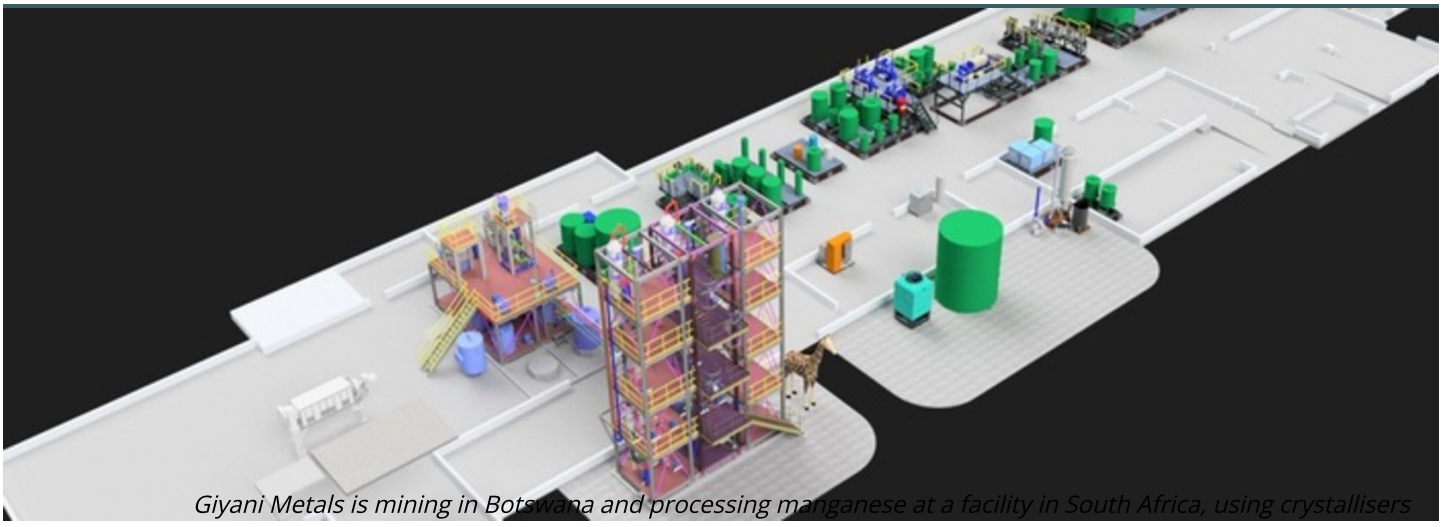
Mining Magazine

Manganese waiting for moment in spotlight

If there's a new metal waiting in the wings for a market explosion, several miners are betting on manganese.



Giyani Metals is mining in Botswana and processing manganese at a facility in South Africa, using crystallisers

Processing > Operational-excellence

Manganese has been lurking beneath the surface and is primed for a massive surge in demand, metal miners and mining analysts told *Mining Magazine.*

Comments

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After years and even decades of minimal manganese production, new companies - including Euro Manganese, Manganese X, Giyani Metals, and American Manganese, among others - are now developing projects to developing the metal.

Vancouver-based Euro Manganese is developing the Chvaletice manganese project in Czechia, which involves the reprocessing of a manganese deposit contained in tailings from a decommissioned mine which operated between 1951 and 1975.

The project's combined Measured and Indicated Resources now amount to 26,960,000 tonnes, grading 7.33% total manganese and 5.86% soluble manganese.

Euro Manganese's pilot plant is expected to begin shortly, and the company recently confirmed receipt of all modules of the demonstration plant.

ıe demonstration plant will produce
rge-scale samples of manganese
oducts. Around 55% of the first-year
oduction at Chvaletice have been
ocated to five customers who have
gned non-binding MoUs.

ıro Manganese is estimating a cost of
pproximately US$5.8 million for the
tal cost of the demonstration plant
ıd cost of operations.

American Manganese is planning to produce manganese as a by-product of its lithium production, through its RecycLiCo patented process. The process will extract lithium, as well as manganese, cobalt, and nickel at its operations.

In August, a test of the demonstration plant attained 163% of designed leach processing capacity of 500 kg per day for lithium-ion battery cathode scraps, American Manganese said.

Manganese X on its way

In Canada, Manganese X is focused exclusively on manganese extraction and production, and is advancing its pilot plant in October.

The Montreal-based company decided to advance the plant in May, which will process manganese produced at its Battery Hill manganese project in New Brunswick.

In May, the company released its PEA for the project, which found an after-tax net present value of US$486 million at a 10% discount rate and an internal rate of return of 25%.

