



(Process) Safety Considerations for Plant Conversion

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COSTA DO SAUÍPE



Content

- **The Demolition**
- **Protection of workers**
- **Protection of environment**
- **Useful documents**

The demolition

- The demolition consist in fact of the following sub parts:
 - Shut-down of the plant (depressurize, draining, flushing, cleaning)
 - Dismantling and decontaminated of installation parts and re-used buildings
 - Demolition and removal of not re-used equipment, buildings etc.

The demolition

Create different working area's

- Separate the area's with (or possible) mercury contamination from the clean area's and clearly indicate the rules and precautions for those area's



The demolition

Create different working area's

- Separate the cell room (if required) in a normal operational part and an area of dismantling; e.g. introducing a wooden wall between the 2 area's



The demolition

Create different working area's

- Create borders/cleaning zone's between the clean and contaminated area's
 - Workers decontamination area;
 - Change clothes (train te people how the remove (possible) contaminated clothes
 - Washing (showers)

Cleaning of shoes and boots



The demolition

Create different working area's

- Create borders/cleaning zone's between the clean and contaminated area's
 - Cleaning of used tools and equipment



The demolition

Transfer of mercury form cells to containers

- To be performed by operators used to work with mercury
- Should use the correct PPE
- Mercury measurement in the working area; ventilation and cleaning of air (by carbon filters)
- Treatment of cleaning water
- Regular check on mercury in urine of the workers



The demolition

Decontamination of cells and denuders

- Each cell can be “confined” for dismantling work, with air sucked to a treatment unit
 - Example of an temporary carbon filter absorption unit



The demolition

Decontamination cabin(s)

- This kind of small cabin, connected to the air treatment unit, can be used for specific 'dirty' works inside the contaminated area



The demolition

removal of smaller amounts of mercury

- Vacuum cleaners equipped with an active carbon filter (or catch-pot connected to a central vacuum system with mercury abatement) are recommended to remove small quantities of liquid mercury
- Use of a zinc sheet to collect mercury spills
 - Bring sheet into contact with Hg droplets
 - Hg 'jumps' to sheet, forming an amalgam



The demolition

Mercury is present in different forms

- Mainly metallic “free” or “bonded” (in soil)
 - Mercury from cells and denuders is liquid metal
 - Mechanical or thermal “cleaning” of equipment can result in liquid metal
- Oxide (HgO) in some equipment
- Chloride $[\text{HgCl}_4]^{2-}$ dissolved in brine (or in active chlorine washing solutions)

- Chemical bonded Hg, if not solubilized, will have to be disposed as hazardous waste
- Mercury in solutions is usually precipitated as HgS or removed by ion-exchanger



The demolition

types of equipment to be used

- “Cold” separating processes are primarily assumed when it comes to choosing the dismantling and separating technologies that do not release any additional Hg, of those that only cause few emissions.
- The following dismantling and separating technologies are practical to carry out the work:
 - Loosening of bolts with a spanner
 - Loosening of screws with a pneumatic screwdriver
 - Loosening of bolts with a nut splitter
 - Water jet cutting with abrasives
 - Cutting with hydraulic shears
 - Sawing with a powered jigsaw
 - Cutting with a sheet metal cutter
 - Parting off grinder

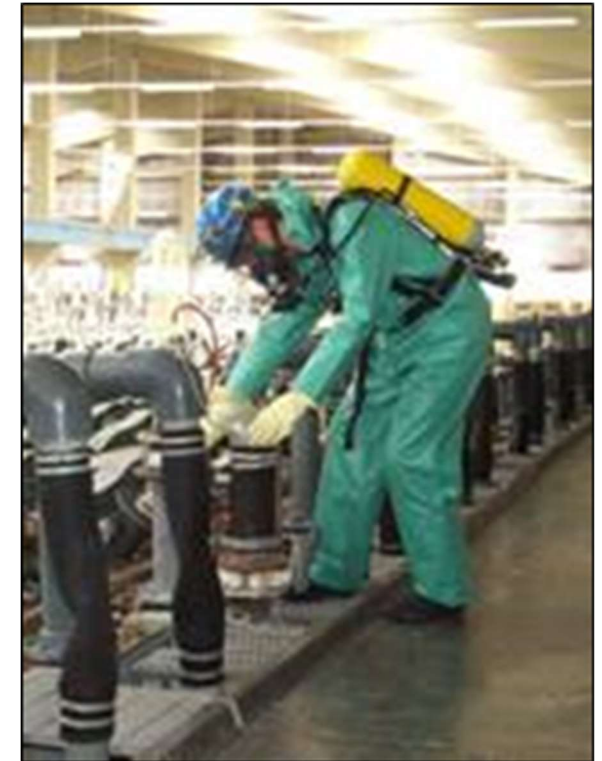
Protection of workers

- Full protective over-coat (single usage)
- Autonomous breathing equipment with pump and filter



