Improved Cone Crusher Chamber Design and Operation Using Design and Simulation Tools

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ABSTRACT

This paper presents the use of design tools and simulation methods, including desktop tools, and computational tools like discrete element method (DEM), in the improvement of cone crusher chamber designs.

Custom chamber designs can be completed based on the given feed size distribution, target closed side setting, equipment parameters, and the process objective. Weir has developed an expedient methodology for routine assessment of chamber designs, based on well researched models and techniques, combined with operating data it has gathered. These methodologies and tools were informed by more computationally intensive DEM simulation. It combines equipment design rules with crusher process models.

The DEM simulations used employed full Whiten particle breakage simulation, giving insight into chamber design, and can provide an indication of power, throughput capacity, and can show relative differences in pressure profile across different liner designs.

An example application is presented, which had a narrow feed size distribution. To prevent localised wear, this application required a progressive liner design to even out applied pressure along the depth of the liner. The example application shown had a high ore competency and a narrow feed size distribution; it was shown that methods like Bond's crushability index was poor at predicting the required power in applications like this, and more sophisticated methods like the Whiten crusher model in JKSimMet® were required. It was shown that the DEM analysis, while providing detailed insight into the behaviour of chamber geometry design, predicted similar comminution power to JKSimMet®.