

Paper Number: 1958

The recovery of chrome from spiral tailing dump

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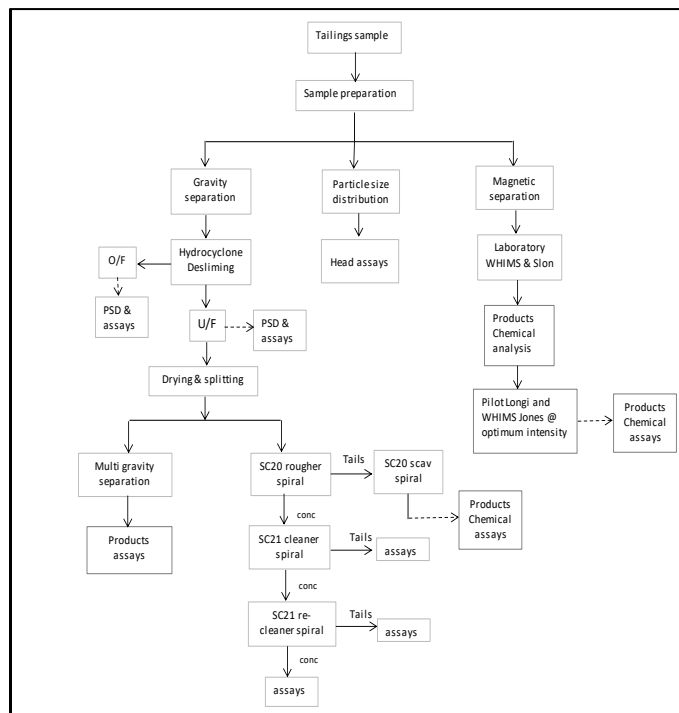
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Chromium is one of the modern industry's essential elements and an important raw material for the production of stainless steel and ferrochrome alloys. South Africa has a substantial resource of chrome, making it the second highest chrome and ferrochrome producer in the world [1].

Numerous dumps in South Africa contain metal grades that can be economically reprocessed, due to demand for the metal and high metal prices. A chrome tailings dump in the Rustenburg area was used for the purpose of this study. Currently they upgrade the run of mine through a spiral beneficiation plant. The tails from this process were used to conduct the recovery tests (see Figure 1).



These tails are currently at a Cr_2O_3 concentration in the range of 24%. The objective of this project was to assess if the -1mm spiral tailings currently stored at the mine can be upgraded to a saleable chrome product (i.e. 40-42% Cr_2O_3) by gravity separation and magnetic separation.

All the magnetic separation equipment tested reported final Cr_2O_3 grade below 40%. Magnetic separation could not reject silica bearing minerals probably associated with FO. Whereas, gravity separation tests conducted show that a 3-cleaner stage spiral can produce a final concentrate at 43.15% Cr_2O_3 , at mass yield of 9.56% and Cr_2O_3 recovery of 18.21%. Shaking table tests reported a final concentrate at 40.56% Cr_2O_3 , 12.77% mass yield and 22.89% Cr_2O_3 recovery.

Figure 1: Summary of tests conducted.

The economic feasibility of the exercise was determined by assuming a million tonne dump [2] and estimations were computed based on gravity separation percentage mass yield from shaking table and 3-stage spiral test work, assuming a feed rate of forty tons per hour [3] plant availability of eighty percent and Cr_2O_3 price of 168 United States Dollar

per tonne, metaloreloy global trade [4]. This paper will present the outcomes of the economic feasibility study for the gravity separation method as a preferred technology for chrome tailings beneficiation. This operation would be economically feasible at a net present value (NPV) of more than R70 million.

References:

[1] <http://www.bdlive.co.za/business/trade/2014/04/10/sa-to-regain-top-spot-in-ferrochrome-production>

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[2] Mular L A and Parkinson E A (1972) Mineral Processing Equipment Cost Preliminary Capital Cost Estimation (13) 310-325

[3] Ruhmer W T (1991) Handbook on the estimation of metallurgical process costs: Mintek Special Publication (14) 134-174

[4] http://www.metaloreloygt.com/industry_reports.html

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