SENSOR-BASED SORTING FOR MINERAL PROCESSING

How to increase the efficiency of a mining operation which aligns with ESG principles

STEINERT

MAGNETIC + SENSOR **SORTING SOLUTIONS**

PROFITABILITY AND ESG PRACTICES GO HAND IN HAND

Sensor-based sorting for minerals and ores is a strong solution to many ESG (Environmental, Social and Governance) issues. The ESG framework is used to evaluate a company's environmental, social, and governance practices. Sensor-based sorting can help mining companies to improve their environmental performance by reducing the amount of waste material generated through various processes. This can result in significant energy savings and reduce the environmental impact of mining.

Additionally, sensor-based sorting can improve the social and governance practices of mining companies by increasing the efficiency and profitability of their operations, which can lead to greater social and economic benefits for local communities. By implementing sensor-based sorting technology, mining companies can help create a more sustainable and responsible approach to mining and minerals processing which aligns with ESG principles.

// **Furthermore, dry sorting in mining is considered better than wet separation for several reasons:**

+ it does not require any water
+ it requires less energy, which reduces the carbon footprint
+ it is known for producing higher recovery rates
+ it is less opex intensive

Overall, dry sorting is considered a more efficient, cost-effective, and environmentally friendly approach to mineral processing compared to wet separation.

THE FIVE SBS OPERATIONS

Sensor-based sorting can be applied for various operations to improve efficiency, reduce costs, increase profitability, and minimise the environmental impact of mining:

+ ROM pre-concentration
+ low grade ores (below cut-off)
+ reduction of tones transported to processing plant
+ final concentration (rougher and cleaning stage)
+ stockpile treatment / secondary mining

Two STEINERT XRT sorting systems in a gold mine in Africa

Various STEINERT KSS | XT CLI in a chromite mine in Brazil

STEINERT KSS | XT CLI in UAE

STEINERT KSS | XT CLI in a fluorite mine in Mexico

STEINERT KSS | XT CLI working under harsh and remote conditions

STEINERT KSS | NR CL pre-concentrates white dolomite

INNOVATIVE CUSTOMERS AROUND THE GLOBE –
Committed to a world of infinite resources

Country	Resource	Benefits	Sorting Systems
Australia	Nickel	Nickel sulphide pre-concentration for low grade stockpiles	STEINERT KSS® | XT CLI
Australia	Gold	Dry pre-concentration	STEINERT KSS® | XT L
Brazil	Chromite	Commercial value: chromite ore 37% of the Cr_2O_3	STEINERT KSS® | XT L
Brazil	Zinc	Waste removal with ESG goals in mind (energy and water reduction)	STEINERT KSS® | CLI
Canada	Copper, Nickel	Upgrading low grade ore	STEINERT KSS® | XT L
Chile	Copper Oxide	Dry process, pre-concentration for low grade stockpiles	STEINERT KSS® | CL
Kazakhstan	Phosphates	Dry processing of phosphates	STEINERT XSS® T EVO 5.0
Mexico	Fluorite	Producing different grades	STEINERT KSS® | CLI
Mexico	Manganese	Dry processing of Mn, Si and Fe, waste removal and grade generation	STEINERT KSS® | XT LI
Namibia	Gold	Doubles the grade	STEINERT XSS® T EVO 5.0
Brazil	Lithium	Pre-concentration and cleaning stage of final product	STEINERT KSS® | XT CLI
Peru	Gold	Upgrade low grade stockpiles	STEINERT KSS® | XT CLI
South Africa	White Dolomite	Zero chemical and dry processing, with high quality product	STEINERT KSS® | NR CL

EASY TO HANDLE AND LOCAL SUPPORT

Gold producer QKR doubles the grade with sorting technology

Video
Gold mine
QKR

The interesting thing about the sorting technology is that it runs at only 1/5 of our conventional operating plants' operating costs.

The technology was easy to work with. STEINERT training packages and field support were key to preparing our operations and maintenance team for a smooth transition from installation to operations.

In general, we double the grade of our input material and that is where the value is generated.

