MERCURY

Basic Information:

- **Name:** Mercury
- **Symbol:** Hg
- **Atomic Number:** 80
- **Atomic Mass:** 200.59 amu
- **Melting Point:** -38.87 ° C (234.28 K, -37.966 ° F)
- **Boiling Point:** 356.58 ° C (629.73 K, 673.844 ° F)
- **Classification:** Transition Metal
- **Crystal Structure:** Rhombohedral
- **Density @ 293 K:** 13.456 g/cm3
- **Color:** Silver

Mercury's Name in Other Languages

- **Latin:** Hydrargyrum
- **Czech:** Rtut´
- **Croatian:** Živa
- **French:** Mercure
- **German:** Quecksilber - e
- **Italian:** Mercurio
- **Norwegian:** Kvikksølv
- **Portuguese:** Mercúrio
- **Spanish:** Mercurio
- **Swedish:** Kvicksilver

Mercury

- Is also called Quicksilver
- A heavy, silvery metal, mercury is one of six elements that are liquid at or near room temperature and pressure.
- Produce toxic effects in high enough doses.

- ✓Its zero oxidation state Hg0 -exists as vapor or as liquid metal
- ✓its mercurous state Hg+- exists as inorganic salts
- ✓its mercuric state Hg2+ -may form either inorganic salts or organomercury compounds

Mercury can enter the body through the respiratory tract, the digestive tract or directly through the skin..

History:

- Mercury was known to the ancient Chinese and was found in Egyptian tombs that date from 1500 BC. In China and Tibet, mercury use was thought to prolong life, heal fractures, and maintain generally good health. The ancient Greeks used mercury in ointments; the ancient Egyptians and the Romans used it in cosmetics which sometimes deformed the face.
- Alchemists often thought of mercury as the First Matter from which all metals were formed.
- Hg is the modern chemical symbol for mercury. Hg from mercury's Latin name Hydrargyrum, which comes from the Greek word "hydrargyros" ("hydor" for water and "argyros" for silver).
- The element was named after the Roman god Mercury. The astrological symbol for the planet is also one of the alchemical symbols for the metal.

Sources:

- Most mercury comes from cinnabar ore.

- Human-generated sources such as

✓ coal plants

✓stationary combustion

✓gold production

✓non-ferrous metal production

✓cement production

✓waste disposal

✓caustic soda production

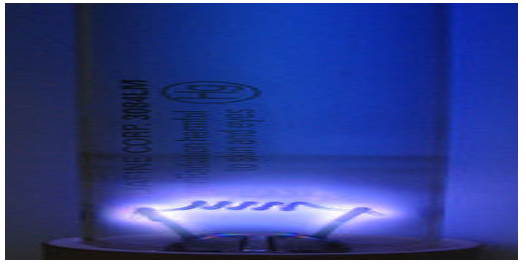
✓steel production

✓mercury production (mostly for batteries)

Uses:

- It is used to make thermometers, manometer and sphygmomanometer or blood pressure meter.

- Gaseous mercury is used in mercury-vapour lamps and some "neon sign" type advertising signs and fluorescent lamps.

