Southern Innovation

SITORO® ACCELERATED ANALYSIS

Revolutionising Conveyor Scanning & Ore Sorting

Southern Innovation's award-winning SITORO® digital signal processing technology dramatically enhances existing analytical techniques to deliver faster and more accurate full-stream bulk material characterisation in real-time, including elemental analysis, mineralogical discrimination and textural determination.

Opportunity

- Enhance existing conveyor scanning and ore sorting, and develop new bulk material characterisation and sorting equipment
- Proven, commercial technology, ready for integration
- SITORO® Accelerated Analysis – faster, more accurate, finer resolution, lower detection limits, light element detection, revolutionary elemental and mineralogical characterisation
- Operational cost savings and plant optimisation

Introduction

Orebodies typically exhibit significant variability, with frequent differences between the averaged, estimated resource grade of an individual ore block and material on a mill conveyor at any point in time.

Poor ore predictability can lead to crushing and treating waste or low grade ore, or the inclusion of deleterious materials, which increase mine costs and reduce product quality.

Accurate, real-time analysis can reduce costs, and enhance plant recovery through the greatly improved characterisation of ore being delivered to, or handled within, a processing plant.

Ore flows are usually assessed by intermittent testing of only part of the stream, with samples sent away for laboratory analysis. The representivity of this testing relies on complicated, and often poorly-understood sampling theory to ascribe what is typically unjustified confidence in the data received, and often even then the results are received too late to optimise plant operation.

Significant financial and operational gains are available by developing superior real-time, full-flow bulk material characterisation before and during processing, since it can enable:

- Pre-comminution sorting or flow diversion
- Proactive plant optimisation
- Improved long-term resource utilisation

Knowledge of real-time ore characteristics can lower cut-off grade, allow targeting of treatment routes, increase mining rate and product quality, reduce production costs including energy and water consumption, and reduce waste and pollution.

Significant improvements in long-term profitability can also be realised when using this information to fine-tune operational mine planning by feeding detailed ore block information back into ongoing ore scheduling and resource estimation.

Radiation-based Materials Analysis

Radiation analysis techniques are increasingly used in mining and mineral processing to deliver elemental and mineralogical information for process optimisation and metal accounting.

Common techniques used for online material analysis include X-ray fluorescence, X-ray transmission, and prompt-gamma neutron activation analysis. However, despite their increasing use, the potential of these techniques is yet to be fully realised.

Existing implementations can be slow, intermittent and inaccurate; have limited capability to detect light elements or low concentrations; may produce poor representivity of results; and, in some cases require onerous radiation safety measures.

X-ray diffraction crystallographic analysis is used for mineralogical identification, but is hard to apply to a real-time, online system, and might be supplanted by new multi-energy XRT technology discussed overleaf.

Southern Innovation's SITORO® technology enables the next generation in performance of radiation-based materials analysis technologies by quickly and accurately processing detector data, overcoming many of the limitations of traditional techniques, such as dead time and pulse pile-up, allowing much larger data flows.

SITORO® processing technology dramatically enhances the speed and accuracy of each of these techniques:

X-ray Fluorescence (XRF)

XRF is a surface analytical technique well suited to on-rig or in-plant powder or slurry analysis where: material is pulverised, and therefore somewhat homogenised; and, is ideally presented to the radiation source and detector(s) in a consistent manner.

SITORO® provides online XRF with significantly improved speed, accuracy and light element detection; and allows enhanced whole rock analysis with curtain scanning, or in combination with other techniques.

Prompt-Gamma Neutron Activation Analysis (PGNAA)

PGNAA is a penetrative technique best suited to bulk materials analysis. This approach provides a more representative but less accurate analysis than XRF but has limited capability to detect light elements or low concentrations, and requires significant radiation safety measures.

SITORO® provides greater speed and accuracy to PGNAA, and allows improved penetration.

X-Ray Transmission (XRT)

XRT is an imaging technique currently used for particulate sorting in mining. With the significantly improved speed, accuracy and revolutionary detection capabilities enabled by SITORO®, XRT can be applied to real-time bulk material characterisation and improved identification, sorting and flow diversion.

Southern Innovation has developed cutting-edge XRT scanning technology that provides high speed, high-resolution transmitted X-ray attenuation images along with accurate measurement of effective atomic number (Z_{eff}). Photon counting spectroscopy using high-performance detectors and SITORO® processing delivers multi-energy XRT, which provides precise determination of effective atomic number not possible using traditional X-ray scanning or even dual-energy XRT.

Multi-energy XRT using SITORO® signal processing, combined with new high-performance detector technology, delivers:

- Radically improved particulate discrimination.
- Unprecedented speed, accuracy, resolution and sensitivity in analysis of full-stream bulk materials.
- Insight into density, mineralogy, and texture, including grain size and distribution, which may be critical to optimising comminution and concentration processes.

Combined System

An online analyser combining SITORO® XRF and XRT scanning would provide a highly valuable cross-referenced analytical system, offering operators unprecedented detailed and timely knowledge of process materials, with a comprehensive suite of results including accurate surface elemental analysis, whole rock grade estimation, mineralogical discrimination, fine resolution imaging of grain size and texture.

Product Development

Southern Innovation provides:

- Cutting-edge digital signal processing to deliver dramatically improved speed, accuracy, resolution and detection limits.
- A revolutionary new method of multi-energy XRT scanning to measure effective atomic number of materials.
- Specialised understanding of active radiation-based analytical techniques and detector technology.
- Proven ability to deliver optimised configurations of X-ray sources, sensors and signal processing.
- A technology already commercialised in other industries ready for immediate application to mining.

Southern Innovation's unparalleled ability to provide high speed, high volume processing of X-ray signals has already been demonstrated in rapid XRF analysis of drill samples, and bulk scanning of moving objects. Application of this technology to ore scanning and sorting will revolutionise mining and processing optimisation.

We are seeking to partner with end users and manufacturers experienced in the utilisation of detector information, and designing mechanical systems for product flow management in a mining environment. Three possible development streams are proposed:

1. Improve the speed and performance of existing online XRF, XRT, XRD or PGNAA detection by integrating SITORO®.
2. Retrofit state-of-the-art detectors & processing technology in existing XRT online scanners to provide Z_{eff} mineralogical information as well as to improve X-ray attenuation images.
3. Design a custom-made, cutting-edge bulk material scanner/sorter.

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