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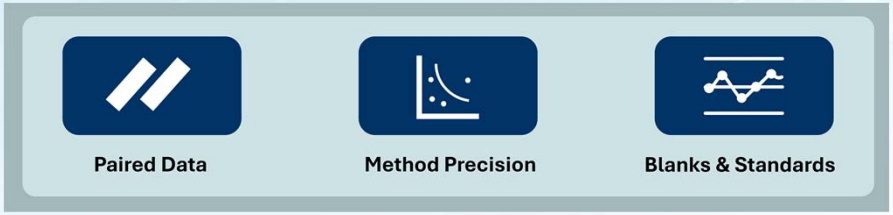
BASIC3QAQC

Octoplus Customized QAQC Module for the Mining Industry

WHAT IS BASIC3QAQC?

- Basic3QAQC is a customized, automated QAQC module developed by Octoplus for a statistical software package called JMP
- The product was developed based on over 20 years of insights and collaboration with QAQC Specialist Markus van der Neut.
- The Basic3QAQC module consists of 3 different evaluation tools:
  1. **Evaluation of paired data**
  2. **Evaluation of Blanks Standards (CRM's)**
  3. **Calculation of the Method Precision of a laboratory**



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GENERAL FEATURES THAT ARE COMMON TO ALL 3 EVALUATIONS TOOLS

- For each element, all results, tables and graphs are stored automatically in a Journal file
- A PDF copy of this Journal file is automatically created and stored
- The rejected records, such as outliers, are automatically stored with a comment
- A summary report containing key results for all elements is automatically generated and stored
- Key results are automatically stored in a History file. This file contains results from all the previous evaluations
- All analysis are done based on user specified parameters, that are stored in called defaults files

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1. EVALUATION OF PAIRED DATA

- **Purpose**: Calculate the precision (e.g. within & between) of a laboratory
- **Data types:**
  - Pulp replicates ("Twin Stream data") – within lab precision at a specific time
  - Pulp duplicates (duplicate samples submitted again to the primary lab – long term precision)
  - Coarse duplicates – precision related to the sample preparation, splitting
  - Field duplicates – precision related to the sampling technique
  - Check samples – samples analysed at a primary lab are sent off to a 2nd lab for analysis (between lab precision)

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2. EVALUATION OF BLANKS & STANDARDS

- **Purpose:**
  - Calculate the accuracy of a laboratory (for a given grade)
  - Calculates the percentage difference between the certified value for an element, as provided by the certificate of a CRM and the result reported by the laboratory.
- **Data types:**
  - Blind Blanks & Standards
  - Lab Blanks & Standards

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3. CALCULATION OF THE METHOD PRECISION OF A LABORATORY

The method precision of a laboratory is a confidence interval, usually expressed for a 99,7% confidence interval (3 Sigma) or 95% (2 Sigma) for a:

- Specific grade
- Specific analytical method
- Type (e.g. Reef type)
- Element

Uses:

- Is probably one of the best techniques to investigate for potential outliers for paired data sets as it takes a variety of criteria into account
- **Provides an answer to important questions such as:**
  - What is the best value I can expect from a lab for a specific CRM for a specific grade?
  - Are the limits of my CRM's realistic for the analytical performance of the lab that I am using?
- Automatically calculate the realistic limits for your CRM's and update your CRM related control tables at the click of a button
- Can be used to provide an indication of a laboratories lowermost detection limit

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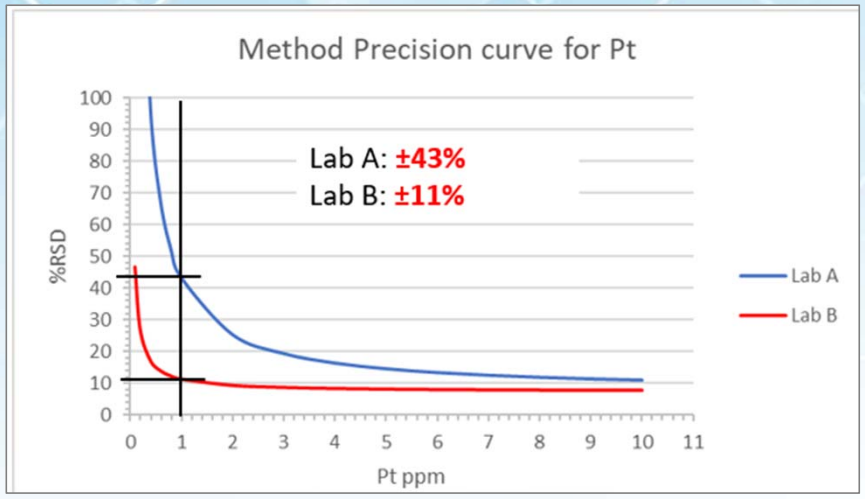
THE METHOD PRECISION OF A LAB TAKES ALL THESE CRITERIA INTO ACCOUNT

