ICMM International Council on Mining & Metals | MINING WITH PRINCIPLES

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Mercury waste in metal production

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On behalf of ICMM

About ICMM

Bringing together 27 of the largest industrial mining and metals companies and over 35 national, regional and commodities association members, the International Council on Mining and Metals is a CEO-led international organisation dedicated to a safe, fair and sustainable mining and metals industry, serving as a catalyst for change, enhancing mining's contribution to society.

In 2009, ICMM members committed to apply materials stewardship to promote the responsible management of the mercury produced from their operations.

No ICMM member company operates primary mercury production facilities.

Some operations can however contribute to the global mercury load through air emissions, supply to the global market of elemental mercury or mercury compounds recovered as a result of pollution control, and naturally occurring mercury compounds in some products (e.g. minerals and concentrates).

As industrial operations, sites are subject to strict environmental management measures, including pollution controls.

Mercury in non-ferrous metal production

- Mercury is a naturally occurring impurity in some non-ferrous ores, which typically occurs at very low concentrations.
- As with any other natural products, concentrations will vary from one ore to another, based on local geochemistry.
- In industrial metal production, ores go through many steps to be transformed into metal as the final product. These will be different for each metal.
- The mercury impurities found in ores tend to follow the desired concentrates during the ore processing steps, allowing for them to be captured during metal production.
- Pollution controls are in place every step of the way to capture mercury and prevent air emissions through gas-cleaning processes.
- Mercury can be recovered through these gas-cleaning processes in three forms:
  - Elemental mercury
  - Calomel
  - Carbon contaminated with mercury
- Air-pollution control efficiency rates keep improving thanks to technological advances.

Example: Gold production process

Mercury flows in gold production

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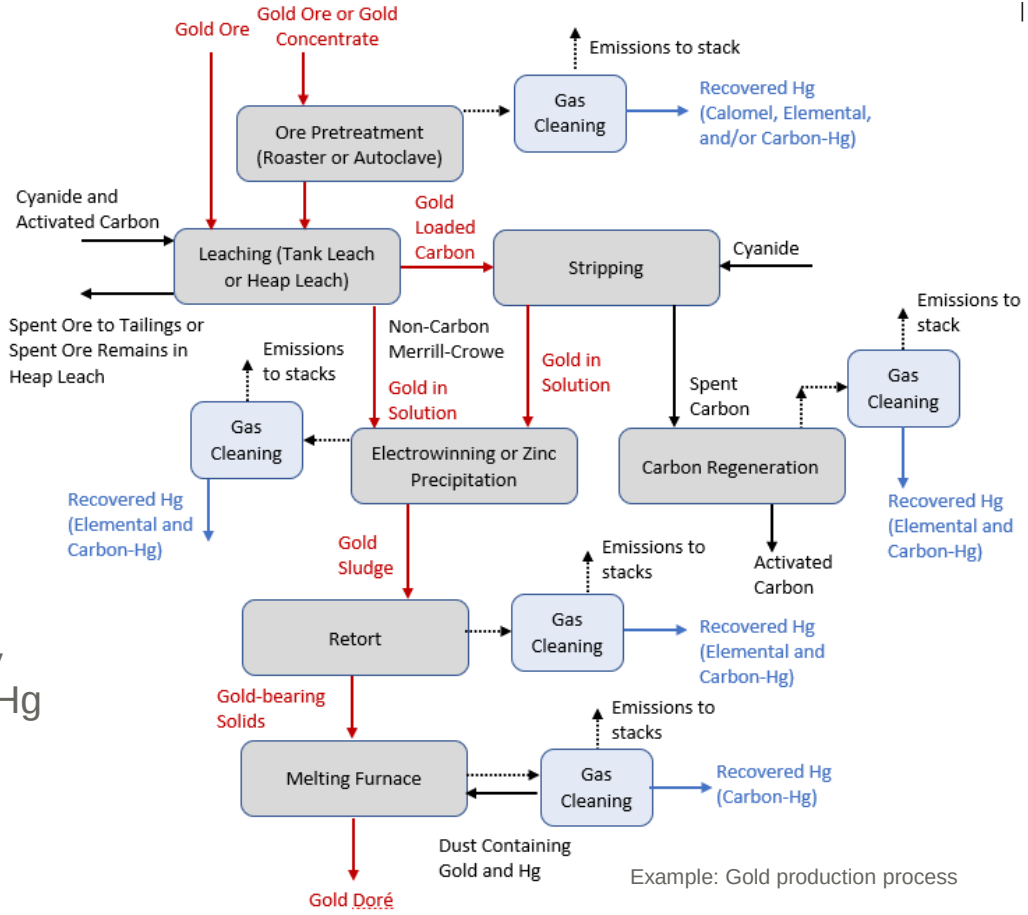
Gold extraction and refining

- Mercury flows in gold mining
  - Gold is extracted from ore via cyanide leaching. Prior to leaching, ores may require milling, floatation, and/or pre-treatment. Most Hg will typically follow the gold concentrates.
- Mercury flows in gold refining
  - Hg is recovered from the gas stream throughout the process: roasters, elecrowinning, carbon regeneration, or retorts
  - Hg is recovered as calomel (Boliden Norzinc scrubbers), elemental mercury (retorts), or carbon contaminated with Hg (Hg filter).

