A Novel Measurement for the Internal Operation of a SAG Mill using Acoustic Sensors

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Abstract

To increase the throughput of the MMG Century operation by over 25% from past practice has resulted in new types of instability in the SAG mill. A twelve microphone array around the SAG mill¹ using the non-contact acoustic measurement methodology²,³ has been used to diagnose the new dynamics. Acoustic noise signal information allows discrimination of the behaviour of the steel balls and the rock. Determination of toe and shoulder angles, water holdup, and proxies for mill load are possible.

To diagnose the instability, an abnormality in the liners/lifters of the SAG mill with one row of lifters having a slightly increased in-mill life compared to the rest, allows the monitoring of the dynamic behaviour of the rocks and steel balls using acoustics. The steel shoulder angle is observed to be disturbed cyclically at a rate of precisely one revolution at low throughputs of 750 t/h. However, at throughputs approaching 1100 t/h the cyclic signal disappears progressively indicating additional dynamics to randomise the repetitive behaviour of the mill charge. The cyclic signal has been used to operate the SAG mill with improved stability at 1100 t/h.

This paper presents and discusses these results and proposes the suggested origin of the extra dynamics. A small consistent aberration of the lifters circumferentially provides a useful detector of stable mill operation and a novel sensor for the internal operation of a mill.

