Differentiation of AG/SAG Mill Feed Particle Size Variations in Batch Milling Process Using Acoustic Emissions

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Abstract

Incoming ore feed size distribution variations impact on Autogenous/Semi-autogenous (AG/SAG) grinding mill operation, potentially influencing mill disturbances and performance. Under batch dry and wet grinding conditions using a purpose-built laboratory-based AG/SAG mill and acoustic sensor, the present work investigates the feasibility of a real-time monitoring technique of different mono-sized ore feed fractions and binary mix ratios of distinct feed size fractions. By signal root mean square analysis derived from the time-domain based signal processing technique, a simple feed size variations estimation model was developed. The results obtained delineate that mill noise emissions frequently increases with an increase in ore feed size. The mix ratios of relatively coarse and fine feed sizes indicated that mill acoustic response was dampened with an increase in the fine size fractions. The best fit correlation plot of both mono-sized and hetero-sized feed fractions (both dry and wet grinding environment) and acoustic emissions showed a non-linear relationship. In comparison, wet milling in the presence of steel balls and water showed a more linear correlation than only rock milling. The preliminary results by the method proposed in the study support that ore feed size variations are sensitivity to mill acoustic emissions with a promising prospect towards real-time monitoring and optimisation of AG/SAG mill feed size.

Keywords: Laboratory-based AG/SAG mill, acoustic emissions, ore feed size, real-time monitoring, dry and wet grinding conditions