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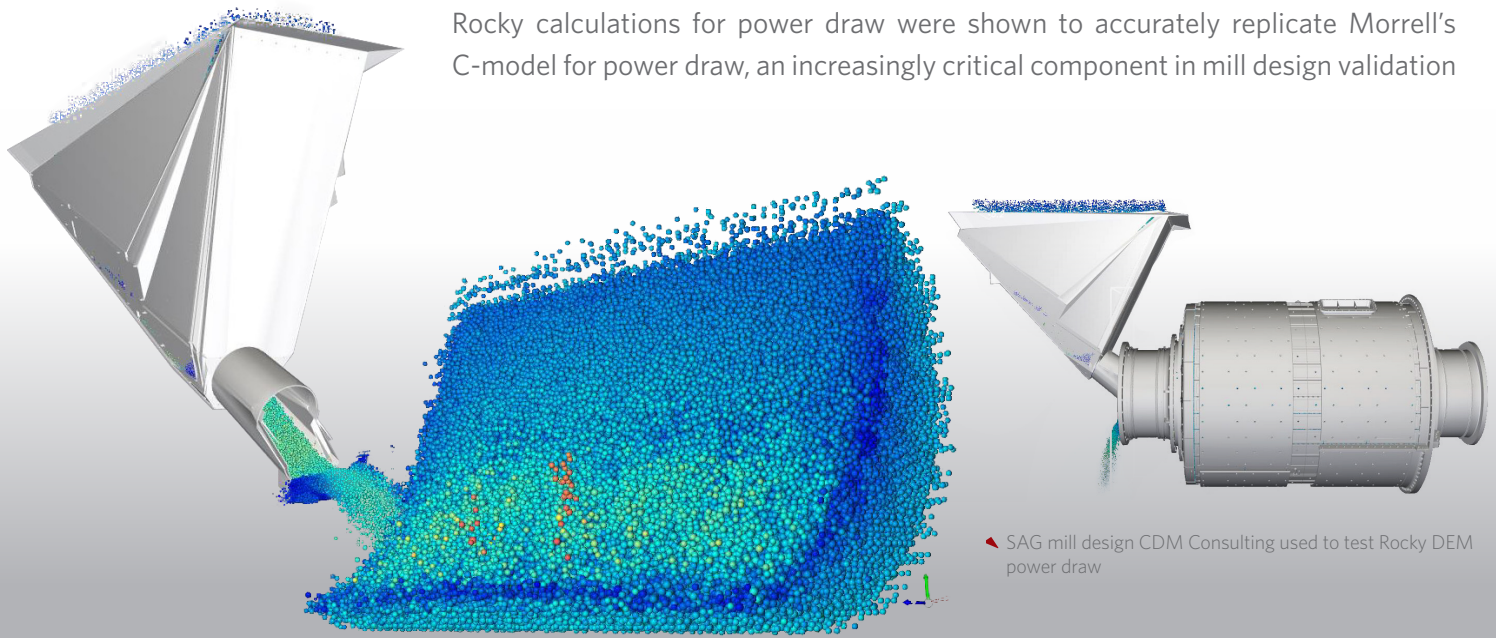
ROCKY

CMD Consulting uses Rocky DEM power calculations to validate mill designs

Rocky calculations for power draw were shown to accurately replicate Morrell's C-model for power draw, an increasingly critical component in mill design validation



SAG mill design CDM Consulting used to test Rocky DEM power draw

In a typical mine, the liners and lifters of a comminution mill are expected to last only 6-9 months and can cost upwards of US$500,000 to US$1,000,000 to replace. It is therefore important that the design of these components be carefully considered to ensure that the mill runs as efficiently as possible while also limiting the effects of wear on the replaceable components.

CMD Consulting, a comminution consulting company in Australia, works with mines to help design more efficient and longer-lasting mill liners and lifters. Because the insides of these giant machines are nearly impossible to observe while in operation, CMD engineers pay close attention to the measurement of energy as a result of the operating conditions, such as mill filling and rotation speed. By using Morrell's empirical C-model (Figure 1)— considered by many in the industry to be the most advanced mathematical model for predicting mill power draw—they are able to evaluate the energy costs of their designs. But measuring power provides only one piece to the mill design puzzle; CMD needed a way to consider the effects of liner wear on the design as well.

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>
> Mike Daniel
> *Eco-Comminution Specialist at CMD Consulting*

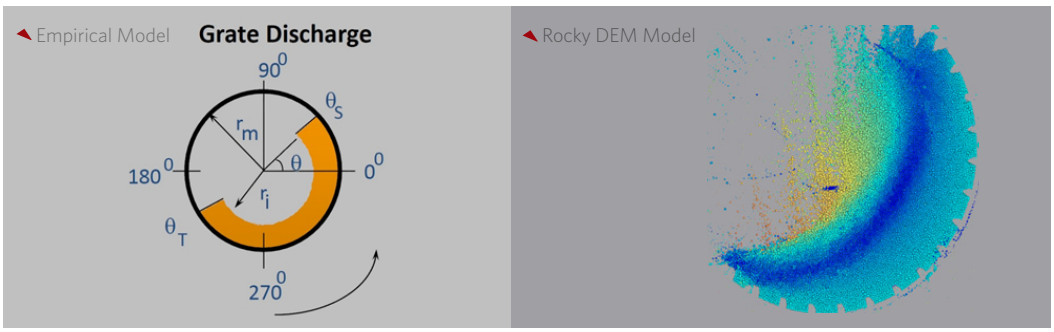

Figure 1 - Morrell C-model for mill power draw

One solution commonly used to simulate how material flows through mill equipment is Discrete Element Modeling (DEM) software. However, explains Mike Daniel, Eco-Comminution Specialist at CMD Consulting, there is still a stigma of inaccuracy that hangs over these kinds of simulation tools. He says, "When it comes to detailed liner, lifter, and grate design, we can show our clients a DEM simulation that gives them more than just a pretty picture but in the end, the client still wants mathematical proof of accuracy. Before we can ask our clients to trust the results, they need to have proof that the tool represents reality."

