T.K.O ENGINEERING cc

Go-Belt® SAMPLING SPECIALISTS

Why Sampling Is Critical to Ore Sorting Success

Accurate Sampling: The Key to Validating Ore Sorting Performance

Sensor-based ore sorting is rapidly transforming the mining industry.

By rejecting waste material before it enters the processing plant, ore sorting has the potential to reduce energy consumption, lower operating costs, increase plant throughput and improve project economics.

However, the success of any ore sorting operation depends on one critical factor:

Can the sorting performance be accurately measured and verified?

The answer lies in representative sampling.

Without accurate sampling of feed, product and reject streams, it becomes extremely difficult to determine whether an ore sorter is delivering the expected economic and metallurgical benefits.

In many cases, representative sampling becomes the foundation upon which the entire ore sorting business case is built.

Understanding Ore Sorting

Ore sorting systems use sensors to identify differences between valuable ore and waste material.

Common technologies include:

- X-Ray Transmission (XRT)
- X-Ray Fluorescence (XRF)
- Near Infrared (NIR)
- Laser-based systems
- Optical sorting systems
- Electromagnetic sensors

These systems analyse individual particles and separate material into:

Accepted Material

Material sent for further processing.

Rejected Material

Material discarded as waste.

The effectiveness of the sorter is determined by how accurately it separates these streams.

Why Measurement Matters

An ore sorter can only create value if it:

- Rejects waste material
- Retains valuable minerals
- Improves feed grade
- Maintains acceptable recovery levels

To verify these outcomes, operators must accurately measure:

- Feed grade
- Accepted product grade
- Reject grade
- Mass recovery
- Metal recovery

Each of these calculations depends on representative sampling.

The Challenge of Heterogeneous Ore

Ore sorting is most effective when there is significant variability within the ore stream.

This means that:

- Some particles contain valuable minerals.
- Some particles contain little or no value.
- The distribution of value is uneven.

While this variability makes sorting possible, it also makes accurate sampling more challenging.

Small samples may fail to capture the true composition of the material stream.

Sampling systems must therefore be designed to account for the natural variability of sorted material.

Sampling the Feed Stream

The feed stream establishes the baseline against which sorter performance is measured.

Representative feed sampling provides:

- Initial grade determination
- Ore variability assessment
- Sorter performance benchmarking
- Metallurgical accounting reference data

If the feed sample is biased, all subsequent performance calculations become questionable.

Sampling the Accepted Product

The accepted product represents the material that will continue through the processing plant.

Sampling this stream allows operators to determine:

- Grade improvement
- Upgrade ratio
- Product quality
- Downstream processing potential

Without accurate sampling, the true value created by the sorter cannot be measured.

Sampling the Reject Stream

The reject stream is often the most critical stream to sample.

Why?

Because it reveals:

- Valuable material lost to waste
- Sorter misclassification
- Recovery performance
- Economic losses

Even small losses of valuable material can significantly impact project economics.

Representative reject sampling is essential for understanding whether the sorter is performing as intended.

Metallurgical Accounting and Ore Sorting

Modern mining operations increasingly rely on metallurgical accounting systems to track metal movement throughout the process plant.

Ore sorting introduces additional streams that must be accurately measured.

Representative sampling supports:

- Feed accounting
- Product accounting
- Waste accounting
- Recovery calculations
- Reconciliation

Without reliable sampling data, metallurgical accounting becomes increasingly difficult.

The Cost of Poor Sampling in Ore Sorting

Poor sampling can create misleading conclusions about sorter performance.

Potential consequences include:

- Overestimated recoveries
- Underestimated losses
- Incorrect grade calculations
- Poor investment decisions
- Misleading performance reports

In extreme cases, an operation may incorrectly conclude that an ore sorter is successful—or unsuccessful—simply because the sampling programme does not accurately reflect reality.

Why Automated Sampling Matters

Manual grab sampling is rarely sufficient for evaluating ore sorting performance.

Automated sampling systems provide:

- Repeatability
- Consistency
- Reduced operator bias
- Improved sample integrity
- Reliable long-term data

For high-value commodities, automated representative sampling often becomes a critical component of any successful ore sorting programme.

The Role of Go-Belt® Sampling Systems

Go-Belt® Sampling Systems provide reliable, representative sampling solutions for conveyor-based material streams.

When applied to ore sorting operations, Go-Belt® systems can support:

- Feed sampling
- Product sampling
- Reject sampling
- Metallurgical accounting
- Recovery analysis

- Performance validation

By ensuring that each stream is sampled accurately, operators gain confidence in the data used to evaluate sorting performance.

Looking Ahead

Ore sorting will continue to play an increasingly important role in the future of mining.

As operations seek to reduce energy consumption, improve sustainability and increase resource utilisation, the ability to accurately measure sorter performance becomes more important than ever.

Representative sampling is not simply a supporting activity.

It is a critical component of ore sorting success.

Without accurate sampling, there can be no reliable assessment of grade improvement, recovery performance or economic benefit.

Confidence in the sorter begins with confidence in the sample.

About T.K.O Engineering

T.K.O Engineering CC specialises in the design, manufacture, installation, commissioning and maintenance of Go-Belt® Sampling Systems and mineral processing support equipment.

With more than 35 years of industry experience and over 100 successful installations, T.K.O Engineering provides representative sampling solutions that support accurate metallurgical accounting, process optimisation and operational confidence.

Go-Belt® Sampling Specialists

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