

Circular Economy in Mining

Recycling mining waste - a new business

Conference 27th April 2021

metals are our passion

AGENDA

1. Field Examples
2. Climate friendly Technologies
3. Challenges & Outlook

Field Example– Iron & Steel slag USA

- ➢ Dump Size: 65’000’000 metric tons
- ➢ Environmental risk of dump: ground water contamination, dust emission, erosion
- ➢ Commodity: Iron scrap (HMS1) & Aggregates
- ☑ Economical viable for high volumes, CO_2 reduced replacement of raw materials, re-duction of environmental hazardous emission
- ☐ Trade finance, off-take finance, hedging



Field Example – Copper slag Zimbabwe

- ➢ Dump Size: 2’700’000 metric tons
- ➢ Environmental risk of dump: ground water contamination, dust emission
- ➢ Commodity: Blister Copper
- ☑ Economical viable with right choice of technology, reduction of environmental hazardous emission, involvement & training
- ☐ Trade finance, small scale finance





Field Example – Tungsten SW Europe

- Dump size: 30’000’000 metric tons
- Environmental risk of dump: erosion
- Commodity: Tungsten ore
- ☒ Economical not viable, content too low for long term feasible production & investment
- ☐ Environmental necessary remediation, small-scale finance support, resource description / reserve establishment





Field Example – Copper & Molybdenum

- ➢ Run of mine beneficiation by pre-sorting
- ➢ Dump size: >10’000’000 metric tons
- ➢ Environmental aspect: surface erosion; high consumables- and energy usage
- ➢ Commodity: Polymetallic Cu & Mo ore
- ☑ Economical viable, reduction of CO_2 emission and water consumption by volume reduction in downstream production process
- ☐ Stability of legal / environmental framework



Field Example – Tungsten Rwanda

- ➢ Dump size: 1’000’000 metric tons & ROM
- ➢ Environmental risk: land erosion, surface water pollution, dust emission
- ➢ Commodity: Tungsten ore
- ☑ Economical viable with right technology for long term feasible production & investment; high impact on CO_2 reduction by de-bulking
- ☐ Political stability, compliance, community involvement, training, education, HSE



AGENDA

1. Field Examples
2. Climate friendly Technologies
3. Challenges & Outlook

Sorter Technology

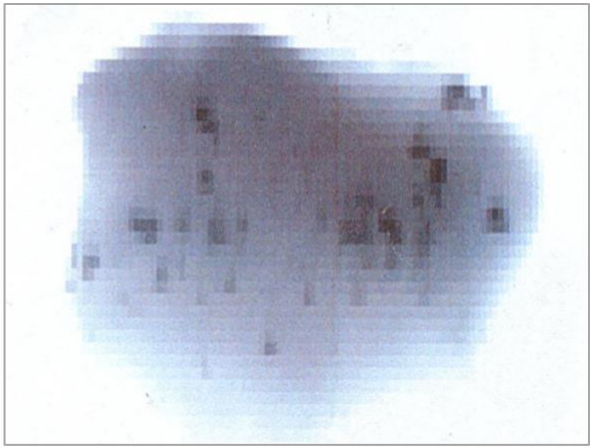


- Sensor detects physical parameter, air bar «shoots» material
- Here «100 stone test»; runs with up to 200 mt per hour

Sorter Technology Performance



Tantalite Ore: Optical Image



Tantalite Ore: XRT Image

Positive Experience with: Tungsten, Tin, Lead, Molybdenum, Copper, Nickel etc

CO_2 Saving by Sorting

- Eliminating 1t of barren host rock from plant feed by sorting:

  (50-100mm particle size & <20% mass reject): **2-3kWh**
- Comminution to flotation or leaching size <100µm: **12-20kWh**
- Energy saving per ton for comminution:* **>10kWh**
- Further positive impact: less emission, wear and consumables for downstream
- CO_2 saving of sorter machines of only one OEM in 2020: >155'000mt**
- Necessary to focus on recovery loss and solve target conflict for profit/loss

* Source: RWTH Aachen, Institut für Aufbereitung Mineralischer Rohstoffe (AMR), Prof. H. Wotruba
** Source: https://www.tomra.com/en/sorting/mining, 14.04.2021

metals are our passion

AGENDA

1. *Field Examples*
2. *Climate friendly Technologies*
3. *Challenges & Outlook*

Challenges for Circular Economy in Mining

- Resource Statements (JORC, NI43101…) for secondary resources
- Challenge: Geological Modelling, drilling campaigns for slag dumps
- Financing solutions for small scale CO_2 impact projects (<20mUSD)
- Legal Framework necessary for rehabilitation with long-term liabilities
- By-product regulations for aggregates, fertilizer, loose chippings
- Customs tariffs for international trade (waste vs. product)

Summary for Circular Economy in Mining

- Recycling of mining waste can turn liabilities into assets
- Several technologies are available and specifically fit for purpose
- A high impact on CO_2 reduction per ton of raw material produced
- Wide range of positive side effects for the environment: reduction of land usage, risk of erosion, reduction of water pollution, less use of natural resources per ton of raw material produced
- Socio-demographic impact by involvement of local communities and enforcement of international working standards in remote regions

Vielen Dank

für Ihre Aufmerksamkeit!

Thank you

very much for paying attention!

https://www.cronimet.de/en/

Disclaimer

Die Präsentation ist lediglich zu Informationszwecken erstellt und beinhaltet weder ein Angebot noch die Aufforderung zur Abgabe eines Angebots.

Der Inhalt, die Struktur sowie das Format dieser Präsentation sind urheberrechtlich geschützt, soweit diese schutzfähig sind. Der Inhalt dieser Präsentation ist vertraulich und darf ohne die vorherige schriftliche Zustimmung durch uns weder verbreitet, vervielfältigt noch sonstigen Dritten zugänglich gemacht werden.

Marke: CRONIMET und Kombinationen hiervon sind Marken der CRONIMET Ferroleg. GmbH in der Europäischen Union und / oder anderen Ländern. Andere in dieser Präsentation verwandte Namen sind möglicherweise ebenfalls Marken und werden hier nur zum Zwecke der Identifikation verwendet.

Weitere Informationen sind auf Anfrage erhältlich.