HILDEBRAND WILHELM
Metallurgist by profession and the ore processing manager at QKR in Navachab (Namibia)

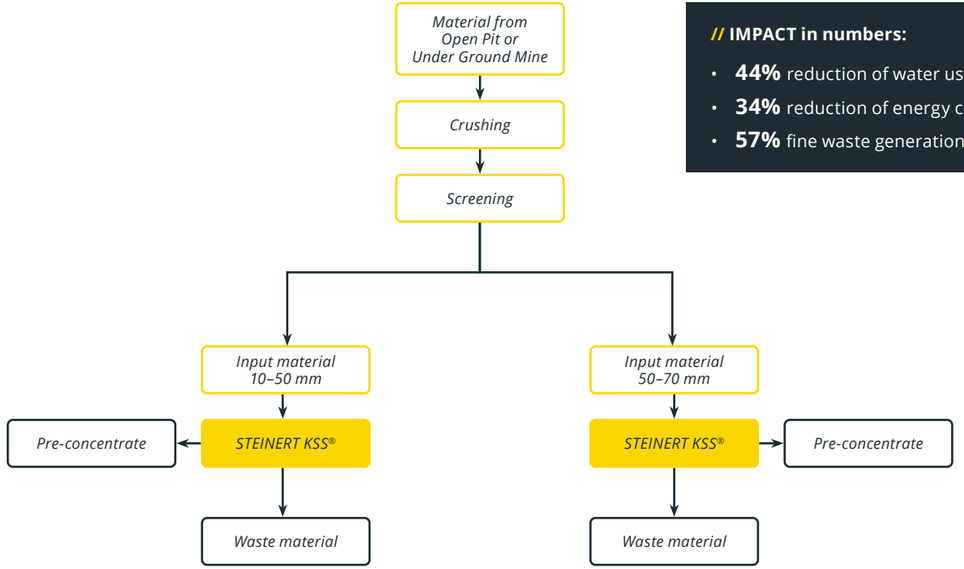
ROM PRE-CONCENTRATION

Separate waste and low-grade ore from the ROM stream at the beginning of the processing plant


Copper input 10–50 mm


Copper oxide waste 10–50 mm


Copper oxide product 10–50 mm



// IMPACT in numbers:

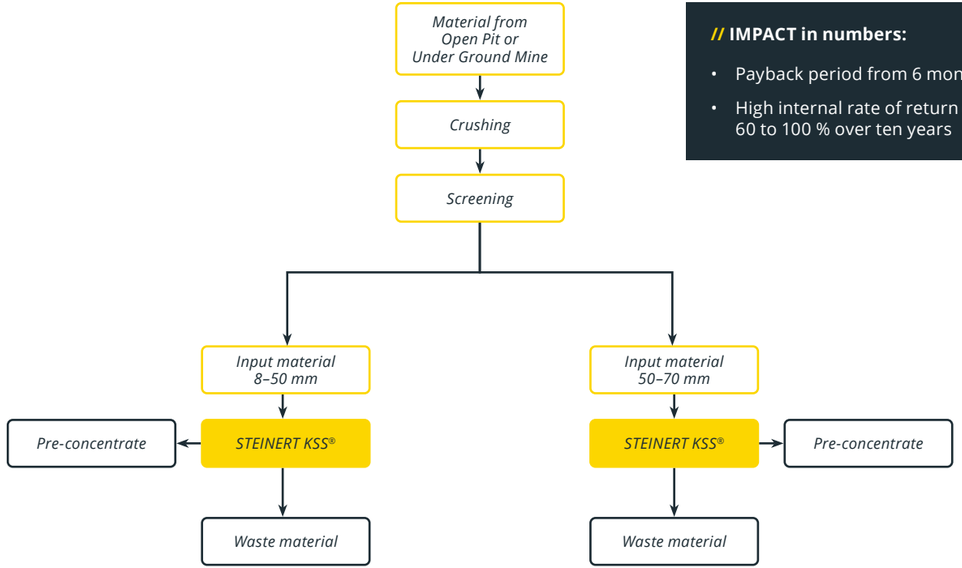
- **44%** reduction of water usage
- **34%** reduction of energy consumption
- **57%** fine waste generation

