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$_2$O$_3$ 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$_2$O$_3$) by gravity separation and magnetic separation.

All the magnetic separation equipment tested reported final Cr$_2$O$_3$ 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$_2$O$_3$, at mass yield of 9.56% and Cr$_2$O$_3$ recovery of 18.21%. Shaking table tests reported a final concentrate at 40.56% Cr$_2$O$_3$, 12.77% mass yield and 22.89% Cr$_2$O$_3$ recovery.

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$_2$O$_3$ price of 168 United States Dollar
per tonne, metalorelloy 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:


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