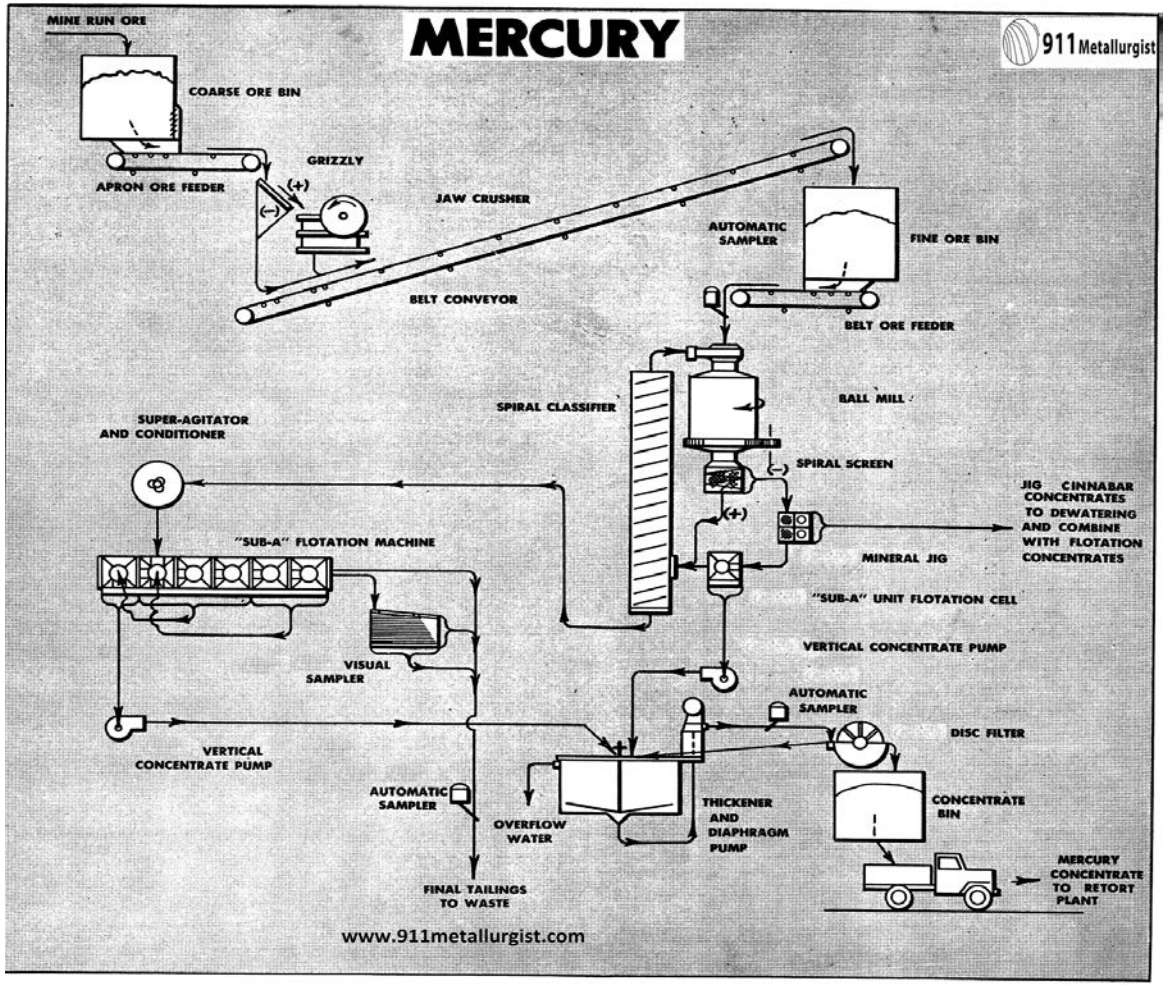


- It is also used to make switches (home mercury light switches).

- Mercury was once used in the amalgamation process of refining gold and silver ores.
- Mercury compounds have been used in antiseptics, laxatives, antidepressants, and in antisyphilitics.
- Mercury is still used in some cultures for folk medicine and ceremonial purposes which may involve ingestion, injection, or the sprinkling of elemental mercury around the home
- Mercury is widely used in the manufacture of mascara
- The element mercury is the main ingredient in dental amalgam.

Extraction of Mercury

- The concentration of low grade cinnabar, HgS, with a specific gravity of 8.0-8.2 is effectively accomplished by gravity and flotation methods.
- Cinnabar ores of relatively high mercury content can be retorted directly to expel the sulphur and condense metallic mercury, but for lower grade ores, preliminary concentration is advisable to reduce the tonnage for retorting.
- Retorting and recovery of metallic mercury is widely practiced at small or large tonnage mines. Cinnabar decomposes, yielding mercury at a temperature from 500 to 600°C. The ore in question is assumed to contain cinnabar associated with a siliceous gangue. Grinding to minus 48 mesh is the economic liberation point, but considerable free cinnabar is released at about 10 mesh and warrants concentrating the mineral as soon as it is freed.



