

REFLUX vs Hydraulic classifier: A comparative analysis for hematite concentrate cleaning

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ABSTRACT

Quebec Iron Ore (QIO), a subsidiary of Champion Iron Limited (Champion), completed the restart of the Bloom Lake iron ore mine located in the heart of the Labrador Trough region of Northern Quebec, Canada in February 2018. Prior to its restart, the concentrator flowsheet underwent major upgrades which brought the iron recovery to the highest of all Labrador Trough operations.

After two profitable years of production, QIO supported by Soutex started to look at technologies to improve its current performance and to integrate into its expansion project flowsheet. From the lessons learned while optimizing phase 1, an improvement opportunity was identified in the addition of a scavenger-cleaner processing stage to increase recovery, produce a higher-grade product, and further improve the stability of concentrate quality. In 2019, the NI-43101 feasibility study for phase 2 expansion, aiming to double the high-grade iron ore concentrate production, was published. Based on the metallurgical test work, the hydraulic classifier was selected to perform the scavenger-cleaning duty for its well establish performance and known behavior at the cleaning step in the phase 1 plant.

To validate the laboratory results, a pilot scavenger-cleaning hydraulic classifier was installed in phase 1. Although the hydraulic classifier was selected for the feasibility study, metallurgical test work performed with the REFLUX classifier showed interesting potential. It was thus decided to also install a pilot RC300 Reflux classifier at the scavenger-cleaning stage in phase 1.

Despite their apparent great similarities, the metallurgical performance was significantly different and many dozens of sampling campaign leading to size-by-size mass balance analysis highlighted the very different nature of both equipment. This article presents the pilot plants result in term of recovery, selectivity, and stability for both the reflux classifier and the hydraulic classifier as scavenger-cleaner at Bloom Lake iron ore concentrator.