LOW GRADE ORES (BELOW CUT-OFF)

Extending the reserve and life of mine (LOM)

Gold quartz input 8-50 mm

Gold quartz pre-concentrate 8-50 mm



// IMPACT in numbers:

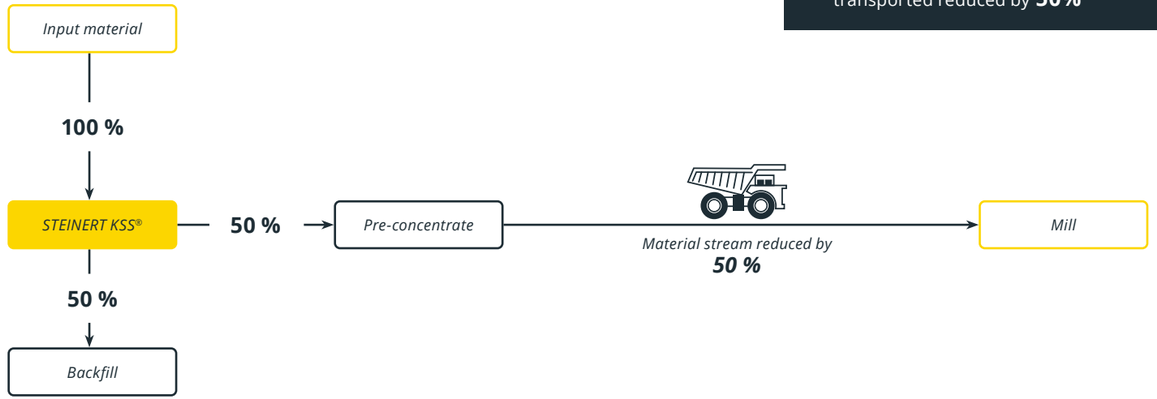
- Payback period from 6 months
- High internal rate of return (IRR) from 60 to 100 % over ten years

HAULAGE EFFICIENCY

Pre-concentrate the material that is being transported to the processing plant

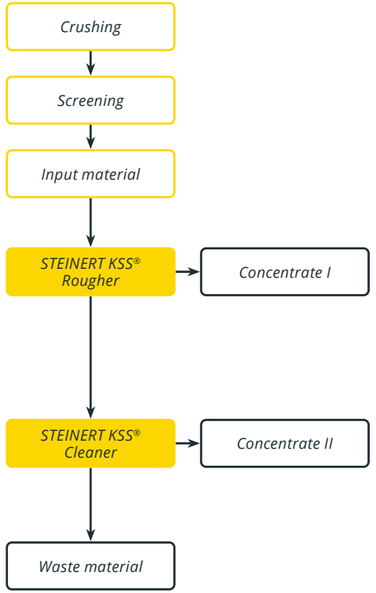
// IMPACT in numbers:

- Amount of material that is being transported reduced by **50%**



FINAL CONCENTRATION

Rougher & cleaner stages that enable the production of final products in the quality demanded by the market



// IMPACT in numbers:

- Input **30–35%** Fe
- Concentrate I **60–63%** Fe
- Concentrate II **54–56%** Fe

