ABSTRACT

Historically, many mining investments have demonstrated inability to meet projected cash-flows despite detailed and costly project evaluations. The risk in mining projects can be attributed to the fact that decisions are made in situations involving high levels of uncertainty. The cash-flow uncertainty is driven by commodity price fluctuations and by the uncertainty of the geometries and grades of ore deposits. Accurately predicting future prices can be very difficult, however, better knowledge of the orebody will allow for improved strategic planning and an ability to build in flexibility into the design of the operation to deal with veiled uncertainty, orebody variability and operational constraints.

Geometallurgy provides a platform for cross-functional collaboration between geology and metallurgy, providing better inputs to mine planning and strategic decision making. Understanding variability in the orebody enables optimum operational designs and extraction methods that maximize value recovery. Geometallurgical programs allow for material characterization that is based on metallurgical responses instead of just geological zones, enabling informed design decisions and building in flexibility to handle variability. On the other hand, metallurgical design decisions made without full appreciation of the resource can limit ability to deal with variability, constraining the process right from design. Geometallurgical risk exists as a result of uncertainty in metallurgical characteristics of the ore resulting in treatability challenges.

Projects such as the Cawse Nickel Project in Western Australia and the Voorspoed Diamond Mine in South Africa are given as illustrations of geometallurgical risk at various phases of projects. Canahuire Project in Peru and the Kemi Chromite and Ferrochrome mine in Finland exemplify how successful geometallurgical programs have and can be implemented.

This report demonstrates a case for geometallurgy at the Orapa A/K1 deposit. Two rock types comprising the kimberlite, SVK_M and NPK_GG, previously not apparent in geological models, have introduced a constraint in the Orapa 2 treatment plant. This treatability challenge is due to the generation of non-settling slurries from the rock types. A metallurgical design decision in the selection of the thickeners has limited the plant's ability to deal with the changes in the ore blend.

The Orapa case proves how design decisions can limit flexibility to deal with orebody variability, constraining the process from achieving the design capacity and limiting forecast cash-flows. The case demonstrates existence of geometallurgical risk and illustrates the consequences of this risk in operational and financial terms.