The Method Precision is a confidence interval, expressed at a 99.7% confidence, for a:

- Specific element
- Grade
- Reef type and laboratory (method)

The method precision curve is defined in such a way that if I would analyse 1000 samples, each of the same grade, then **997** out of the **1000** results would fall below the curve (**acceptable precision**). 3 results would statistically **fall above** the line and would be classified as **outliers**.



- The graph to the left shows the method precision curves for **Pt** for 2 laboratories. At a Pt grade of 1 ppm the confidence interval required is shown in the graph to the left
- So if I had a CRM with a certified value for Pt of 1 ppm then the labs will report their results within the following intervals: **Lab A: 0.57 – 1.43 ppm** and **Lab B: 0.89 - 1.11 ppm**

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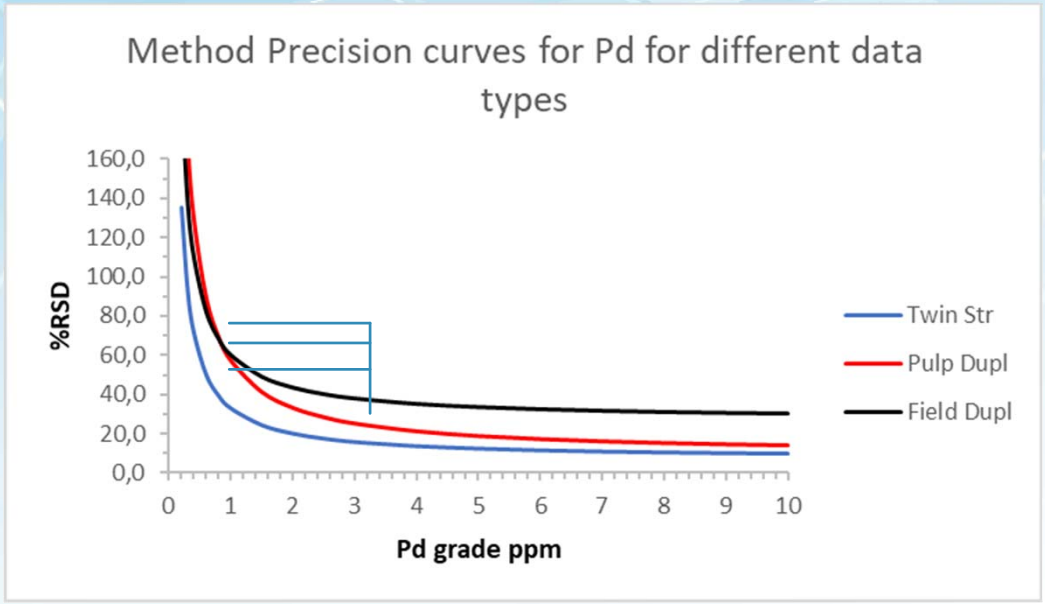
METHOD PRECISION CURVES FOR PD FOR ANALYSED AT THE SAME LABORATORY

- Pulp Replicates (**PREP** "Twin Stream data")
- Pulp duplicates (**PDUP**)
- Field duplicates (**FDUP**)



Grade	PREP	PDUP	FDUP
2ppm	±20,3%	±33%	±43,5%

At A Pd grade of 2 ppm the laboratory requires a confidence interval of:

- **± 20,3%** for Prep (Twin Stream) data
- **± 33%** for PDUP data and
- **± 43,5%** for FDUP data

This indicates that one can not use a fixed % criteria as a pass/ fail criteria for different data types

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A GOOD OUTLIER TECHNIQUE SHOULD TAKE THE FOLLOWING CRITERIA INTO ACCOUNT

1. **Laboratory** – not all labs have the same analytical performance (i.e. are equally good)
2. **Element**
3. **Grade** – the definition of an outlier is related to the grade
4. **Reef type** – A lab's ability to repeat an assay result is a function of the reef type

The Method Precision technique meets all these requirements

Note:

- The precision for different laboratories for the same element, but different analytical methods differs
- The precision for different types of paired data, for the same element analysed at the same laboratory is different.
- Therefore, the pass/ fail criteria for different data types for the same element analysed at the same laboratory, needs to differ. **One should not use the same criteria for different data types**.

