**Reprocessing and Upgrading Cassiterite from Tailings using different generations of the Reflux Classifier**

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# ABSTRACT

After mine closure, large volumes of tailings are often discarded, requiring careful disposal and management strategies. Though traditionally considered a waste, tailings often contain residual minerals that can be recovered through beneficiation, leading to more sustainable mineral recovery. These tailings reflect the limitations of 20th century methods of beneficiation. Therefore, innovative methods of extraction are needed to address the challenges encountered during reprocessing. These challenges include the effects of slimes, the broad particle size range, the need for further liberation, and the need to recover down to ~ 10 mm.

This paper investigates the application and continued advancement of a novel gravity separation technology, the Reflux™ Classifier (RC). The device consists of a system of parallel inclined channels above a fluidized bed. Specifically, this work focussed on the processing of fine tailings containing cassiterite (SnO₂), sourced from a NSW tailings dam, addressing a 40-year-old challenge. The feed containing only 0.32 wt.% tin with 50% of the tin below 20 µm. This paper describes recent advances in this technology that leads to higher upgrades and recoveries, and new circuits to fully exploit those advances. A new method for fluidizing the lower zone of the RC led to a step change increase in the mineral grade, achieving upgrades of order ~ 100 folds in the finer sizes, with lower upgrades at coarser sizes due to a lack of liberation. New approaches to achieving liberation, using efficient size classification to prevent excessive generation of fines, are also discussed.