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PREDICTING BALL MILLING HARDNESS AT A WESTERN AUSTRALIAN MINESITE

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ABSTRACT

The ball milling circuit at the study site (a gold mine located in Western Australia) experiences periods of high recirculation despite mill power and product grind size meeting targeted specifications, consequently requiring throughput to be reduced. Periods of reduced throughput result in reduced gold production and higher cash costs per ounce of metal produced, not to mention difficulties in budgeting and forecasting.

The site has suspected increases in the ore's hardness (or grindability) as the key factor attributing to the decreased throughput as it has been anectodally observed that the mill feed coming from the crushing circuit is considerably coarser on these occasions. Currently there are no routine methods used at the site to characterise the ore's hardness therefore, the reason for the high circulating load cannot be verified, and quick, appropriate action cannot be taken.

A literature review was conducted and a new grindability test method was developed, based on existing validated testwork. The proposed method is applicable for onsite diagnosis, which enables a quick turnaround time and low analysis costs. The method incorporates batch, dry grinding in a standard laboratory rod mill for a set grind time. Comparing the variation in P_{80} with the ore's Bond Work Index (BWi) results in a correlation, from which a relative change in hardnes can be inferred, as long as the standard test conditions are maintained.

With application of this proxy hardness method and creation of a ore hardness database, it is ultimately intended that a geometallurgical modelling program can be developed, using XRD to correlate ore hardness to mineralogy. Incorporation of these factors will allow improved forecasting and budgeting, it will also reduce inherent risk and cash cost while improving life of mine prediction.

Keywords: Ball Milling Circuit, Ore Hardness, Bond Work Index, Grindability, Geometallurgical Modelling