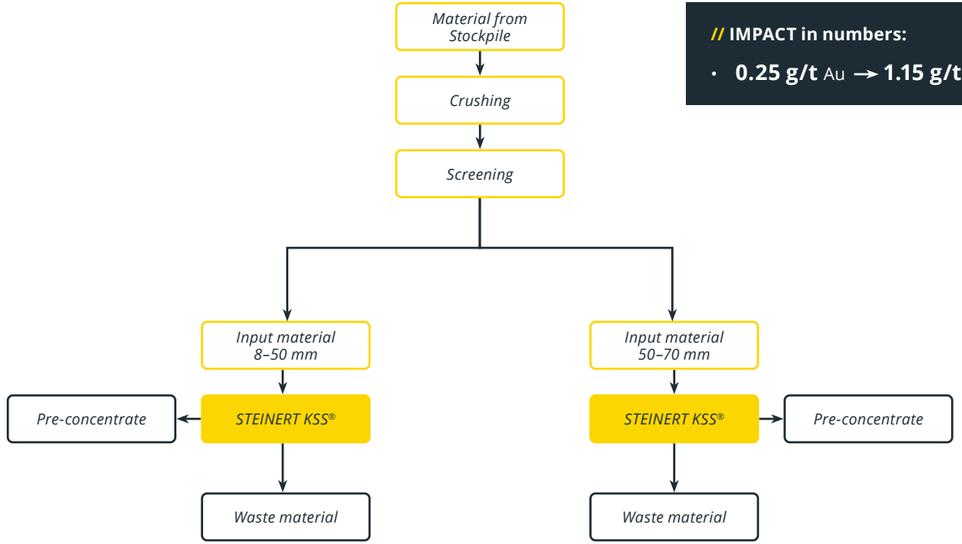
STOCKPILE TREATMENT/ SECONDARY MINING

Give life to waste material: Recover valuable minerals from the stockpile and save resources by increasing the amount of recovered material


Gold stockpile input 8–50 mm


Gold concentrate 8–50 mm


Gold waste material



// IMPACT in numbers:

- **0.25 g/t** Au → **1.15 g/t** Au

STEINERT KSS®

Sensor combination depending on the sorting material and task

+ STEINERT KSS® | XT CLI

The combination sensor sorting system detects differences in density by using X-ray transmission. Two optical sensors provide colour and three-dimensional shape information and surface characteristics (opacity and crystal) structure. The inductive sensor detects metals.

// Ideal for complex ores with several sensor opportunities

+ Separates quartz veins (laser) together with sulphides (De-XRT) simultaneously in one step

// Further products sorted with main sensor X-ray transmission:

+ lithium pegmatites
+ gold
+ silver
+ zinc
+ tin
+ lead
+ copper
+ nickel
+ cobalt
+ tungsten
+ barite
+ magnesite
+ polymetallics
+ rare earth elements
+ iron ore (magnetite)
+ iron ore (hematite)
+ chromite
+ manganese
+ coal
+ diamonds
+ phosphate

+ STEINERT KSS® | NR CLI

The sorting system combines colour, 3D and metal detection with detection in the near infrared (NR) range.

// Ideal for industrial minerals

+ Cleaning of calcite and dolomite from impurities like quartz and other waste stones
+ Upgrading critical minerals such as spodumene, petalite and lepidolite in lithium processing plants

// Further industrial minerals:

+ white dolomite
+ lithium pegmatites
+ fluorite / flourspar
+ limestone
+ quartz
+ salt
+ talc
+ calcium carbonite
+ chalk

THE RIGHT REQUIREMENT FOR YOUR APPLICATION

More flexibility for your application – adapt when you need it

STEINERT KSS® | XT CLI

Two optical sensors provide colour and three-dimensional shape information and surface characteristics (opacity and crystal structure), the inductive sensor detects metals and differences in density are detected using x-ray transmission.

