Type Standardization) sample procedures or prioritization of the samples would allow laboratories to tailor the system to their requirements and workflow.

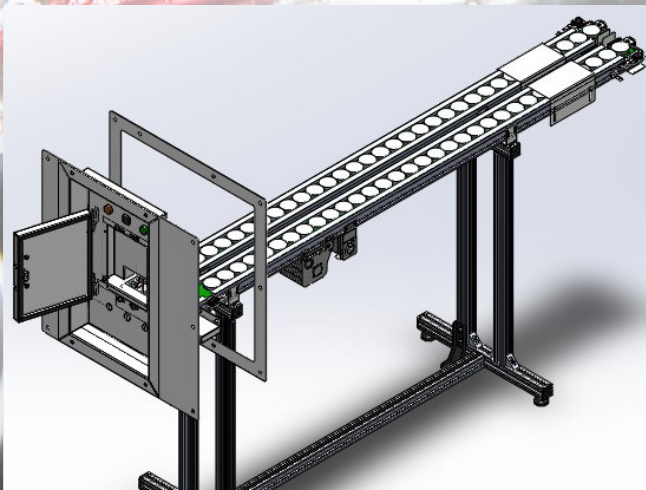
Market-proven ARL SMS systems:

Compact, ultra-fast, and easy-to-use, the ARL SMS Automation Systems leverage the latest automation technologies to exceed the expectations of modern aluminum laboratories. The ARL SMS products are manufactured and maintained according to ISO 9001 procedures alongside our reputed metals analyzers. Thermo Fisher Scientific can supply and support instruments and laboratory workflow automation solutions, as a single source, reducing the visits to the lab and downtime.



Spiral magazine:

- Allow a batch of samples to be introduced at the same time (faster sample registration process)
- Up to around 100 aluminum samples (of approx. 50mm diameter)
- Linear belt for direct connection to SMS system
- Great value for aluminum laboratories



Lineal magazine:

- Allow multiple sample introduction, with the possibility to have the entering door outside the lab room
- Single or multiple belts allowing different sample priorities
- Customizable length and design

ARL SMS Automation System product range

This exceptional automation product range allows for flawless automation of manual processes and fast analysis of production samples. The product range includes:



Thermo Scientific™ ARL™ SMS-2300 Automation for OES or XRF

A single instrument system with a small footprint, ideal for low to medium volume operations or as a redundant system. This is an entry-level automation system for one Thermo Scientific™ ARL™ iSpark™ Plus OES Spectrometer or Thermo Scientific™ ARL™ X900 XRF Spectrometer.

Thermo Scientific™ ARL™ SMS-3300 Automation for Single or Dual OES or XRF

With a larger robot than the ARL SMS-2300, it allows more flexibility and options for the integration of the system into the lab. As stand-alone directly connected to one sample preparation machine, or as part of a central lab, the ARL SMS-3300 Single or Dual can process a large number of samples per day.



Thermo Scientific™ ARL™ SMS-3500 Automation for Twin OES or XRF

A double instruments system (OES or XRF), capable of being connected to two sample preparation machines. The largest robot within the ARL SMS family allows high layout flexibility and options. Perfect for high sample volumes or challenging configurations.



ARL SMS automation systems share the same software automation platform. A single software product where the core of the automation software is to obtain the proper results in the most efficient and fastest way, as opposed to a re-engineered software version produced for each customer. ARL SMS software is fully owned and maintained by Thermo Fisher Scientific.

Thermo Fisher Scientific is firmly committed to further developing its automation solutions, making them completely future proof. Updates are regularly made available to customers whenever new capabilities are implemented to keep them on pace with fast technology evolution.

ARL service program

Our service offerings provide comprehensive solutions that drive operational excellence and ensure the longevity and efficiency of your ARL SMS Automation systems. Our service offerings are designed to meet the diverse needs of our customers, whatever those may be. We offer specific service plans for our product lines, high-quality spare parts, and responsive technical support for quick issue resolution.

Our service plans

Every analytical application is unique. Our service experts understand this and take into account your specific needs and expectations when providing the tailored approach to services you deserve. Our comprehensive service plans are further designed to provide you with many value-added benefits.

- **Flexible coverage:** We understand that you have unique requirements for service. That is why we offer a variety of service agreement levels. You can choose the level of coverage that best suits your needs for your systems.
- **Reduced downtime:** Regular preventive maintenance and pre-scheduled calibration visits can dramatically reduce production downtime and unnecessary product giveaways.

- **Priority response:** Customers who hold service contracts receive priority responses over non-contract customers, ensuring minimal disruption to your operations.
- **Manufacturer-certified parts:** Our parts are guaranteed to perform to our instruments' rigorous design specifications, ensuring optimal performance of your equipment.
- **Predictable costs:** A Thermo Fisher Scientific service plan guarantees the highest level of response at predictable costs, thus eliminating surprises and allowing you better control over your expenses.
- **High quality:** All our engineers are factory-trained, and our manufacturing sites are ISO9001 registered and compliant. We provide traceable certification for your quality systems, ensuring the highest standards for your instruments.

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Learn more at thermofisher.com/aluminum

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