Regrinding: A subtle mix of liberation and chemistry

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ABSTRACT

As ore bodies become leaner and the mineralogy more complex the need to grind finer to achieve liberation, and therefore produce a saleable concentrate grade has lead to the development of several fine grinding technologies. The ISAmill, HIG mill and SMD have all been developed for this purpose. In the first instance, a simple laboratory test can be performed to develop a signature plot to determine the kWh/t required to grind to the desired particle size. This is generally trialled at pilot scale to confirm the energy requirement. However, these tests do not examine changes in pulp chemistry and impact on downstream processing.

Invariably at plant scale fine grinding whilst achieving the target particle size (i.e. liberation) the ground product does not have the right pulp chemistry for flotation. It was observed in the plant at Capricorn Copper that the HIG mill discharge tended to have a reducing Eh, near zero ppm of dissolved oxygen and a high oxygen demand. This tended to yield poor metallurgical performance in the plant. In the laboratory regrind it was noted that the ground pulp had an oxidising Eh, high dissolved oxygen content and low oxygen demand. Upon further investigation it was also noted that there was a marked difference in pulp temperature between the laboratory and the plant.

This paper describes how to conduct a laboratory test to generate the pulp chemistry observes in the plant, by using ceramic media that had been preheated and extending the grind time. These changes to the laboratory procedure produced similar pulp chemistry readings to those noted in the plant, as well as poor metallurgical performance. Further work was completed to show how to restore the conditions needed to achieve acceptable flotation.