Exploring iron ore fines beneficiation in a South African Context

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Globally the major iron ore producers are Vale, Rio Tinto, BHP Billiton and Fortescue Metals. The prevailing low commodity prices ensure that only the largest and lowest cost producers survive and thus mines in China, Canada and South Africa are buckling under the pressure. The largest Fe ore producers in South Africa are investigating -1mm fines processing to reduce its cost of production by utilising its -1mm tailings material that are easily accessible and high grade (~55-60% Fe). To compete in the global market the major South African iron ore producers are investigating ways to reduce processing costs and increase their fines product grade to 66% Fe. Mintek has been researching the beneficiation of fine iron ore over the last three years to fulfil some of the strategic needs outlined in South Africa's National Development Plan and Beneficiation Strategy namely the treatment of low grades ores; tailings treatment and maximising resource utilisation; job retention in the iron ore and chrome industries, and applying novel technologies for the treatment of waste streams.

Utilising mineralogy data various gravity circuit configurations, typically the cheapest of physical separation units, were modelled by Mintek. These circuits compared spirals, Reflux Classifiers and fine Dense Media Separation to narrow down the circuits that should be explored from a metallurgical performance point of view. The circuit comparison showed that the Reflux Classifier achieves superior metallurgical results. Some testwork was conducted to set the model parameters but more extensive testing would be required for model validation purposes.

To improve the product grades the impact of fine milling technology on the liberation characteristics and flotation performance was also investigated. This involved evaluating various milling unit operations and the associated downstream performance benefits. Work is currently underway and the results thereof will reported at the time of the presentation.

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