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MEXICAN MINERALS

SENSOR-BASED SORTERS ENABLE MINERS TO PROCESS ORE FASTER

Staff Report

Throughout history, miners have continually sought to improve the efficiency of extracting ore, and thankfully, today, advancements in computerized and automated-mining techniques are allowing the industry to keep pace with an ever-increasing demand for the world's resources.

One of these advancements involves the increased reliance on sensor-based sorting machines and while ore sorting is certainly not a new concept, these newer systems are now delivering impressive returns to many mining companies.

The primary objective of ore sorting is to remove waste rock before valuable time and money is spent processing it and until the mid-twentieth century that process was simply carried out by hand. Today, however, thanks to companies like Tomra Systems of Norway a keen eye has been replaced with sensor technologies capable of recognizing and separating waste rock based on a variety of physical characteristics including conductivity, transparency, shape, colour, brightness or atomic density.

Founded in 1972, Tomra Systems is now one of the world's leading sensor-based solution companies. Its first systems focused on collection solutions delivering automated equipment to grocery retailers and beverage manufacturers for handling bottles and packaging returns. This segment still represents approximately 60% of their business.

In 2004, Tomra began developing and installing sorting applications for use in the recycling industry for material recovery facilities, scrap dealers and metal shredder operators. They also found application in the food growing, packing and processing industry. It also found application in the food growing, packing and processing industry.

Today, however, the company has moved forward into the mining industry and now claims to have more than 200 mining installations around the world.

One of the first mining applications for sensor-based sorting was in the diamond industry.

According to the company, its sensor-based sorting systems were capable of scanning each individual rock processed at a diamond mine to determine if the rock was waste material or mineral bearing. A combination of sensor-based sorting technologies – one using colour and near-infrared spectroscopy (NIR) scanning and the other X-ray transmission (XRT) – significantly improved diamond recovery, reducing diamond breakage and reducing overall energy consumption.

Once the desired rocks were identified, the physical sorting process was applied, where the rock was ejected by means of compressed air nozzles.

Currently the same technology is being applied beyond gems to the sorting of base and precious metals. Crushed rock is fed into the system, scanned and sorted. By removing the lower grade waste, a significantly higher grade ore is fed to the mill.

For miners this provides three game-changing outcomes; the first being a significant reduction in upfront capital expenditures. By processing higher grade material, smaller plants can now be utilized to deliver larger amounts of metal.

Once in production, operators can drive high margins through the reduction of energy, water and reagent costs. Tomra points out that the mining industry consumes 2%-3% of the world's energy. That's the same amount of energy used by the entire airline industry. Their sensor-based sorters can reduce that energy consumption by 15%, as well as reduce the amount of water used by

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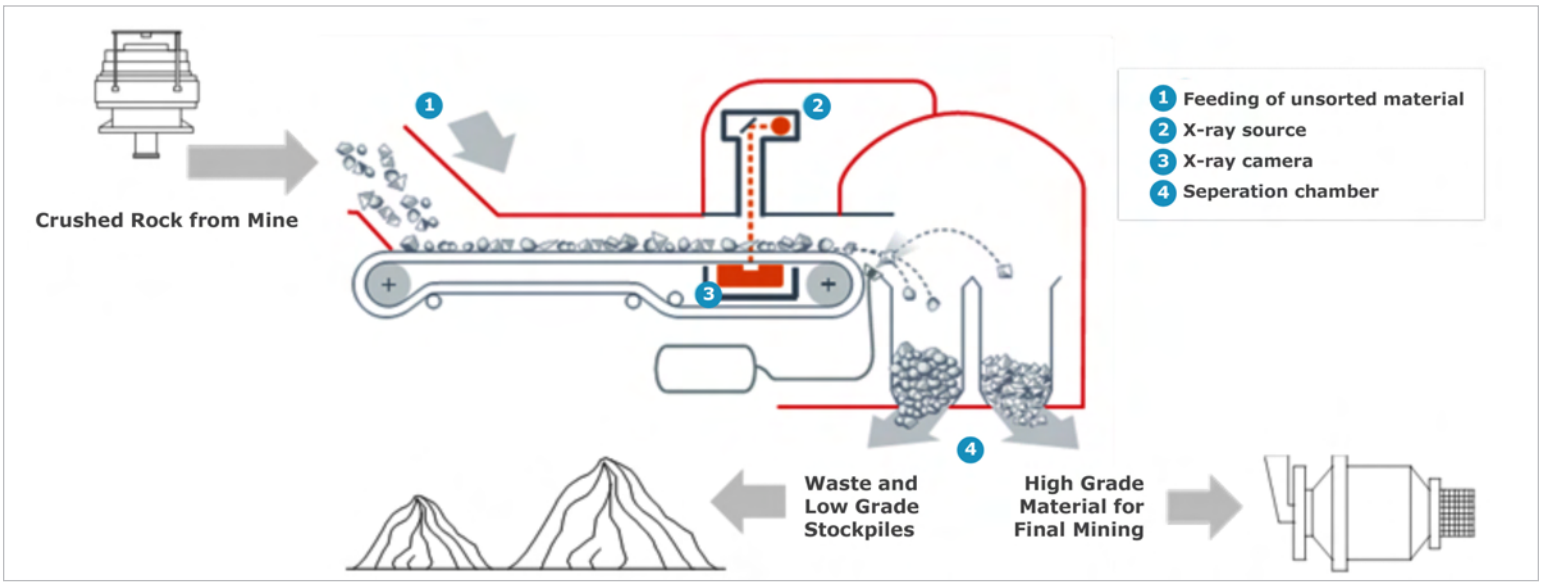

