

Increasing Capacity for Mercury-Free ASGM Through Provision of Technical Assistance, Technology Transfer and Support for Formalization.

GOLD ISMIA is a GEF project being implemented by UNDP in partnership with the Ministry of Environment and Forestry, and National Agency for Technology Assessment and Application (KLHK and BPPT).

GOLD ISMIA's goal is to reduce mercury (Hg) use in ASGM by 15 ton in 3 years working together with GOLD ISMIA's and BPPT to lead the assessment and implementation of technology that will allow Indonesian ASGM miners to transition to mercury-free technology through provision of technical assistance, technology transfer and support for formalization.

ASGM miners use a range of techniques to recover gold from ore. Mercury amalgamation has traditionally been used, but this technique can be inefficient and release mercury into the environment. An estimated 195 tonnes of mercury are released by Indonesia ASGM to the environment each year.

which include:

- Training, public awareness and policy review to promote mercury-free gold processing techniques.
- Institutional development: an ASGM training center, and strengthening existing institutional setup
- Enhancing the network of database for gold processing and mercury usage.
- Mercury-free gold processing project pilots (TA, FS, and engineering assessment)

Technical Assistance and Technology Transfer are the main mechanisms being used by GOLD ISMIA to prevent Mercury usage in ASGM gold recovery. Under the regulations of the Minamata Convention on Mercury, the use of mercury in ASGM must be stopped by 2025.

Many gold-ores in Indonesia have been characterized as fine, and poorly suited to gravity concentration. However, such ores are well-suited to cyanidation. Gold recovery using cyanide can be as high as 90% for such ores; compare this to recovery of only 40% using

mercury amalgamation. Knowledge of cyanide's effectiveness is not new: cyanidation has been applied for more than decade in Indonesia mining and this has led to the widespread adoption of cyanidation in leach tanks (tong) across Indonesia.

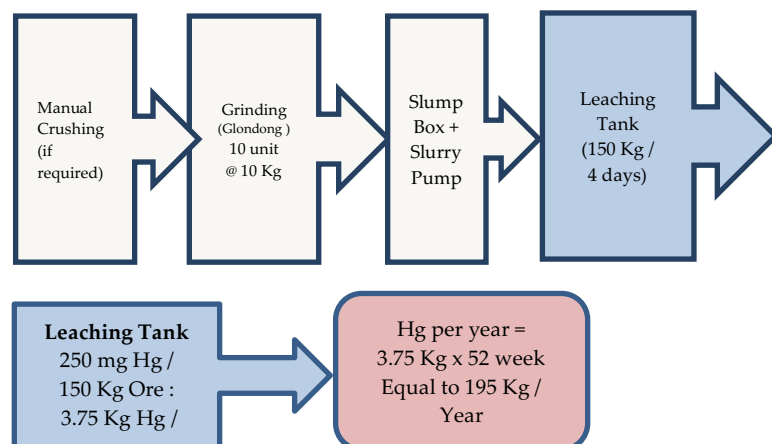
The environmental safety of cyanide is a main concern of GOLD ISMIA. BPPT (as the technology advisor) have found a technology to destroy free cyanide in wastewater from the leach concentration of 200 ppm to as low as 1 ppm in four hours. To achieve environmental standards for discharge from ASGM the cyanide concentration in wastewater must be reduced into 0.5 ppm.

GOLD ISMIA has developed 2 technology scenarios for mercury-free gold technology based on the scale of proposed processing plant:

1. Mill grinding and tank leaching: capacity 150 Kg

Scenario 1 is a very small scale of micro mining. Miners can use their own trommels to process the ore, but the leaching process will be supported with BPPT equipment.

The process will use trommels to crush ore, and cyanide leaching using a small tong where 150 kg of crushed rock is leached every 4 days. The modelled processing capacity is 7.8 tonnes of ore processed through 52 leach cycles each year. This scenario is predicted to reduce mercury use by 195 Kg per year from total 7.8 tonnes of ore processed.



The capital cost of this scenario is predicted to be less than \$5,000. Components are trommels and small leaching tanks. Manual labours from the miners is a key part of this scenario.

Total plant energy requirement is predicted to be less than 25 horsepower (equal to 18.642 watt). This is a key characteristic of the scenario: the energy requirement is allowed under a people mining permit.

Cyanidation is expected to yield significantly higher gold recovery than amalgamation and the scenario is predicted to quickly generate a profit from low amounts of ore. Payback of capital costs is expected within a year of operation.

2. Small-scale Ball Mill and Carbon In Leach (CIL)

Scenario 2 follows a similar engineering flow sheet to Scenario 1. The difference is the grinding equipment used: a Ball mill that will grind 0.5 tonnes per batch (4 hours grinding time) and bigger leaching tanks with capacity of 1.5 tonnes of ore.

Processing capacity process is 25 ton in 50 days or 175 tonne per year. The capital cost of this scenario is higher than Scenario 1 due to the technology and scale of the processing equipment: US\$ 40,000.

This large-scale micro-mining plant will produce a large amount of tailings and to comply with environment regulations, the processing plant should have several ponds to contain the tailings from leaching process.

With its increased capacity and upgraded equipment, Scenario 2 will have a greater energy requirement than Scenario 1 (more than 25 Horsepower). This plant will require a Ministry of Mineral and Energy Resources processing permit known as **IUP-OPK Pengolahan dan/atau Pemurnian**.

This scenario will have superior gold recovery to Scenario 1 due to the technological used, and will be profitable if there is sufficient ore availability (reserve) to sustain the production for long time. Payback of capital costs would be expected sometime after one year of operation.

GOLD ISMIA will investigate ore availability and grade at the 6 project areas to assess the applicability of these two mercury-free technology scenarios for miners.



Fig.1 Five tonnes capacity Leaching Tank in Obi Island, Halmahera, Indonesia

At the same time, miner groups in each area will be interviewed to evaluate their potential to form a cooperation. This will be a function of the scale and legality of their operations. GOLD ISMIA will support the formation of cooperatives to operate processing plants.