It projects a 40-year mine life with a seven-year stockpile reclaim feed, with a total life-of-mine production of 3.2 million tonnes of high-purity manganese sulphate monohydrate, essential for use in lithium-ion batteries.

Manganese X projects an average annual production of 68,000 tonnes over the course of the life of the mine, with an annual average production of 84,000 tonnes in the first seven years of production.

Battery Hill will be an open pit mine with a total mining rate of 1.0 million tonnes per year, which will provide a mill feed of 365,000 tonnes per year, or 1,000 tonnes per day, Manganese X said. Using a stockpile will allow Manganese X to process higher-grade material early in the mill life, which will sustain mill operations.

To process the metal, Manganese X is using a whole ore sulphuric acid slurry leach which will create a filterable residue. The company will then neutralise the leach solution with a calcium base, which will be concentrated via evaporation. The solution will then be purified through a proprietary selection cation removal process.

Manganese X will then further evaporate the solution to create a crystalline manganese sulphate monohydrate resulting product, which will meet the requirements of battery producers, the company said.

"We take our carbonate and directly, turn it into a chemical compound and it turns into high-purity manganese sulphate monohydrate (HPMSM), crystallised into a pink powder," founder and chief executive of Manganese X Martin Kepman told *Mining Magazine.*

"What we want to be able to do is to produce our end product on a repetitive basis," he said. "We've proved already that we're able to do it on a low-scale test."

Manganese X has been working with research metallurgical company Kemetco Research Inc. for the last four and a half years to develop the process, Kepman said.

The next phase will involve a series of optimisations, he said.

"We are now going into a pilot plant in two phases. The first phase is going to upgrade the technology and reduce the number of processes and get higher purity, and also produce samples of about 25 to 30 kilogrammes or more of end

product of high-purity manganese, in a much more economical way."

The company is avoiding the usual electroplating method, which puts sulphuric acid in manganese and transforms it to metal, due to its environmental impacts using high electricity, Kepman said.

Giyani Metals

Another company is taking a similar route to manganese production.

Giyani Metals is mining in Botswana and processing manganese at a facility in South Africa, using crystallisers.

The process will include a hydrometallurgical process to produce high-purity manganese sulphate monohydrate and high-purity electrolytic manganese metal.

The demonstration plant will be constructed and commissioned in South Africa in the December quarter, and then moved to Botswana after commissioning. Giyani is targeting 2023 for its first shipments to potential customers.

The processes - there's nothing really super fancy about them, other than a crystalliser," Birchall said.

Giyani had considered other options for developing manganese sulphate monohydrate and electrolytic manganese metal, chief executive Robin Birchall told *Mining Magazine*.

"We considered making metal, but then you go back through leaching and run through the process again. While we know it is easier to dissolve the metal and it's much purer and you don't have to do the intermediary steps, we know that the energy consumption for this process is about five times as much if you take this approach," he said.

Giyani also faced a "counterintuitive" choice when deciding on how to fire its crystalliser.

"If you know anything about boilers, a gas-fired house boiler is much more efficient at transferring heat into water than using an electric coil," he said. "Unless you have zero-carbon power, and you have your power plant right next to your project, the carbon units is high, because of the loss of transmission and because of the inefficiency of electric boilers."

In the end, the company is opting to use hydrocarbon boilers because it emits much lower carbon, Birchall said.

According to Minviro, which Giyani appointed to provide a Life Cycle Assessment, the carbon footprint of the project will be "extremely low," Birchall said.

"If you compare us to [Chinese manganese production], we're going to be one quarter or less of carbon kg per tonne of product."

Market explosion

Giyani Metals and Manganese X are both well-positioned in the market, CPM Group analyst Andrew Zemek told *Mining Magazine*.

The demand for electric vehicles - and the batteries that power them - is expanding at rapid pace, and manganese is an important part of these batteries.

"The 2020s will be the decade of manganese," Zemek said. "It might be a decade of cobalt-almost free manganese-rich electric vehicles," if cobalt becomes too problematic to supply.

Since September 2020, at least six major companies - including Stellantis, Tesla, and Mitsubishi - have committed themselves to manganese-based batteries, he said.

The other wild card is China, which currently produces 92% of high purity manganese used in lithium-ion batteries.

"All these [EV] producers don't want to be over-reliant on a single country [China] for their raw material and find themselves cut off from their suppliers if the political situation changes [conflict over Taiwan]. There's another phenomenon developing in the industry - a non-Chinese premium," Zemek said.

"From anecdotal evidence, we can see in Europe, buyers are willing to pay 15 to 20% for similar specifications or better if it doesn't come from China, and comes from a reliable source."