

LABORATORY QUALITY CONTROL (SLIM)

SCOPE

This summary describes the Quality Control protocols established at SGS Minerals Services geochemistry laboratories to ensure test results are consistently monitored and accepted as fit for purpose.

LABORATORY INFORMATION MANAGEMENT (SLIM)

Every Minerals Services laboratory in the SGS network operates a Laboratory Information Management System called SLIM. The SLIM system has been designed to be the “backbone” of SGS geochem labs and includes our method set up protocols (analytes, ranges, internal QC materials that include blanks, duplicates, replicates, and reference materials) as well as their frequency of insertion and tolerance requirements. SLIM is also used to monitor our internal processes for instruments, equipment, sample tracking, storage and reporting formats. SLIM uses a secure and complete audit trail to ensure traceability and confidentiality. The system will also allow the lab to transfer all data to a web portal called QLab™ for easy electronic access of your data. SLIM is typically compatible with the most frequently used databases such as Maxwell / Acquire etc.

SLIM is the link to all of our internal quality control criteria outlined below.

QUALITY CONTROL CRITERIA

QUALITY CONTROL INSERTION AND FREQUENCY

Our QC material insertion frequency is 14% for exploration and ore grade samples which includes sample reduction blanks and duplicates, method blanks, weighed pulp replicates and reference materials.

Process control and metal accounting solid samples are typically run in duplicate with added insertion of blanks and reference materials for a QC frequency of 115%. For process control samples not performed in duplicate, the frequency insertion rate is ~20% which includes sample reduction blanks and duplicates, weighed pulp replicates and reference materials.

For process control and metal accounting solution samples the QC insertion is 14-20% which includes blanks, spike blanks, spike replicates and solution standards.

SLIM automatically flags whenever a QC material fails to meet established statistical rules preset in the system. The SLIM QC module is based on the Thompson and Howarth precision curve which sets tolerance requirements that are associated with the detection limit and expected precision of the analyte within the method. These rules are based on rigorous method validation requirements established for our methodology.

Note: The frequencies specified are the minimum expected and may not apply to all sample types due to sample size, sample matrix, and analytical method applied (e.g. trade analysis). In the case of samples received as pulps the preparation blank is substituted with an additional method blank for pulps and for solutions with a spike replicate and/ or a spike blank in order to retain the QC frequency.

CRITERIA FOR ACCEPTANCE AND REJECTION OF BLANKS, REFERENCE MATERIALS, REPLICATES AND DUPLICATES

Blanks

Sample reduction blanks, method blanks, reagent blanks are used to assess (and correct for when appropriate) responses other than those inherent to the blank material. If failure occurs, that cannot be accounted for based on set rules for exemption; a minimum of 25% of the samples including the failed blank is repeated. Repeated sample failure results in investigation and repeating the entire batch.

Reference Materials, Replicates and Duplicates

When inputting the acceptable values and associated tolerances for duplicates, replicates and reference materials consideration is given to the fitness for purpose of the method (what are the customer's needs) as well as the certification process of reference material when compared to the method for which the material will be used. Repeats are performed based on a percentage of reference material, duplicate and replicate failures to the total number of these materials inserted in a batch and range from 25-100%. These are clearly specified in our globally controlled internal quality procedures.

QUALITY NOTES

In those cases where results are outside of the method range or where suspected sample homogeneity and/or matrix problems are encountered, this information is noted in SLIM and reported to the customer.

QUALITY TREND ANALYSIS

In addition to being accepted or rejected on a batch basis the performance of quality control samples is assessed on a short term and long term basis. This is critical to the detection and remediation of systematic biases and trends. The performance of reference materials and blanks must be monitored in a short term context (e.g. an instrument batch or daily basis) and a long term context.

Reports can be provided which allow for method data and/or customer specific data review. SLIM has key tools that are used to look at these processes as described below.

CONTROL CHARTS AND STATISTICAL PROCESS CONTROL (SPC)

These are monitored on a regular and on-going basis; daily, weekly, monthly etc. although the frequency will depend upon the method utilization. Shewhart Control chart rules apply that are statistically based to flag and monitor warnings, actions, trends and bias for individual reference materials or set up to monitor all method based reference materials in a single frame.

KEY PERFORMANCE INDICATOR REPORTS (KPIs)

The weekly KPI reports contain pivot tables listing z-scores for every internal standard used in the laboratory. These tables can be sorted by scheme and/or analyte. The warning limit for bias is a z-score of ± 0.5 and the warning limit for precision is 1.0 z-score. Sections falling outside these limits require further inspection.

A weekly KPI Report is reviewed at the weekly production meeting by all senior laboratory staff. It is particularly useful as it gives the user an overview of the laboratory and its sections combined with the ability to drill down to an individual standard level. Control charts can then be run on targeted standards to determine underlying trends.

QC REPORTS

QC reports can be customer specific reports and as such are tailored to each client's requirements. They produce information on bias, precision, sample volumes and turn-around times and can be used at the request of a customer or as part of an investigative or remedial process.

CONTACT INFORMATION

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