In this article, the implementation of a technology called sensor-based sorting technology is briefly described from different perspectives. This technology can be used for the identification of individual particles in order to sort wanted material from unwanted material in the mining and mineral processing industry.

Today, the sorting technology is widely used in different industries such as the food industry, the recycling industry, and to some extent also in the mining and mineral processing industry.

Benefits
If fully implemented in the mining and mineral processing industry several critical areas can be improved. For example both energy and water consumption can be decreased and the life time of mineral reserves can be increased.

Simplified, the overall benefit of sorting technology can be explained by the principle that “the elimination of waste at any cost less than the total milling cost will show profit”. (Mathews, 1974)

Since the processes downstream from the sorters (i.e. milling and flotation processes) by their nature have a high consumption of both water and electricity, attempts to pre-concentrate the feed with the help from sorting machines have the potential to be profitable.

Summarized, sorting can help overcome several critical areas within the modern mining and mineral processing industry:

- Less energy and water consumption
- Increased life time of mineral reserves
- Lowered environmental impact
- Increased economic profitability

Application areas
The general objective of sorting is divided into three main application
areas; pre-concentration, concentration and salvage. Pre-concentration is used in an early stage after the first or second crushing stage with the purpose to upgrade and produce a smaller bulk for further processing. Pre-concentration is suitable for processing base metals, precious metals and fuels. (Manouchehri, 2003)

**History**

Sorting has been used in mineral processing since the Stone Age and until modern time sorting has been carried out by hand to sort out valuable material from unwanted material. During the twentieth century ore grades and liberation sizes decreased, the scale and economics of processing operations changed, and new technology was introduced. By the late 1960’s and early 1970’s hand-sorting was largely abandoned since it had become impractical, impossible or too expensive. (Salter & Wyatt, 1991)

**Present situation**

In both the mining and mineral processing industry, and in the industrial minerals industry, sorting machines are today most commonly used for the sorting of diamonds and different industrial minerals. Also fuels (coal and uranium), precious metals and base metals are sorted by sorting machines, but in a very limited scale. However, with the rapid development of new sensors new commodities can be processed and old commodities can be sorted in new ways.

The number of sorting machines that are operational in the world differs depending on both the application area and on the source of information. According to estimations from different manufacturers, approximately 300 sorters were operational in the mineral processing industry by 2009. (Bergman, 2009) An assumptions is that the total number of sorters, today is slightly higher.

According to one of the largest manufacturer of sorting machines, approximately one hundred of their sorting machines are in use in the diamond industry today. The same manufacturer estimates that about 30 of their sorting machines are used for the sorting of different base and precious metals.

**Estimated potential**

Sorting technology has an enormous potential both as a pre-concentration method (i.e. the sorting
of base metals, precious metals and fuels) and for intermediate and finished product production (i.e. diamonds and industrial minerals). Sorters are already in use for both pre-concentration applications and for intermediate or finished product production. With a short time perspective, the market potential is estimated to be high when it comes to applications for industrial minerals and diamonds. With a long term perspective, the market potential is estimated to also be high when it comes to the use of sorters as a pre-concentration method.

Conclusion

The overall conclusion for the implementation of sensor-based sorting technology in the mining and mineral processing industry is that the potential is high, but hard to quantify, and due to several reasons not yet fully utilized.

References


