Tailings Management

Reduce the Mercury concentration on contaminated tailings

Case Study Colombia

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PURE EARTH is a non-profit organization founded in New York in 1999. It focuses on the identification and cleanup of contaminated sites in low- and middle-income countries, where there is an impact on human health. More than 50 intervention projects in contaminated sites in 20 countries. Implementation of the Toxic Site Investigation Program (TSIP) from 2009. Working in Colombia from 2016.
TSIP- Database

Sites contaminated with Hg:
- 577 Elemental
- 19 Inorganic
- 31 Organic

495 Sites coming from ASGM (78%)

Total Sites: 627
Where is the Tailings coming from?
Global Problem

The poor management of ASGM tailings with the presence of mercury has been identified as one of the main causes of the expansion of mercury in the environment, mainly affecting vulnerable communities.

Peru

Indonesia

Costa Rica
Colombia Case Study

86 Mercury Contaminated Sites identified
Current situation of contaminated tailings in Colombia

Tailings Hills

Sacks

Tailing Pool

Relevant aspects evidenced

- Generated by illegal mining
- Mercury concentration from 50 – 120 ppm
  (No Value Reference for Tailings – Value Reference EPA Residential Soil - 11 ppm)
- Gold concentration between 5 and 15 gr /ton
- Reprocessing contaminated tailings through cyanidation process to get gold (Worse Practice)
- Circular economic opportunity – Colombian Law 2250 / 2022
Department of State Project

“Recovery Mercury from Contaminated Tailings”

Principal objectives

• Identify promising responsible mercury-recovery techniques and increase understanding of criteria for choosing a technique for use in the Colombian ASGM context.

• Develop a model for the responsible and profitable recovery of mercury and gold from tailings based on experiences with a pilot processing center.

• Develop a technical protocol that facilitates responsible tailings management for use by the Colombian government.
Identifying mercury recovery technologies

- International technical workshop in 2019 (3 days).
- Around 15 potential alternatives identified.
- Criteria for selection
  - Low cost investment for miners
  - Easy implementation on field
  - Minimum energy and water resources needed
  - High efficiency of recovery

Copper Plates
Copper Plates

• It is not a new technology. It is an adaptation for current context in Colombia
• Copper is just a support medium
• The action of capturing mercury is carried out by silver
• Electrolysis plating process is required
• Other materials to replace copper were tested without success
• Pure Earth’s contribution is the protocolization of the process
Copper Plates – Preparation
(Base on market availability)

• Each plate size is 30 x 30 cm
• Thick between 1.5 – 3.0 millimeters
• Time process 14 minutes by plate
• Grooves on the surfaces of the plates increase efficiency of capture Hg
Copper Plates – Implementation

Lab Test November 2019
Cascade Style

Pilot Test Phase I
March 2020
Cascade Style

Pilot Test Phase II
October 2020
Cascade Style

Pilot Test Phase III
2021 -2022
Channel Style
Copper Plates – Tests I- Cascade Style

- Initial design of the support the position of the plates
- 3 different types of tailings (ages)
- Average of 6 ton processing per tailings
- Up to 83% reduction in mercury under ideal conditions
Improvement of the positioning of the plates
5 different types of tailings (ages)
Average of 8 ton processing per tailings
Liquid mercury was recovery with the use of shaking table.
Up to 70% reduction in mercury
Copper Plates – Tests III – Channel Style
Copper Plates – Tests III – Channel Style
Ø 30 copper plates in series
Ø 5 different types of tailings (ages)
Ø Average of 8 ton processing per tailings
Ø Increase in residence time and surface area of contact between the tailings and the plates
Ø Up to 50% reduction in mercury
Mercury capture scheme from copper plates – Channel Style
Results after only one pass through the plates

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Copper Plates – Final Development

- Award-winning design as development of innovation in mining environmental solution. (Conservation x Lab)
- Capacity 1 ton of tailings
- Permanent recirculation to increase efficiency
- 24 Copper plates in Cascade Style
### Economic Model of Implementation

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Precio onza troy Plata en dólares

Evolución y proyección precio plata Onza Troy en dólares
The effectiveness of mercury recovery from tailings can be positively affected by physical pretreatment of the tailings. The mineralogical distribution of the tailings has a low influence on the mercury recovery process with the copper plates. The lifetime of copper plates is a variable that is still under study. Mercury recovery is affected by tailings age of more than 3 years. High profit for miners when it is well implemented. After use, the plates must be considered hazardous waste with mercury.
Thank You