

A review of operating data over 50 years of secondary crushing prior to AG/SAG mills

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ABSTRACT

Since their first application in the late 1950s, the development of autogenous grinding (AG) and semi-autogenous grinding (SAG) mills has provided the modern mining industry with workhorses used for most high-throughput comminution applications. Secondary crushing is a means to debottleneck the AG/SAG mills for the coarse-competent feed. In the early years of AG/SAG milling, secondary crushers were pertinent equipment in the flowsheet to manage the coarse feed in smaller diameter AG/SAG mills at the high throughput capacity-duty. As bigger shell diameters incorporating larger motor capacities were adopted in the comminution flowsheet, secondary crushing options were rarely considered in greenfield flowsheet design; but instead, considered as an option to deconstrain the undersized AG/SAG mill for the high competency-coarse feed.

Feeding AG/SAG mills with secondary crusher product changes the behaviour of the breakage and classification mechanism of the ore in the mill when comparing mills fed with primary crusher product; therefore, requiring changes to the operating (ball and total mill filling levels), process control, and internal changes, such as shell liners and discharge system designs.

This paper reviews the last 50 years of operating data of comminution circuits comprising secondary crushing prior to AG/SAG mills. The paper focuses on the varying operating strategies adapted to treat the secondary crushed feed in the grinding mills. The key objectives of the review are to identify circuit design options to treat critically size fractions in the mill feed and opportunities to reduce the grinding media consumption, therefore minimising the overall GHGe footprint for high throughput applications.