NEW FEATURES OF THE BASIC3QAQC MODULE

- Elements and their units are separate, i.e. an element can have:
  - multiple methods, e.g. Cu XRF and Cu ICP
  - multiple units e.g. % or ppm
  - however for a specific data set the units for each element should be fixed.
- Basic3 QAQC can evaluate assay results for any element, oxide or even mineral as long as the relevant control tables contain all the necessary information
- Improved backup and restore facilities for management files, such as Control, Default and History files. Backup files can be assigned a specific name, e.g. project name, date etc
- Improved control table management. Control tables can be checked for missing information, before an analysis is run.
- Is database friendly – can update control tables based on the contents of a database – however this must be customised for user specific data bases.

The generation of QAQC analysis reports can be detailed or for clients only, This was developed by Octoplus in the customer specific Basic3QAQC model for the international Intertek laboratories group.

APPENDIX: COMPONENTS OF AN ANALYTICAL QAQC EVALUATION

Assay results are considered to be reliable ("fit for purpose") if they are:

1. **Precise**
2. **Accurate**
3. **Produced in an environment free of contamination**

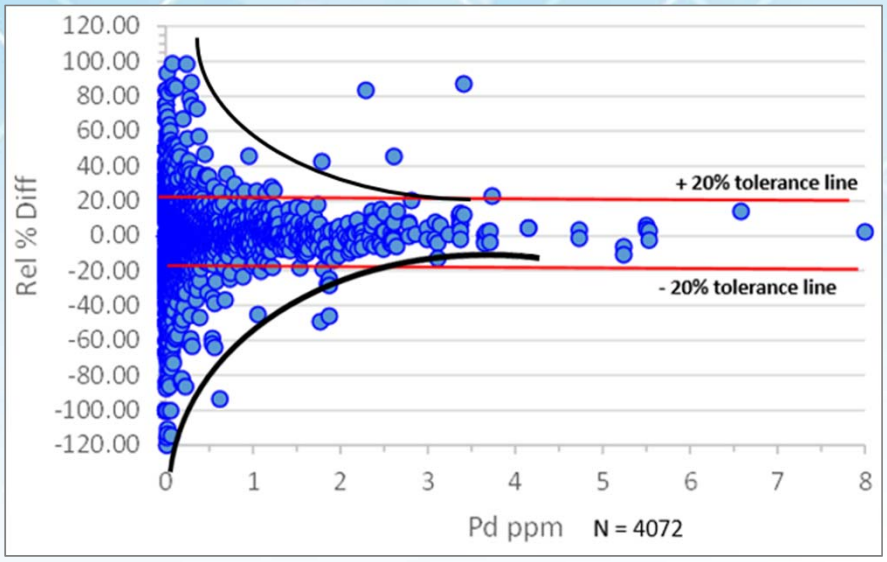
These 3 criteria can be compared to a 3-legged table, if one leg is missing the table will fall over.

Definition of terms:

- **Precision**: The ability of a lab to reproduce a result (requires paired data e.g. Leg1 and Leg2)
- **Accuracy**: provides an indication of how close to a known & "true" value a lab can report (requires CRMs)
- **Contamination**: Uses a material that does not contain any traces of any of the analyte being analysed for. Such a material is simply referred to as a "**Blank**" and it is used to test if machines such as mills and crushers are cleaned properly. Coarse silica chips (**Quartzite**) are the best.

RELATIONSHIP BETWEEN RELATIVE % DIFFERENCE AND GRADE

- **Precision is often expressed as the Relative % Difference between paired data**
- **The relationship between Relative % Difference and grade is not a straight line but a curve** (black lines in graph).
- For this reason, applying a fixed criteria such as a ±20% tolerance line to identify potential outliers for paired data, is not a good practice. It is too tight at lower grades and far too lenient at higher grades.



- Instead of a fixed criteria to identify potential outliers for paired data, a technique that takes a number of criteria such as grade, element and the analytical method into account, is being used.
- This technique is called the **Method Precision** which applies a precision curve to the data.