A Novel Application of Gravity Separation Technology to Beneficiate Ultrafine Iron Ore

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ABSTRACT

Processing of large volumes of ultrafine ores has long challenged mineral processing resulting in lower recoveries and increased tailings. This has led to many deposits, or parts of existing deposits, being viewed as uneconomic. As the mining industry can no longer afford to overlook resources that require finer sizes to achieve liberation or result in high tailings losses so the need for technologies to address these issues has increased.

Mineral Technologies (MT) worked with a prominent Australian iron ore producer over five years to implement gravity separation technology for the beneficiation of ultrafine magnetite. The magnetite mineralization requires a liberation size of <40µm and selective rejection of ultrafine silica prior to magnetic separation.

Through collaboration with our client, MT adapted their Lyons Feed Control Unit (LFCU) technology to beneficiate the magnetite ore. LFCUs are widely used in mineral sands and iron ore gravity plants, and in tailings applications, to recover water and provide constant high density process streams. This project was an extension of knowledge gained from these applications.

Testwork was conducted on-site, in 1 t/h pilot and 300 kg/hr laboratory scale units. The work showed that the LFCUs were rejecting 20% of feed mass to tails whilst recovering >94% of Fe to product. This upgraded the feed from 53.7% Fe & 19.7% SiO_2 to 63.8% Fe & 8.8% SiO_2.

Recovery by size data showed a minimum 88% Fe recovery to product for <8µm material and up to 98% Fe recovery for the -38+25µm fraction. The LFCU rejected 70% of <25µm SiO_2. The information obtained from the tests was used to design the full-scale units which are being installed at the project site in 2021.

This paper outlines the results of this laboratory and pilot scale testwork and how the data obtained was used to design the full sized units.