

Chromite fines, WHIMS and BOOM/BOOT financial models

MechChem Africa talks to Rudo Engelbrecht of Minprotech about high-intensity magnetic separation of chromite fines in the 38 to 150 µm range, and the advantages for mining companies of adopting Minprotech's BOOM/BOOT expertise to build, own, operate and maintain/transfer processing plants on their behalf.

Minprotech, founded 12 years ago, was the first South African company to use WHIMS (wet, high-intensity magnetic separation) technology on chromite fines on a commercial scale. "We use Australian-manufactured equipment and apply our WHIMS expertise to build and operate successful chromite fines recovery plants. There are now seven operational WHIMS plants in South Africa in our care," begins Minprotech director, Rudo Engelbrecht.

"We are not an Original Equipment Manufacturer. We are an operations company with particular expertise in using WHIMS for fines recovery, most notably, chromite, using a process that we commercialised here in South Africa. Magnetic separation technology has been around for many years, mostly processing mineral sands, but we were the first to specifically test the technology on chromite fines, and as mentioned, we have built our business around building and operating successful chromite fines recovery plants," he says.

By maximising recovery of metallurgical grade chromite from tailings, Minprotech transforms waste streams into valuable resources and significantly reduces the environmental impact of mining, offering a sustainable and cost-efficient approach that is essential for African mining to remain competitive on the global stage.

Chromite, Engelbrecht explains, is paramagnetic, which means it is weakly magnetic. If a wet slurry of chromite fines is exposed to a strong magnetic field, typically in the order 10 000-11 000 Gauss, then the paramagnetic chromite particles can be efficiently separated from the non-magnetic ore. Compared to using spiral or other gravity separation processes, this enables higher percentages of the chromite fines to be recovered.

"The finer the particles the harder it is to recover, regardless of the technology, but from our testing, we found that in the size range from 150 µm down to 38 µm – and even lower with some ore fines – WHIMS magnetic separation outperforms even those spirals specially designed for



Minprotech directors, Werner Otto and Rudo Engelbrecht

ultra-fines that we tested. There is certainly a place for both technologies, though," Engelbrecht explains.

Minprotech's initial market was to recover tailings from waste dumps and tailings dams with unrecovered chromite. In South Africa, there are numerous different chromite containing ore types, including LG, MG to UG platinum group metal (PGM) ores. As well as the target platinum, these different ore bodies have different chrome to iron ratios, so chromite fines recovery depends on the specific ore being mined.

"Increasingly, the fines recovery plant is being added in-line with mainstream ore processing. If a mine has a processing plant treating UG2 PGM ore for example, the finer material can be split off for treatment using a magnetic separation plant, while the course material can be diverted to a conventional gravity separation circuit," he says.

"Recovering all the possible fines on the first pass through the plant is clearly the best approach, since it reduces reclamation and dam costs," he notes, adding that Minprotech's OEM partner, Mineral Technologies also manufactures spirals and a range of different processing equipment to support this in-line recovery approach.

The key to success

Minprotech believes that for minerals processing projects such as these to succeed,

someone with both expertise and a passion for the specific process needs to take ownership of plant processing and recovery efficiencies.

"It has to be someone's baby," Engelbrecht suggests, "This is where we add value. We are not in the business of selling equipment or processing plants. The success of these projects is dependent on taking out tons of valuable material each and every month for the life of the project, and we want to be a part of that, making sure that plants continue to produce the promised recovery rates as efficiently as possible for as long as possible. To achieve this, we are willing to take on the risk for a share of the reward," he says.

"We offer both full responsibility build-own-operate-maintain (BOOM); and build-own-operate-transfer (BOOT) financial models. We fully or partly finance these recovery projects, so a client with a tailings resource or efficiency improvement opportunity does not need to find capital. If the tests prove the viability of using the technology, we are prepared design and build a plant based on sharing the added value produced," he explains.

Since the company's foundation in 2012, Minprotech has invested in seven chromite recovery operations based on this approach; on the Eastern limb of the of the Bushveld complex in the Burgerspoort/Steelpoort

area; and on the Western limb in the Rustenburg area. "Our model is adaptable, though. Some clients have capital available, in which case we can offer process or recovery efficiency guarantees; while others will prefer to finance the plant over a period of time, or from the product produced.

"If the test work and cost analysis is positive, which we can determine at our local in-house pilot plant facility, we are willing to help meet the client's needs in any way they prefer," Engelbrecht assures.

In partnership with Tabono

Rudo Engelbrecht is very excited by the company's latest collaboration with Tabono – a growth partner focused on driving economic development across Africa – which has acquired a 33% equity stake in Minprotech. "Tabono is also very active within the chromite and PGM mining environment. This new partnership allows us to expand our capabilities because of their skill set in big capital projects. We have already collaborated with Tabono on a full run-of-mine and integrated processing project, which includes much more than fines recovery circuits," he says.

According to Tabono CEO, Reon Barnard: Tabono's acquisition demonstrates a com-

mitment to driving Minprotech innovation, sustainability and operational efficiency beyond the borders of South Africa and into Africa. "This deal bucks the broader trend in the African mining sector, where many companies have been slow to adopt new technologies and sustainable practices due to the high upfront costs and uncertain returns," he adds.

Engelbrecht continues: "On the processing side, we are keen to keep accelerating innovation, a sentiment that Tabono shares with us. New technology excites us. We spend a lot of time testing new and more efficient processing solutions, and we are quite keen to implement some of these on a commercial or production scale," he says, adding that the focus will remain on the chromite and PGM space for the immediate future.

"Magnetic separation does not define us, though. We are a contract or owner operator of minerals processing plants, and we do not see a lot of competition in the operator space in South Africa. With sustainability, operating costs and recovery optimisation under scrutiny, we see this as a growth trend, so it is where we want to be," he tells MCA.

"Within the industry and together with



Tabono, CEO Reon Barnard

Tabono, we have significantly more capability, which enables us to offer a much wider variety of different services within the mining industry, all with a view to advancing innovation and sustainability, improving recovery performance and reducing costs," he says.

Minprotech is a 51% black-owned, which underscores its commitment to promoting economic transformation and empowerment in the South African mining industry.

"But we also see opportunities across Africa," concludes Rudo Engelbrecht.

<https://minprotech.co.za>



Minprotech specialises in the use of Australian-manufactured WHIMS magnetic separation technology to build and operate successful chromite fines recovery plants.