

Statistical Benchmark Surveying will identify the potential processing opportunities, and diagnose the limiting factors, in the performance of an operating concentrator circuit at a measured confidence level, usually 95%. There are four stages to this process:

1. Formulation and execution of the survey to extract several sample suites and a reference operations data set from the operation
2. Application of appropriate quality controls to reject outlier candidate samples, usually at the 95% confidence level
3. Preparation of a final survey composite sample suite for mass and value balancing, sizing and mineralogical measurement
4. Quantitative mineralogical measurement of the sized survey sample composite suite, and identification/quantification of processing implications

The surveying models apply principles of Best Sampling Practice after Gy, the Central Limit Theorem, and Reference Distributions. The system has been successfully used by FTC and now XPS since 1997, and successfully underwent academic scrutiny in a postgraduate study 2002-2004 (Lotter, 2004; Lotter and Laplante, 2007). The full flowsheet stream list is sampled.

Detailed quality control procedures are applied to assure the representativeness of each of several survey units are combined to form composites for mass and metal balances and subsequent size-by-size QemSCAN analysis. In particular, the feed, concentrate and tailings grades are matched between the survey composites and the average of a block of production data.

Adhering to these quality controls enables us to validate survey data and make recommendations that will lead to sustainable process change.

The track record of this system has a consistent history of successes. (Lotter et al., 2011). In the first post-commissioning survey of the Raglan concentrator, Quebec, the implementation of three flowsheet changes delivered concentrate grade and metal recovery gains amounting to:

- a concentrate grade gain from 16 to 18% Ni
- paymetal recovery gains of 2.1% Ni, 1.5% Cu, 1.9% Pd and 4.1% Pt.

Key Capabilities

- Full concentrator surveys or focused mini surveys of specific streams and unit operations
- Mass and metal value balances
- Complete mineral composition and liberation reported by mineral and by size using QemScan
- Modelling capability including ultimate Grade/Recovery curves
- Recommendations for sustainable process process optimisation
- Quantification of potential recovery increase and grade improvement
- Quality controls to validate survey data

Lotter, N.O., 2005. Statistical Benchmark Surveying of Operating Concentrators, Ph.D. Thesis, McGill University, 2005.

Lotter, N.O., and Laplante, A.R., 2007. Statistical Benchmark Surveying of Operating Concentrators, Minerals Engineering, 20, (2007), pp. 793-801.

Lotter, N.O., Kormos, L.J., Oliveira, J.F., and Fragomeni, D., 2011. Modern Process Mineralogy – Two Case Studies, Minerals Engineering, 24, (2011), pp. 638-650.



Statistical Benchmark Surveys have been successfully undertaken at all of the Glencore Nickel Concentrators (Strathcona, Raglan, Montcalm) as well as at Kidd Creek Copper/Zinc Concentrator and at Collahuasi.