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The growing trend of using high steel load in SAG mills – what is driving this?

SAG mills are often used in mineral processing plants to reduce ore particles so that the minerals of value can be extracted by downstream recovery processes. The SAG mills are preferred because minimal preparation is required after the mining stage for the ore to be introduced to these mills. SAG mill circuits have low capital and maintenance costs due to the absence of elaborate crusher plants which add to these expenses. SAG mills can be operated as primary mills in multiple grinding stages or as single stage grinding mills in closed circuit with classifiers to produce the final product for the recovery processes downstream. SAG mills are designed to operate with ball loads ranging from 4 to 15% volumetric filling, but recent designs have provision to accommodate ball loads in the range from 16 to 36% volumetric filling for SAG mills with high steel load or Run of Mine ball mills. The ball load in SAG mills plays a significant role in defining the throughput and product size for the circuit. For SAG mills operated at lower ball filling, the rock component of the grinding media plays a significant role in dictating mill performance while for SAG mills operated with a higher ball filling, the contribution is dominated by steel media. The rock/ball ratio is an important parameter in determining the energy efficiency of the SAG mills. Low energy efficiencies have been observed for mills that are operated with low ore/ball ratio. The significant role of the ball filling in SAG mill operations for different feed attributes will be discussed. Opportunities to enhance circuit performance and reduce detrimental consequences that the ball filling degree can impose on the circuit are discussed. This paper will provide insights on the importance of considering implications of the energy efficiency when designing plants to avoid oversizing the mills, which is a common feature in the industry. If most mills draw only 70% of the motor power, what is driving the current trend of using high steel load SAG mills?

Figure 1
Typical SAG Mill Power Load Curves (actual shape depends on the particular application)

