

Metso

Leading-edge technology increasing
overall value of ore deposits

Sensor-based particle sorting solutions





Sustainable use of Earth's natural resources

Metso particle sorting solutions remove waste from the ore feed in your crushing and grinding circuit, increasing productivity and significantly reducing energy and water consumption. This is vital at a time when declining ore grades – coupled with high energy and production costs, water shortages, and stricter environmental regulations – are creating increased pressure on the mining industry.

Benefits

- Increase the head grades
- Decrease milling costs based on metal in concentrate production
- Increase in-situ value of deposit
- Reduce energy consumption
- Increase efficiency of water use
- Reduce amount of fine tailings



Sorting of orogenic gold deposit (left to right): feed, accept, reject

Increase energy efficiency and life-of-mine in a challenging landscape

Almost half of the energy consumed in the mining industry results from crushing and grinding operations. Together with declining ore grades and water shortages, this means that innovative, sustainable process solutions are urgently needed to improve efficiency and meet ever-stricter environmental regulations in both greenfield and brownfield operations.

Thanks to rapid development in established sensor technologies, sensor-based particle sorting is capable of transforming the outlook for the mining industry. By combining particle sorting technology with Metso's comprehensive process knowhow, plant-engineering expertise, and leading technology, we can offer the

most productive and sustainable process solutions for customers in the base and precious metals segments.

Reliable and cost-effective solutions

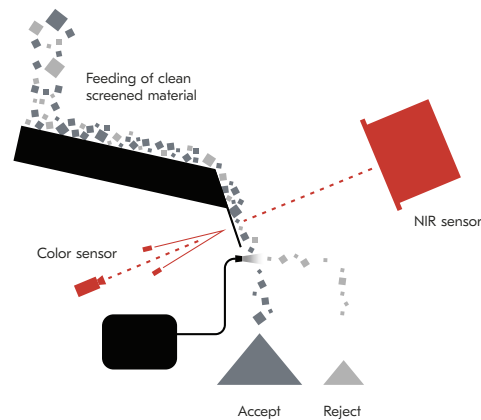
User-friendly, reliable, and low-maintenance technology is designed to meet the demanding uptime and durability requirements of your mining project. Wear is limited to a small number of parts, enabling your personnel to perform basic maintenance onsite.

Sorting equipment is easy to integrate into your process. It includes a secure data connection for software updates and remote access for performing diagnostics. Our solutions are designed for high performance in a wide range of operating conditions.

Sensor-based particle sorters are cost-effective, as they require no chemicals and minimal water – only electricity and clean pressurized air are needed.

Sensor-based ore sorting
increases your productivity

Sensor-based sorting



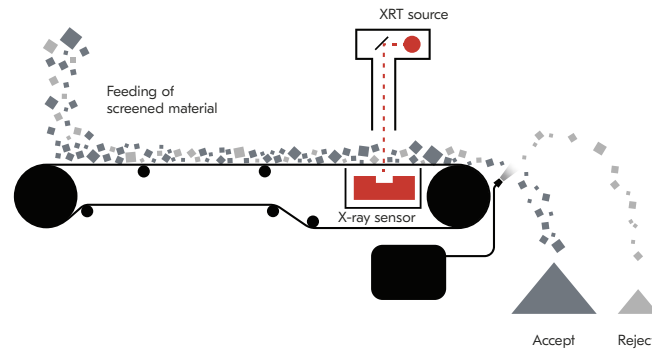
Sorting is used at mine sites to separate waste from ore. The rejected waste rock can be sold as aggregate to local markets. Sensor-based ore sorting consists of the following sub-processes:

Material preparation

Particles are crushed and screened for applicable size, typically in the range 10–150 mm, with a maximum to minimum size ratio of 1:3.

Material presentation

Individual particles need to be presented to the sensor system. Typically, this is done using vibrating feeders followed by a chute or fast-moving conveyor belt.



