A Model for the Shear Thickening Effect of Raking Systems on Red Mud.

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Abstract

Raking systems are commonly installed in settlers used in the mining industry. They contribute to the thickening of the mud and to its displacement towards the underflow. These effects have been known for many years, but the understanding of the compaction mechanisms is incomplete. A better understanding of these mechanisms would facilitate rake design improvements and would allow for a more accurate assessment of their efficiency. Several software suppliers propose commercial codes that simulate fluid flow, but unfortunately, no software application has been identified to simulate the compaction of mud by the shearing action of a rotating rake. Red mud compaction by shear action has been measured in our laboratory using a novel and unique experimental set-up. The observed data agree well with a semi-empirical mathematical model that we have established based on shear strain. This model has been incorporated as a compaction module into the ANSYS FLUENT fluid flow software to simulate the mud compaction by a rotating rake. The compacting performance of rake systems under various operational conditions can therefore be investigated.

Keywords: Red mud; shear strain thickening; compaction; rake.