

Influence of Slimes on Gravity Separation of Iron Ore Fines in a Reflux Classifier

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ABSTRACT

Iron ore fines contain so-called “slimes” that act negatively on particle beneficiation due to elevated viscosity, contamination of the final product, subsequent dewatering, and inferior materials handling. Cyclones provide a low cost solution to removing the slimes, while also concentrating the coarser particles. The reality, however, is that there is significant misplacement of slimes into the underflow and significant loss of ultrafine iron ore that reports with the majority of the slimes to the tailings.

This study investigated the application of a Reflux Classifier, incorporating closely spaced inclined channels, to achieve beneficiation of iron ore fines less than 0.3 mm. The objective was to extend the separation to cover the full size range below 0.3 mm, maximizing the Fe recovery and the product grade, while seeking to achieve complete removal of any slimes not removed by the cyclone. The impact of the presence of the slimes was investigated by performing experiments at different volumetric feed rates and pulp densities, recognising the impact of the viscosity due to the slimes could be reduced through dilution. Additional experiments were conducted using the Reflux Graviton, exploiting G forces to remove the slimes below 0.01 mm, and then examining the performance of the Reflux Classifier in the absence of the slimes. The results demonstrate the challenge faced by the industry in slimes removal and the prospects for significant advances in this area.