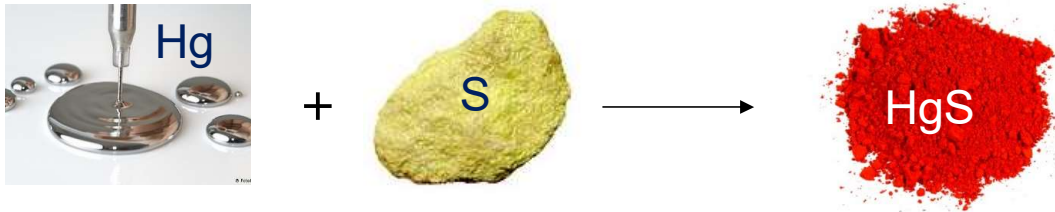
Protection of workers

- Alternative protective equipment
- Mercury control in urines frequency at least 1 time per month
- Daily controls at the workplace with portable analyzer



Protection of environment

- Conversion of liquid metallic mercury to mercury sulfide



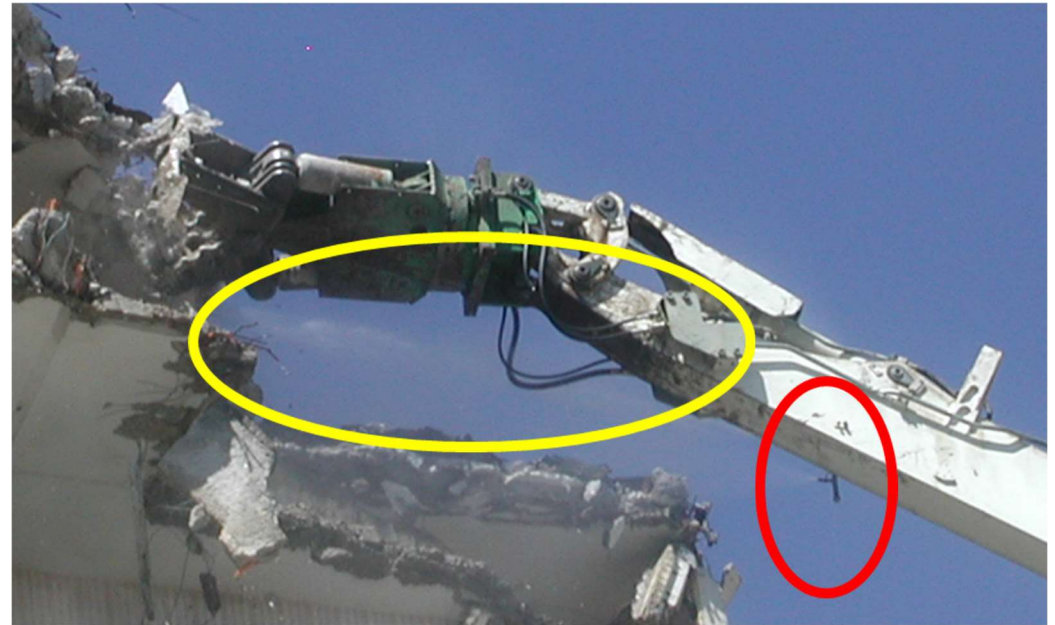
Store of the inert substance
HgS in an underground mine