FLOWSHEET FOR MERCURY RECOVERY

Mercury Ore Beneficiation Process

1. Crushing Circuit

Conventional single stage crushing comprises this section, since the tonnage is less than 100 tons per day. The mine ore is fed from the coarse bin by means of a Apron Feeder to the Jaw Crusher. Crusher feed passes over a grizzly with an opening similar to the crusher setting. Grizzly undersize and crusher discharge product are delivered to the fine ore bin by means of a belt conveyor. A Adjustable Stroke Belt Ore Feeder delivers the fine ore to the grinding circuit at a uniform rate.

2. Mercury Ore Grinding Section

The Mineral Jig and Unit Cell are installed in the ball mill-classifier circuit to recover an important amount of the freed cinnabar at a relatively coarse particle size, desirable because of cinnabar's tendency to be friable and slime easily. In addition, the coarser concentrates are preferred for retorting, since dust losses can be substantially reduced.

The Ball Mill of the grate discharge type uniformly discharges through a Spiral Screen to the Duplex Mineral Jig which recovers a coarse cinnabar concentrate. The jig tailing passes to the Unit Cell, which produces a granular flotation concentrate, while the tailing flows by gravity to the Spiral Classifier. Additional water for the proper classifier dilution is added to the Unit Flotation Cell feed. The classifier overflow, minus 48 mesh, passes to a Conditioner, then to flotation.

3. Mercury Flotation Section

Conditioned classifier overflow is sent to a 6-cell "Sub-A" Flotation Machine, arranged to provide three rougher cells, two scavenger cells, and one cleaner cell. The rougher flotation froth of cinnabar passes to the cleaner cell,while the scavenger froth is returned to the first rougher cell. This arrangement, including re-circulation of the cleaner tailing, is accomplished without the use of pumps, a typical illustration of the great flexibility of the "Sub-A" Flotation Machine.

4. Filtration

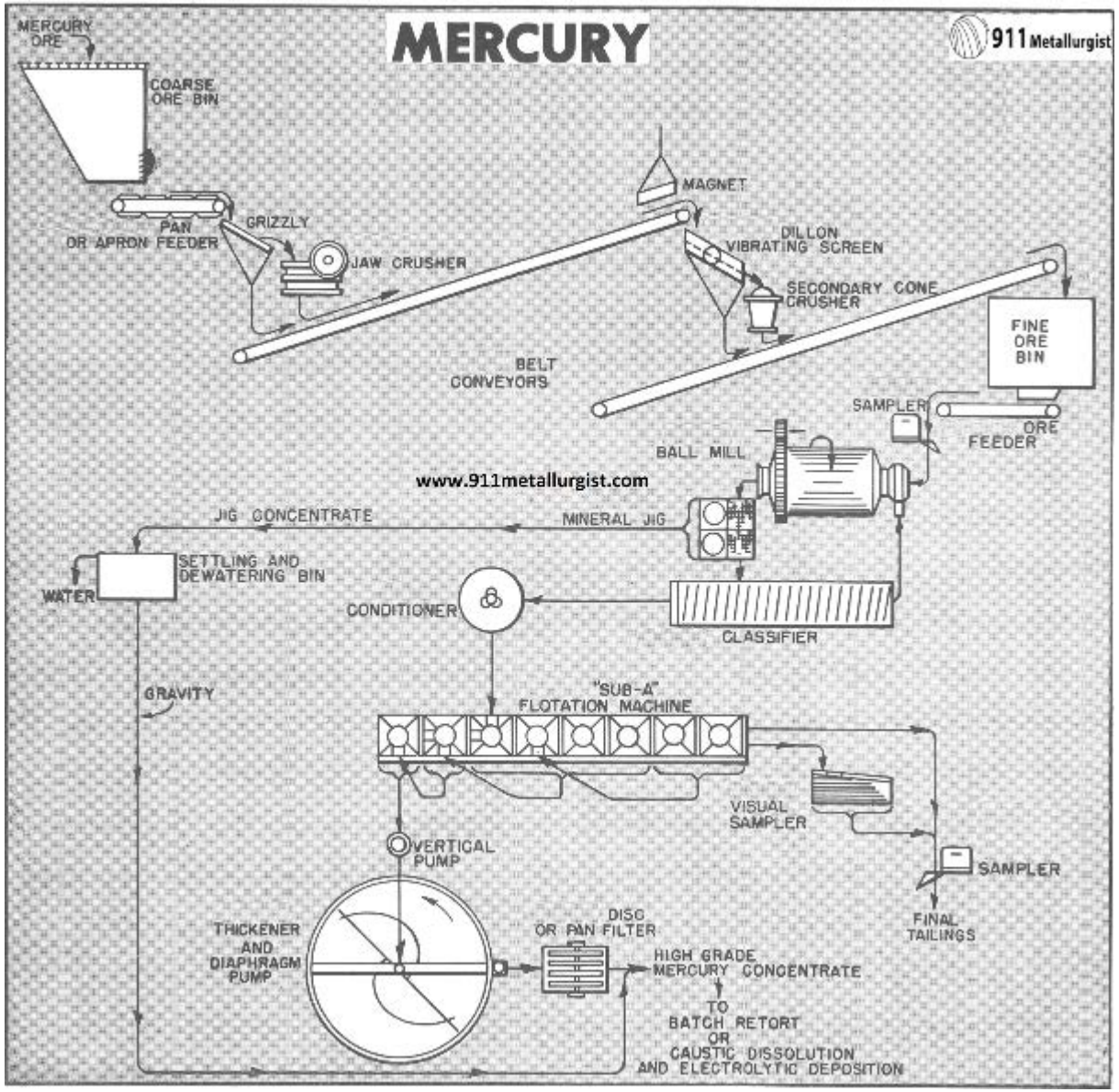
- The cleaned flotation concentrate and Unit Flotation Cell concentrate are combined, thickened, and filtered. Thickening is optional, depending upon the tonnage and settling characteristics of the concentrates. Since the Unit Cell concentrate is relatively coarse and easily filtered, direct filtration of the combined flotation concentrates, utilizing the Disc Filter is often feasible.
- Dewatered Mineral Jig concentrate is combined with the filtered cinnabar flotation concentrate and stored preparatory to retorting and recovery of the metallic mercury.

