



BLUE CUBE QUARTERLY.

2017 | December

The Blue Cube heart beat, 2017

The calibration is the heart beat of the analyser and has been the focus of the technical support team the past year.

The importance of representativity of samples was emphasised during the Sampling conference in Perth and the Flotation '17 conference in Cape Town. Both these conferences were attended by Blue Cube representatives.

Amongst new employees Rigardt Barnard (legal), Luanne Musfield (HR), Stuart Cullum (sales), Liza du Plessis (calibrations) and Bubele Booie (technical support) there is Matthew Molteno, who has been appointed in a newly created role responsible for multi-disciplinary analyser performance investigations.

Good analyser performance requires a good calibration and a good calibration requires the optical data to be representative of the analytical results of the physical sample collected during the optical data scans.

The Blue Cube calibration sequence entails the collection of a physical sample over two minutes through the multiple actuation of a pneumatic sampler. During the collection of a particular sample, optical scans are collected and earmarked as calibration files.

The physical sample that is collected typically ranges between 500 g to 2 kg solids. The steps followed to reduce the sample



size in preparation for chemical analysis are critical to ensure the sub-sample remains representative of the initial sample.

Blue Cube calibrations are built using proprietary algorithms which are then used by the analyser to predict mineral and elemental content in real-time. The performance of an analyser is best described by two metrics; one defining the accuracy and the other defining its directional trending ability.

BCS has recently standardised on two metrics for analyser performance evaluation. This edition briefly explains these metrics as well as the role of the outlier indicator (OI) in deciding when calibration samples should be collected.

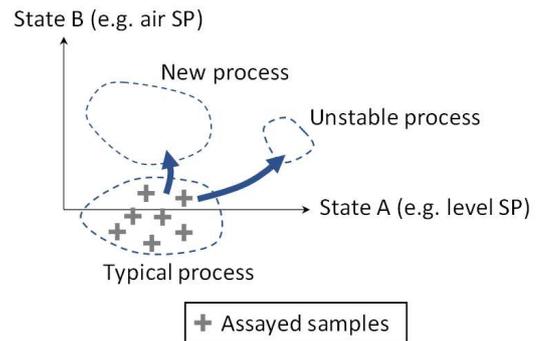
Calibration sampling and the role of the outlier indicator

BCS has a recommended calibration sampling schedule of at least four samples per week during calibration maintenance phase. To ensure that each collected sample adds value to the calibration, it is helpful to understand the ideal conditions to collect a sample.

During normal operation, new process conditions need to be recognised and added to the 'calibration set', which is a set of analytical lab results that are matched with optical signals captured by the analyser. This is done by collecting calibration samples representing these new process conditions.

The analyser is able to detect when a non-typical process or 'unrecognised' optical signal occurs that is not already included in the calibration set. This is determined by the OI which is shown on the Blue Cube display as the fourth output. For most cases, an OI of between 0 and 1 indicates a typical process condition that has already been included in the calibration set. For this reason, the OI is a valuable tool to identify a new process condition that is unrecognised by the analyser. This is indicated by any OI values greater than 1.

However, the OI is unable to discriminate between a new valid process and a temporary unstable process. For example, if a process change was introduced through an increase in the air set-point. this may lead to a new condition that has not yet been sampled and included in the calibration set:



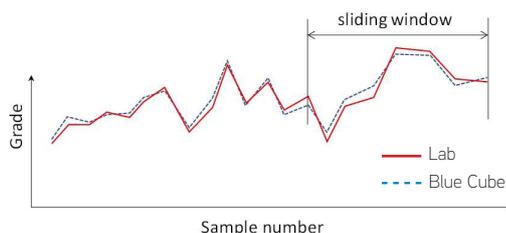
Calibration samples representing the new process condition provide excellent value to the analyser's calibration set. However, if the process change was due to a process upset, it is unlikely that calibration samples collected during this time will add value to the calibration.

Performance metrics

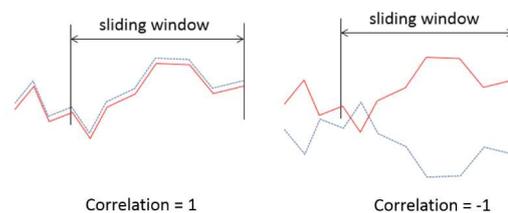
The only reliable measure of performance is comparing lab assays of calibration samples with the analyser outputs while the physical samples were collected. Only data points for OI values less than 1 can be used for evaluation purposes as higher OI values refer to conditions outside of the calibration model.

Accuracy of each data point is defined as the absolute error between the lab value and analyser output which is then divided by the range of the lab values in the particular calibration set.

To assess performance over time and to evaluate improvements, the absolute error is averaged for a running window of 30 data points.



However, it is also important for process control purposes to ensure that the analyser outputs have a similar trend to the laboratory estimates: i.e. increasing and decreasing in-sync with the lab data. Here, the *Pearson* correlation co-efficient between the lab results and analyser outputs is used to define directional trending ability.



Note that in either case the vertical offset between the lab results and the analyser outputs is ignored but it is already addressed by the first metric (accuracy).

BLUE CANVAS

South African clients



Matt Molteno (left) with Kallie Potgieter from Chrome Traders.



Matt Molteno with Karen Keet and Tumi Tumisho from Tharisa.



Matt with James Phaho from Kroondal Platinum.



Karen with Hansie Kuhn of Chrome Traders.

Australian clients



Matt Thompson and Saiwei Lam from IGO Nova in Western Australia.



Matt and Karen recently visited Mt Keith Nickel in Western Australia. Here they are with Paul Philippsen.



Matt and Karen also visited Talison. Here they are with Imogen Paton (centre) and Adrian Paine.

COMMISSIONING



Mosima Mathibe (BCS) is with Sydwell Maleka during the commissioning of a Blue Cube Analyser at Glencore's new PGM processing facility in Mpumalanga.

FLOTATION '17



Brian Whitehead from Northam Platinum Booyssendal was the author of a conference paper on success factors of on-line analysers for use in process control. The paper was presented by co-author Karen Keet.

Welcoming new faces

Bubele Booi will be responsible for second line availability support.



Matt Molteno will be responsible for second line calibration investigations.



Luanne Musfeld is the new HR officer.



Janelle Theron has joined the engineering team.



Season's greetings!