special transport containers
for metallic mercury

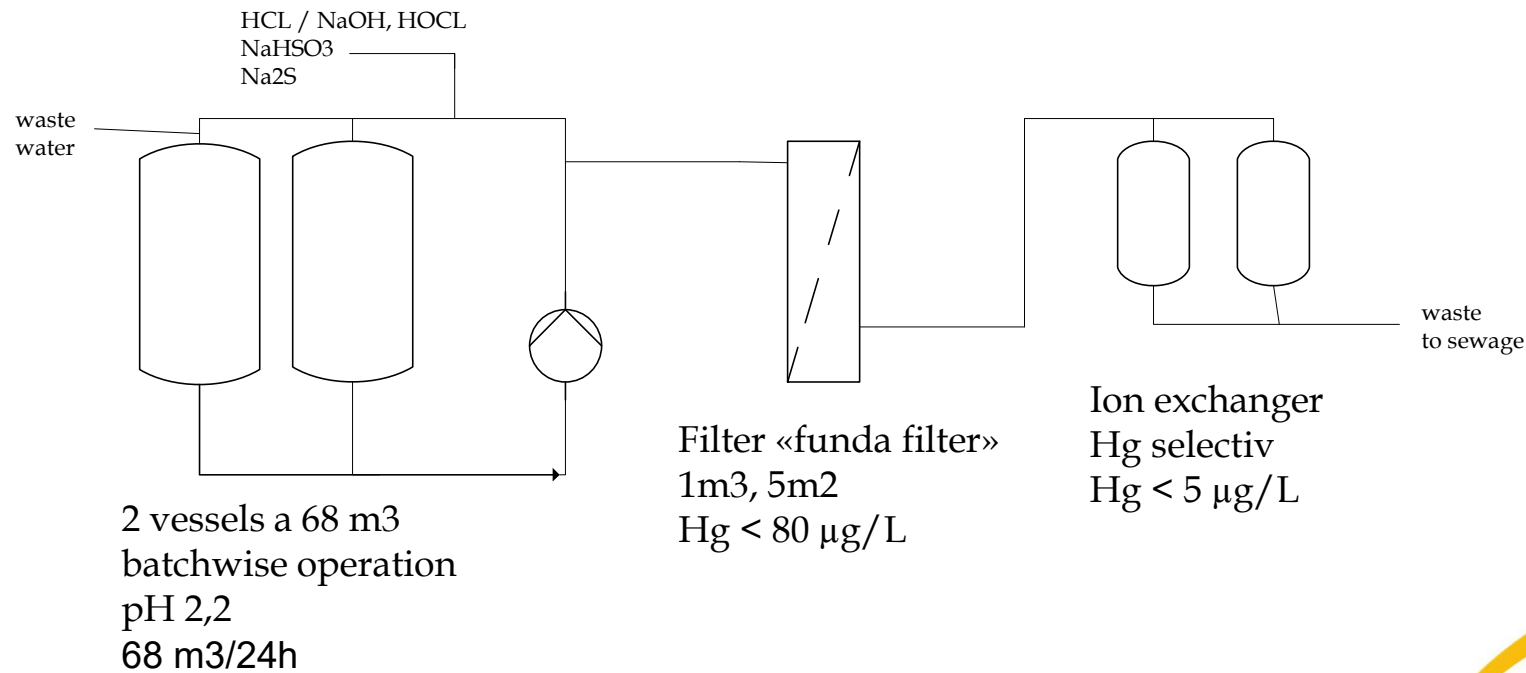
Protection of environment

- Crane and demolition equipment equipped with water jets to reduce emissions of dust



Protection of environment

- The water treatment plant must be available continuously



Protection of environment

- Material destruction
 - Several cleaning methods used
 - Ultra high-pressure cleaning
 - Temperature treatment
- Re-use of materials
 - Anodes: disassembling, high pressure wash and send back to owner
 - Copper wires, wash with water and recycle
 - Cells, decomposers, metal pipes: UHP and Recycle depending of the control value with portable X analysor
 - Concrete: Control and recycling
 - Ground: Control, treatment and recycling if possible
- Materials not be able to be re-used
 - Plastic equipment: Wash with THP and to destruction
 - Other materials with too high mercury levels to special chemical waste storage (e.g. uderground in old mines)

Useful documents (Euro Chlor)

- Env Prot 03 - Guideline for Decommissioning of Mercury Chlor-Alkali Plants
- Env Prot 11 - Code of Practice - Mercury Housekeeping
- Env Prot 13 - Guideline for the Minimisation of Mercury Emissions and Wastes from Mercury Chlor-Alkali Plants
- Env Prot 15 - Management of Mercury Contaminated Sites
- Env Prot 18 - Guidance for Reporting on the Decommissioning or Conversion of Mercury Cell Chlor-Alkali Plants
- Health 8 - Mercury DO'S and DON'TS Poster
- Analytical 3 - Determination of Mercury in Solids
- Analytical 6 - Determination of Mercury in Gases
- Analytical 7 - Determination of Mercury in Liquids

A tropical landscape featuring a body of water in the foreground, a line of palm trees on a small island in the middle ground, and a blue sky with scattered white clouds. The scene is partially obscured by a large, diagonal, light orange overlay that contains the text.

Thank You
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