Modelling to Prepare for and Mitigate the Impact of Increasing Ore Hardness at Lihir

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ABSTRACT

Lihir, located on Niolam Island, 900km from Port Moresby, Papua New Guinea, is one of the world's largest producing gold mines. Future changes in feed blend (less argillic ores and an increased proportion of porphyry and epithermal ores) will increase ore hardness and thus impact comminution circuit throughput. Lihir has experienced harder ores in the past, although more recently, the feed has been predominantly softer. Unusually, the Lihir circuit can swing between SAG or ball mill limiting conditions due to the variable ore hardness in terms of resistance to impact breakage (for SAG milling) versus fine grinding.

To develop effective strategies to maximize performance for the future ore types, it is necessary to understand the ore characteristics, the impact of these on the Lihir circuit, and when the circuit will be SAG or ball mill limited. Newcrest engaged Hatch to assist, and the project involved analyzing ore characterization data, historical and recent operating data, previous studies and surveys as well as developing site-specific comminution models to reflect the current conditions. Several modelling and simulation approaches were used. Morrell power-based modelling estimates the specific energy of the comminution circuit as a function of ore hardness and feed size for the required product size and was used to assess the impact of changing feed characteristics and determine when the circuit would be SAG or ball mill limited. However, power-based models do not have the sensitivity required to investigate, in detail, the impact of changing many operating conditions. This was achieved using calibrated process models, such as those used within JKSimMet. Together these models were used evaluate the influence of ore properties on comminution circuit performance and assess strategies to mitigate against increasing ore hardness.

This paper describes the data analysis, modelling, simulation and the resulting recommendations to maximize production for future ores.