Where DEM and SPH Collide - Wet Screening Optimisation with Numeric Tools

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The imperative to operate sustainably requires any equipment and all processes to operate at their maximum possible efficiency. Achieving this ideal state requires a thorough understanding of the process itself but also of the tools available to design and assess potential improvements. This paper presents a case where the widely employed Discrete Element Method (DEM) toolset proved insufficient to model problematic material flow during the process of optimising wet screening performance. A Smoothed Particle Hydrodynamics (SPH) model was found to more accurately replicate the flow characteristics of the physical system.

Deficiencies in the wet screening efficiency of an iron ore processing circuit were identified to be the result of biased loading of the screen decks from an upstream scrubber. An initial DEM model was developed to model the existing arrangement and to enable development and assessment of improvements. DEM was found to over-simplify the slurry flow dynamics within the scrubber and, as a result, no non-centrality was introduced to the otherwise symmetric system. Since DEM was not able to accurately replicate the existing problem it was deemed an unsuitable method to assess the effect of any changes. The numeric approach was therefore expanded and a Smoothed Particle Hydrodynamics (SPH) model was created. This model was found to map the flow within the scrubber with sufficient accuracy and produced biased screen loading comparable to that reported from site. Changes to the wet chute delivering material from the scrubber to the screen that were aimed to neutralise the non-centrality introduced via the scrubber were then successfully designed and assessed using the SPH model.