5. Sampling

- Automatic Samplers are used to sample the feed, concentrate, and tailing. A portion of the final tailing is removed and treated on the Visual Sampler, consisting of a ¾” Suction- Pressure Diaphragm Pump and a No. 13A Wilfley Concentrating Table. The flotation results and conditions may easily be controlled by observing the concentrate streak on the table.

The Mercury Ore Beneficiation by Flotation

- The flowsheet given is typical for the average mercury concentrator. Two stage crushing followed by grinding in closed circuit with a classifier is used to reduce the ore down to flotation size, 48 to 65 mesh. Many ores contain granular particles of cinnabar recoverable by gravity. The Mineral Jig is incorporated in the mill circuit to scalp out this coarse heavy mineral and any metallic mercury which may be present in the ore.



Advantages of Flotation for Mercury Processing

Treatment of low grade mercury ores by flotation show generally a lower capital investment than for a comparable tonnage furnace plant. Operating costs are about equal, however. Advantages of concentration are:

- Higher recoveries on low grade and/or wet, sticky ores. Wet sticky or dusty ores cannot be furnaced efficiently.
- Less health hazard. Mercury fumes are poisonous.
- Tonnage of plant can be more flexible. Plant can start and stop on short notice.
- Higher resale value on flotation equipment. Furnace equipment only applicable on mercury ores.
- Impurities can be rejected from complex ores by flotation; as for example, arsenic.

Mercury Poisoning

(also known as **hydrargaria** or **mercurialism**) disease caused by exposure to mercury or its compounds.

Toxic effects

- ✓damage to the brain, kidney, and lungs
- ✓acrodynia (pink disease)
- ✓Hunter-Russell syndrome
- ✓Minamata disease

Signs and symptoms

- Peripheral neuropathy (presenting as paresthesia or itching, burning or pain)
- skin discoloration (pink cheeks, fingertips and toes)
- edema (swelling)
- desquamation (dead skin peels off in layers)
- hyperhidrosis (profuse sweating)
- tachycardia
- mercurial ptyalism (hypersalivation)
- Hypertension

Prevention

- eliminate or reduce exposure to mercury and mercury compounds
- many governments and private groups have made efforts to regulate the use of mercury heavily, or to issue advisories about its use.
- The United States Environmental Protection Agency (EPA) issued recommendations in 2004 regarding exposure to mercury in fish and shellfish