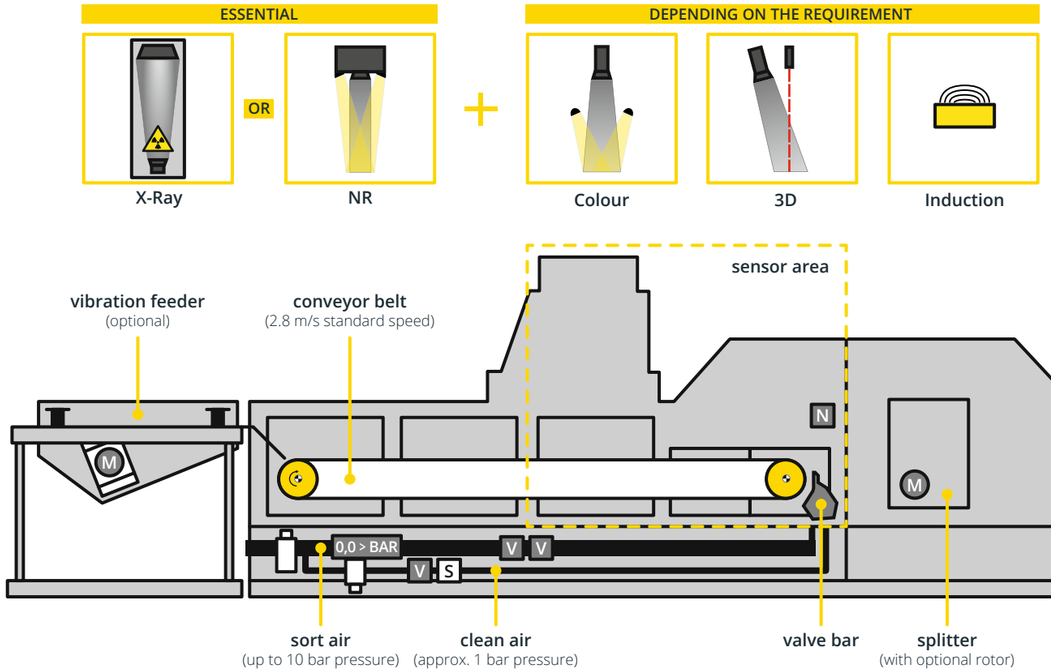
The logical combination of multi-sensory data collected for each individual object enables a wide variety of tasks to be covered by just one sorting machine.

XT = x-ray transmission
C = colour detection
L = laser (3D detection)
I = inductive sensor

STEINERT KSS® | NR CLI

The sorting system combines colour, 3D and metal detection with detection in the near infrared (NIR) range. The modular design allows a combination of all four sensors, or only a partial combination.

NR = near infrared detection
C = colour detection
L = laser (3D detection)
I = inductive sensor



ASSURING PERFORMANCE

Industrial scale testing for your application

Benefit from skilled engineers and a combination of cutting-edge sorting systems.

Realistic testing can be undertaken in the Test and Development Center on an industrial scale to validate the demands, feasibility and ROI for the planned investment.

+ Create investment security based on data and facts
+ Check the feasibility, planning and layout of the process
+ Verify sorting performance in terms of quality, yield and throughput

Want to try out the STEINERT Test Center? Simply get in touch with your personal STEINERT contact.

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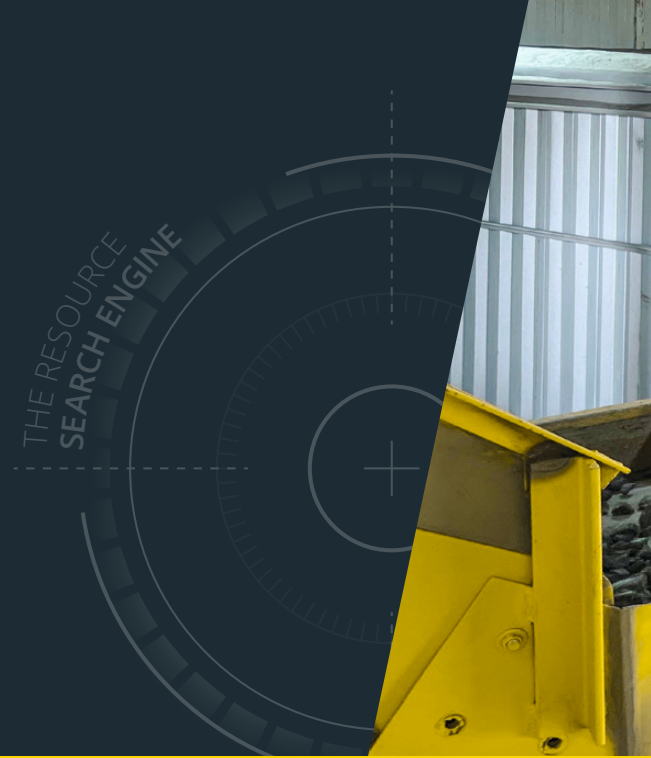

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