Investigating the load trajectory in AG and SAG Mills: The Gol-E-Gohar Mining and Industrial Company case

ABSTRACT

Recently the use of large AG (autogenous)/SAG (semiautogenous) mills reduces capital and operating costs. Charge motion is of prime importance in the efficiency of these mills. A combination of analytical and physical studies was used to determine charge trajectory. In this research, the measured charge trajectory in a model mill with the transparent end was compared with that of the GMT. To explore various charge shapes and trajectories, the model mill was operated at 55, 70 and 85% of critical speed for five levels of mill filling (10, 15, 20, 25 and 30% by volume). The angular displacement of the toe, toe departure, shoulder and charge impact point were determined from the photographs taken from the model mill. New relationships to predict charge shape and charge impact points were introduced. The results indicated that when the lifter face angle of Gol-E-Gohar AG mill liners increased from 7 to 30°, the distance between the charge impact point and the toe decreased from 52 to 31° for 25% filling which favoured more efficient comminution practice. After converting AG mills to SAG mills on account of liner profile change, 31% increase in throughput (from 419 to 548 t/h) in addition to 4% decrease in the product size (from 516 to 496 μm) were realized.

KEY WORDS: SAG mill, Liner, Lifter face angle, Charge shoulder, Toe, GMT.