Sensor detection

Sensors are essentially divided into two different system types:

- Reflection systems including technologies such as optical cameras that identify particles based on surface properties.
- Transmission systems such as X-ray transmission that detect particles based on density differences.

Data processing

The data received from the sensor system needs to be processed in real time. Data processing makes the “yes or no” ejection decision for each particle.

Physical separation

After decision-making the particle to be separated is selectively ejected by air jets that push the particle out of the main stream.

Sensor types

Working with global particle sorting companies, Metso can offer a versatile combination of solutions for a broad range of sorting tasks.

Color recognition

Typically used for separation of low-grade and contaminant particles our color camera capabilities include visible spectrum, infrared, ultraviolet and others.

Near infrared (NIR)

Near infrared (NIR) sensors recognize materials based on unique spectral properties of reflected light. NIR sensors can be used to differentiate between minerals.

X-ray transmission (XRT)

XRT technology separates material based on its specific atomic density. This leads to higher purity levels, regardless of moisture or dust and can be used to detect sulfide inclusions.

Electromagnetic sensor (EM)

The highly sensitive EM sensor sorts materials based on electromagnetic properties, including conductivity and permeability. This sensor is suitable for applications such as sulfide ores and metal slags.

Photometry (PM)

The PM sensor uses laser attenuation and photo multiplier reflectance. It sorts material based on color, structure, size, and shape differences and can be used as a supplementary detector to complement other sensors.

Metso's sensor-based ore sorting product portfolio



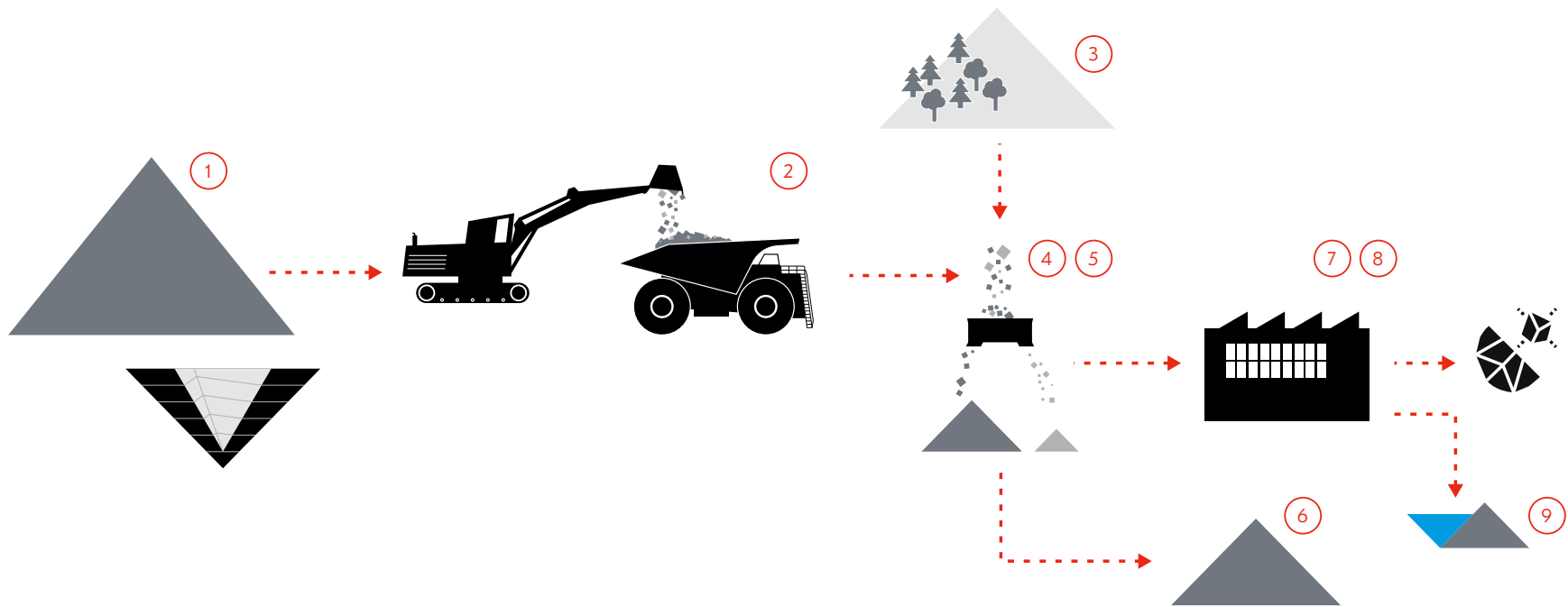
Metso can fulfill your sorting needs, from equipment-only through complete sorting and mineral processing solutions. Metso works with global sensor suppliers to package the right sensor for your application.

