Representative measurement using high performance PGNAA to digitalise process feed quality

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Keywords: PGNAA, digitalisation, elemental analysis, automated grade control

# ABSTRACT

A major challenge for mineral processing operations is to maximize recovery, minimize operating costs and maintain consistent throughput rates when dealing with a supply of highly variable ore quality from the mine. Ore quality parameters include ore grade, ore hardness, mineralogy, dilution by waste, deleterious components, ore textures affecting liberation, gangue content and quality, and many more. Any or all of these can be variable due to the heterogeneity of ore bodies, complexity of ore/waste boundaries and influence of the mining process. Few operators complain of monotonous feed quality and consistent process performance requiring minimal supervision and response requirements. The inability to receive uniform feed material quality is a major reason that mining is unlike manufacturing. This paper uses case studies to demonstrate successful application of real time, representative, composition measurement technology for conveyed plant feed flows to measure, understand and control quality variability to benefit process performance. High performance Prompt Gamma Neutron Activation Analysis (PGNAA) has been proven effective in digitalizing conveyed flow quality to enable real time responses to quality variability through ore blending control, ore and waste parcel diversion (bulk sorting), feedback to mining operations and feed forward to process operators. The representative measurement data is used for ore reconciliation and metal accounting applications in multiple commodities. Benefits through preventing unnecessary processing of coarse waste include reductions in GHG emissions, reduced use of consumables and reduced generation of fine tailings per tonne of metal produced. Process feed quality is no longer dictated purely by the mining operations. The ability to measure and control process feed quality has significantly improved operational economics and sustainability in iron ore, base metals and industrial minerals.