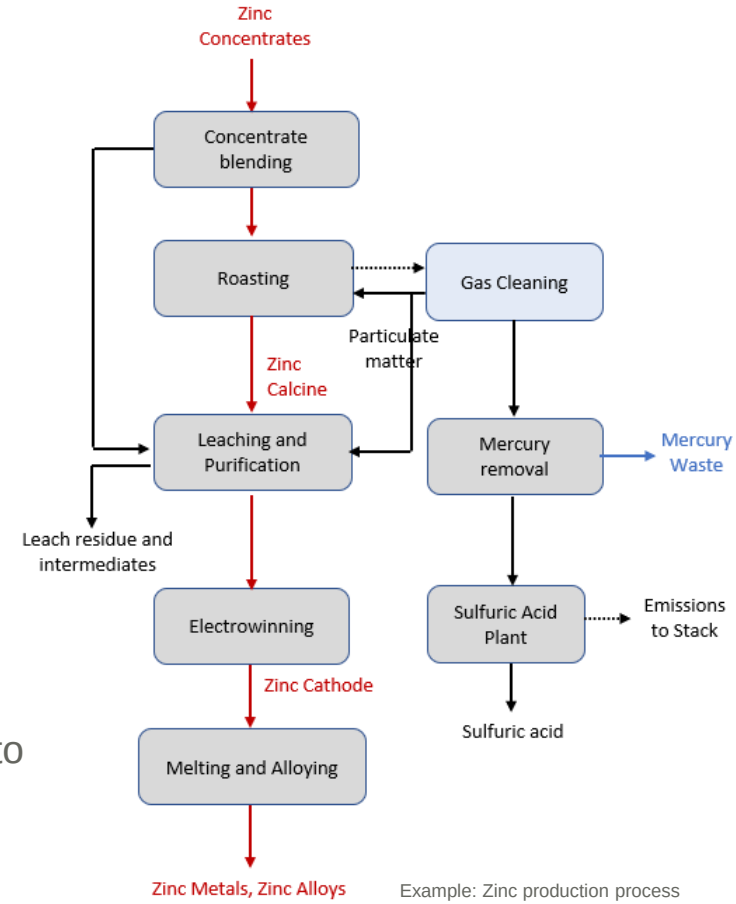


Example: Gold production process

Mercury flows in zinc production

Zinc extraction and refining

- Mercury flows in zinc mining
  - Zinc deposits are milled and separated from gangues by sulphide flotation. Most Hg will typically follow zinc concentrate.
- Mercury flow in zinc refining
  - Most Hg is recovered from the gas stream from concentrate roasting.
  - Hg is recovered in a waste acid or more concentrated from Hg filter.
  - Removal of Hg required to achieve quality spec for H_2SO_4.
  - According to a recent IZA survey, the total world-wide releases and emissions of mercury to water and air < 6t/year. Significant decrease over past decade due to more stringent regulations.



Example: Zinc production process

By-product supply - trends

- Commercialisation
  - Commercialisation of elemental Hg or calomel often not possible (no internal market, export bans)
  - Most western-world plants report that they no longer sell mercury or calomel
- Disposal of elemental Hg and calomel
  - Disposed of according to location-specific environmental regulations
    - Disposal occurs in permitted hazardous waste disposal facility (e.g., Germany, Quebec).
    - Long-term storage may take place at third-party sites or on-site subject to appropriate permits.
  - Considerations for long-term storage and disposal must include cost and security.

Conclusions

ICMM observation: Companies are increasingly treating by-product mercury as waste and managing it by using long-term secure storage facilities or permitted disposal facilities.

- Increasing regulatory pressures and improving availability of mercury alternatives are effectively reducing legitimate demand for mercury.
- Mercury waste from the mining and metals sector can consist of mercury-contaminated waste (Category C) (e.g., carbon contaminated with mercury), recovered elemental mercury, or calomel.
- In many countries, mercury wastes are reported via PRTRs or other registries for elemental Hg and/or calomel.
  - Mercury-contaminated waste (Category C) are typically covered by broader hazardous waste legislation so reporting requirements will depend on what the legal framework states in specific jurisdictions.

Other considerations

- As supply has been dwindling, elemental mercury market prices have been increasing; authorities should remain vigilant when it comes to the illegal trade of mercury.
- As metals demand is forecasted to grow in support of a long-term low-carbon economy and mercury is a naturally occuring substance in ores, the mining and metals sector is likely to continue to produce mercury waste.
- Considerations should be given to effective and sustainable regional solutions to secure sufficient capacity for the safe and long-term storage of mercury.

More information on best available techniques in terms of pollution controls in metal production can be found in the BAT/BEP guidance on air emissions on the Minamata Convention's website.

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