Turnkey sorting plant solutions

Metso has the expertise and capability to design, supply, and build state-of-the-art sorting plants. The Metso process expertise can connect the sorting solution to the plant design, identifying opportunities for process efficiencies, savings, and maximizing product production. Our global presence means we can provide for customers worldwide during the entire offering lifecycle.

We can provide the following for green and brownfield mining projects:

- Assistance in ore sorting test-work and sample selection
- Ore sorting test works
- Conceptual studies for sorting plant
- Ore reserve evaluation and mine planning
- Downstream process optimization
- Basic and detail engineering for sorting plant
- Process equipment and consultation
- Automation and instrumentation
- Construction, installation, and commissioning services
- Operation and maintenance services



Sorting solutions add value throughout your mining process

1. Increase minable tons

Sensor-based ore sorting rejects waste rocks from run-of-mine ore. This enables mining with a lower cutoff grade, which means beneficiation of more diluted ore with lower ore loss in mining.

2. Decrease haulage costs

Sensor-based ore sorting reduces ore transportation costs per ton of produced metal when a sorting plant is installed at the mine.

3. Reclaim old waste dumps

Many waste and mine-development dumps are marginal reserves. These can be upgraded to ore-grade material and converted to cleaner waste material by using sensor-based ore sorting.

4. Divert ore types

Our sorters allow you to separate ore types based on their characteristics. Treating different ores separately can increase recovery and concentrate grades.

5. Access additional sources of revenue

Once separated, coarse waste can be sold as aggregate to local markets, offering an additional source of revenue.

6. Increase productivity

Boost concentrate production by replacing rejected waste with higher-grade feed ore to the mill.

7. Reduce energy consumption

Waste rejection before the mill reduces your energy consumption and carbon emissions per ton of produced metal in concentrate.

8. Reduce water consumption

Using sensor-based ore sorting technology reduces your water consumption per ton of produced metal in concentrate.

9. Reduce mass of fine final tailings

Rejecting waste from ore at an early stage in the processing circuit allows the mass of fine final tailings to be reduced, which in turn reduces the space required for tailings storage and the related costs per ton of produced metal in concentrate.



First-class customer service – worldwide

Metso creates sustainable and reliable life-cycle solutions to ensure the best return on your investments.

Through our global network of service centers in more than 25 countries, we provide life-cycle service solutions from spare parts, maintenance, and technical service to modernizations and O&M agreements. Our ambition lies in maximizing productivity, while providing optimized and sustainable solutions for plant specific needs:

- Unparalleled service expertise and experience
- Certified Best Available Techniques (BAT)
- Improved equipment and environmental efficiency, reliability, and safety
- Optimized operating costs

Metso has a worldwide network of service engineers with in-depth experience in the mining industry. We can accurately configure and adjust our high-performance systems to ensure maximum output and trouble-free operation.

Metso is a frontrunner in sustainable technologies, end-to-end solutions and services for the aggregates, minerals processing and metals refining industries globally. We improve our customers' energy and water efficiency, increase their productivity, and reduce environmental risks with our product and service expertise. We are the partner for positive change.

metso.com

