

Optical, electromagnetic and X-ray sorters improve efficiencies for the mineral industry



Containerized sorter.

By Lisa Fattori

Commodas Inc., a wholly-owned subsidiary of Norway-based TiTech Visionsort AS, is a leading provider of sensor-based electronic sorters for the mining industry. Recently, the company merged with UltraSort of Australia, to provide customers with a more extensive product line and enhanced services in custom sorting systems.

Active in sensor-based sorting of bulk materials since 1993, Commodas expanded operations and set up a Toronto-based office,

in 2007, to service the North American market. The company's sorting applications increase efficiencies and lower a mine's environmental footprint in the extraction of diamonds, gem stones, gold, platinum and other minerals. Optical, Electromagnetic (EM) and X-ray Transmission (XRT) sorters enable operators to separate waste rock from raw minerals, prior to the milling process, which increases yields and reduces operating costs.

"The grinding down of materials consumes about 70 per cent of operating

costs," says Lütke von Ketelhodt, general manager for Commodas Inc.'s North American operations. "If you can remove 20 per cent of waste rock up front, then you save a lot in energy. Also, you have fewer tailings and the waste rock can be used as a by-product, such as gravel for road construction."

The unique characteristics of a mine – its location, climate, topography and minerals – all determine the sorting system that is best suited to the operation. Commodas' sorters are equipped with



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Kai Batram

leading-edge detection techniques that include RGB colour cameras, X-ray transmission technology, electromagnetic sensors and near infrared sensors. With the addition of Ultra Sort's X-ray fluorescence technology for diamonds and radiometric sensor technology for uranium ore sorting, the entire range of sensor sorting technologies can be offered from one company.

"UltraSort has complementary technology, which makes the company a perfect



Lütke von Ketelhodt

fit with Commodas," von Ketelhodt says. "We're taking the best designed machines and the best sensors of both companies to create brand new equipment, as well as new software."

Chute-fed or belt-driven sorters can sort material from 1 mm to 300 mm in size. For very deep mines, the sorter can be placed underground near the shaft, where waste rock can be discarded. By keeping waste rock underground, only higher grade material is hoisted, which improves

the shaft capacity, and reduces surface rock dumps and tailings dams.

Sorting also reduces crushing requirements, by removing up front waste that is up to 200 mm in lump size. As a result, processing plants will receive consistent higher grade material. Greater throughput and higher grades recovered, in turn, lead to greater efficiency in extracting higher concentrate grades.

Southern Africa's mining industry has been using optical sorters since 2002, with applications ranging from gold, platinum, coal, limestone diamonds and tanzanite. In Germany, underground sorters are used in mining salt, and the technology is easily transferable to the mineral industry, which will be attractive for deep-level mines. With an office now in Toronto, Commodas is actively bringing its expertise in optical and X-ray sorters to North American mining companies so that they, too, can enjoy the economical and environmental benefits of electronic sorting systems.

"We're saying, 'let's give you a high-grade resource and leave the waste rock in the ground,'" von Ketelhodt says. "An in-situ resource underground will always have varying grades. During the mining opera-

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tion, waste rock dilution from hangingwall and footwall is inevitable. When placing a sorter between the mine and the mill, operators will be able to remove this waste and supply their plants with a consistent grade. Down-stream plants will then operate far more efficiently.”

Optical sorters involve linescan cameras and complex sorting software and hardware equipment. These sorters can separate minerals and waste rock if there are sufficient colour differences visible on the clean surfaces of the rock. For example, calcium carbonates (white) can be distinguished from shale (brown).

With the latest XRT sensors, the sorter generates X-ray images of each and every rock flowing through the sorter. One literally looks inside rock to determine its composition and the presence or absence of especially dense metal-bearing minerals.

In the optical sorting process, it is important that the rock goes through a washing screen, which enables the sensors to differentiate between colours of the clean surfaces of the feed material. After the colour-evaluation of each particle, which is a process happening in milliseconds, a valve bank of approximately 165 valves is used to eject rock across a splitter plate, resulting in two streams – mineral product and waste rock. Prior to designing a sensor system, Commodas performs a test program for a client, to determine whether an optical, EM or XRT sensor is best suited to the project.

Canada’s climate plays a key role in determining the design of the best sorting system at a particular mine. “We are working with a gold mine in northern Ontario, in the Timmins area and, while the optical sorter works very well, in winter the water required for the washing process freezes. This means that the mine can only sort when temperatures are above freezing, or adequate infrastructure/housing would

have to be built to handle such harsh conditions. The XRT sorter, on the other hand, doesn’t require the washing stage, so it can be used in all weather conditions. However, not all applications are suitable for XRT sorting.”

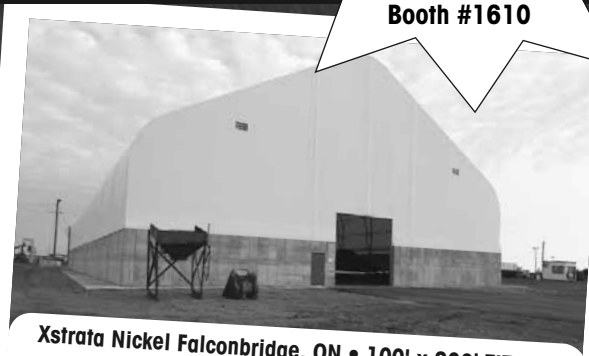
In 2007, Commodas’ sorting equipment was used to separate high-grade talc from waste material at Dynatec’s waste dump in Madoc, Ontario. Upon completion of the project, the plant was moved to Lakefield, where SGS Mineral Services offers sorting tests for mining companies. The two-camera optical sorter performs double-sided scanning on samples with a particle size range from one to three inches. SGS provides clients with a report that includes the sorting results, as well as SGS chemical and metallurgical analysis.

A further example is nickel ore. Samples tested from a Sudbury Basin nickel mine have shown that 30 per cent of the Run of Mine material was waste rock, and could be ejected using the XRT sorting process. The remaining nickel was upgraded significantly. Sorting and dumping the waste rock at the shaft will considerably reduce transportation cost of the upgraded nickel ore to the distant processing plant. In many instances, mineral reserves that were previously uneconomic are now viable projects, which extend the life of the mine.

“Mining companies are much more profitable, when they can squeeze valuable minerals from what would otherwise be considered waste rock,” von Ketelhodt says. “Sorting systems provide other economic benefits, including lower transportation costs and a reduction in the use of chemicals and water. The opportunity to extract a higher concentration of minerals also extends the life of a mine, which provides companies with a better return on their investment.” ☒

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