With the goal of proving accuracy in mind, Mike devised a study to demine how accurately Rocky DEM measured power draw. He chose to replicate a SAG mill modeled with a grate discharge for his design, using only the actual liners and grate ends components in the simulation itself. He then set up a series of Rocky cases that filled up the mill with particles and steel balls to varying levels and then rotated the mill at various speeds. Once the mills reached a steady state, he compared the power draw calculated by Rocky with the Morrell C-model prediction. In doing so, he discovered that Rocky measured a power draw nearly identical to that predicted by the Morrell C-model (Figure 2).

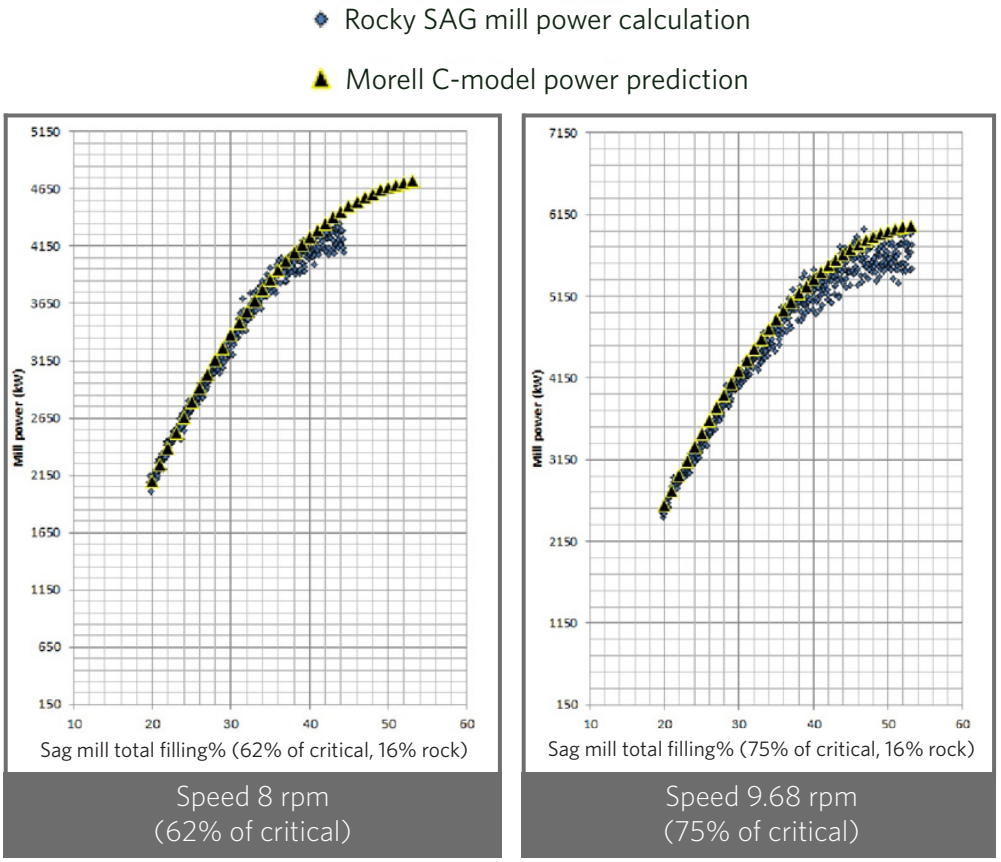

Figure 2 - Rocky power draw (blue diamonds) compared to Morrell C-model prediction (black triangles) as mill fills at different rotation speeds

"Discovering that Rocky DEM power almost exactly equals the Morrell power model is a vital conclusion," Mike says. "It provides the proof we required that Rocky can be used to accurately test a mill under non-standard operating conditions."

Further, Mike explains that empirical models for power draw, such as Morrell's, have shown to be accurate within ±6%, a level of accuracy that he feels comfortable extending to Rocky DEM. "Rocky being proven accurate to this degree offers a huge potential for savings throughout the industry," he says. Encouraged by these initial results, Mike is eager to test out other Rocky DEM predictions in future studies, including fluid flow and particle breakage.

CHALLENGE

Find a method of proving to clients that Rocky DEM simulations are more than just "pretty pictures," but are truly accurate representations of real-world conditions.

SOLUTION

By comparing Rocky DEM power draw calculations with those predicted by Morrell's C-model, CMD Consulting discovered that Rocky DEM is accurate to ± 6%.

BENEFITS

With this proof of accuracy, CMD Consulting can instill confidence in their clients that designs simulated using Rocky DEM will work similarly in the real world.

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CMD Consulting Pty Ltd. provides technical consulting services to the minerals beneficiation industries in respect to comminution processes. They specialize in services dealing with the application of HPGR and eco-comminution® circuit design, which is unique to their company.