three to four cubic meters per ton of ore.

Finally, miners can now revisit lower grade resources which may have initially been considered unprofitable. Many companies are now taking a fresh new look at their projects to optimize their opportunity in an ever-changing financial climate.

One such company is Toronto based **Minera Alamos Inc.** (TSXV : MAI). The company is currently advancing their Mexican copper project, Los Verdes, towards a production decision by year end.

"Los Verdes is a modestly sized project with outstanding ore grades" said Minera Alamos CEO Chris Frostad. "By applying sensor-based sorters to the process we are able to super charge the economics of the project and deliver the results of a much larger mine".

The project was originally designed to mine and process approximately 3,000 tonnes per day (tpd) of rock with an estimated start-up cost of just over $90 million. With an internal rate of return of approximately 34%, Los Verdes looked to be an attractive project.

Earlier this year, however, Minera Alamos went back to the drawing board to determine if there might be a more attractive approach to the project. They considered a much smaller operation (400-500 tpd), a higher cut-off of their resource and the application of Tomra's X-ray transmission (XRT) sorting process.

Apparently the early results were staggering. The newly sized plant could potentially be constructed for one tenth the cost while the copper concentrate production rate dropped by only one half. The rate of return for this project is expected to increase exponentially.

"We currently have samples at Tomra's lab in Australia where they are determining exactly how effective the sensors will be in differentiating and sorting the ore" says Frostad. "Based on tests we performed a few years ago, we are hoping to double our ore grade prior to processing".

The Los Verdes South deposit currently has measured and indicated resources of 7.71 million tonnes grading 0.64% copper, 0.12% molybdenum, 4.74 g/t silver and 0.07% tungsten. The company is also drilling 1,400m at its North deposit to extend Los Verdes' life by more than 10 years.

"The mine life issue is really why we are drilling right now. We bought the North area a few years back, which historically had better results during private mining. It had similar grades, a cleaner concentrate and it was easier to access," said Chris Frostad. "And the area is open so there's potential to add more mill feed, and there's also a promising induced-polarization anomaly south of there that's more intense than both of the past-producing deposits."

The North deposit also hosts a historic resource at the past-producing Buenavista mine of approximately 1.1 million tonnes of 0.5% copper and 0.1% molybdenum.

But the question remains; with such economic potential, why is ore sorting only now attracting more attention?

The answer comes down to speed.

First developed in the 1970's the primary drawback of sensor-based sorting was processing speed. First generation systems simply were not economically feasible for most mining applications.

Today, however, the reliability and speed of computer processing has removed that barrier. Imaging and assay technics have improved thus delivering higher throughput and more accurate density measurements have allowed for the processing of smaller particles.

Beyond its financial benefits, sensor-based sorting also delivers an environmental advantage. First, it is a completely dry and chemical free process. Second, it ultimately reduces the amount of processed tailings thereby requiring smaller tailings containment and treatment facilities.

Sensor-based machines sales in mining are expected to grow at around 15% per year, however, they do point out that growth will be contingent on new applications and the development of new technologies.

Sensor-based sorting like that at Minera Alamos' Los Verdes mine in Mexico is still a technology yet to be fully accepted by the mining industry but the need for more financially effective approaches should continue to draw more attention in the future because of economic benefits. ■