
Mercury management

in the Chlor-alkali industry

**Workshop on mercury management in the
Latin American and Caribbean region**

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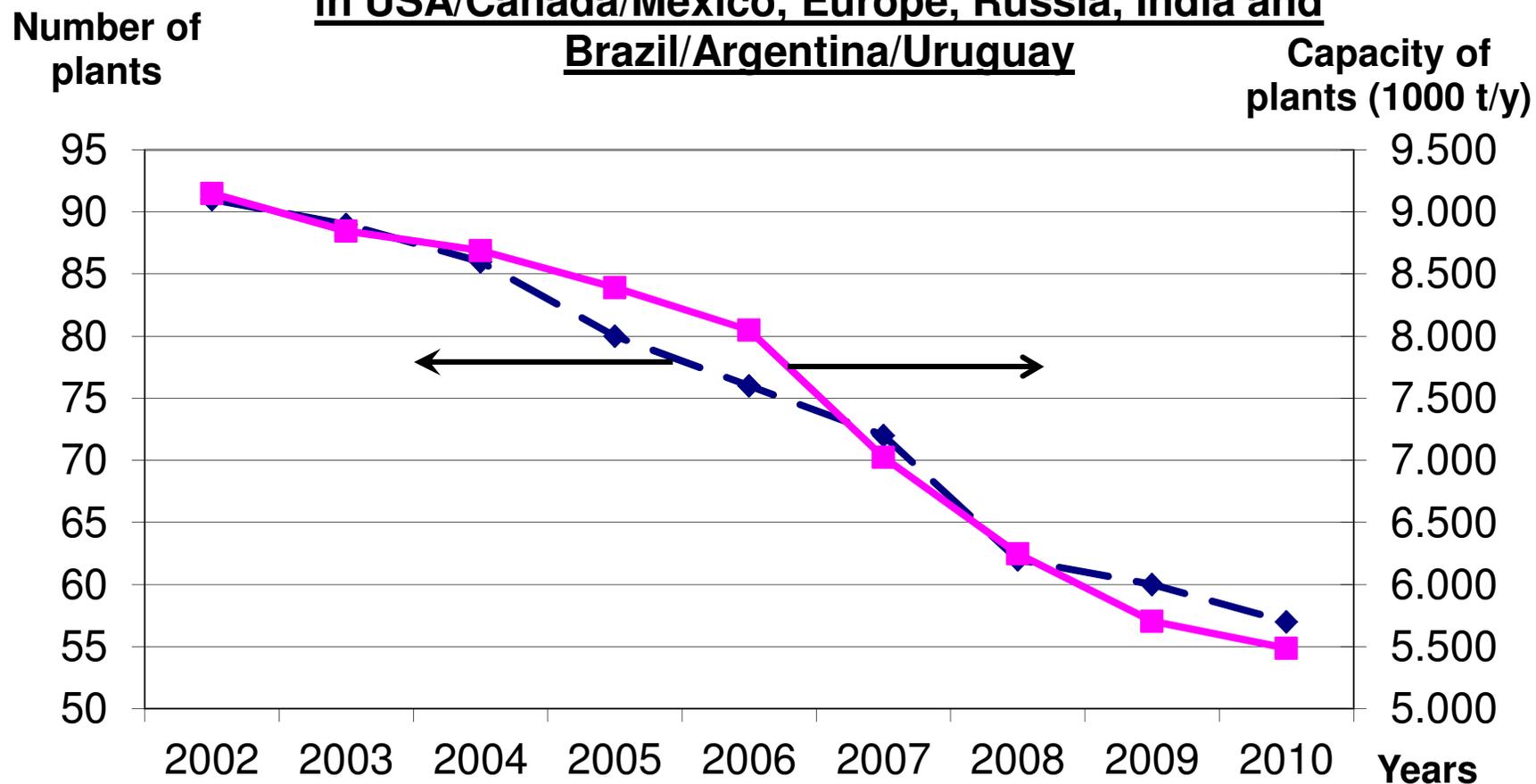
Mercury management in the chlor-alkali industry

Content

- WCC: phase out of mercury use
- Mercury storage
- Solvay Indupa technology conversion project
- Mercury stabilization
- General information

Hg use in chlor-alkali by WCC members

**Number of plants and capacity of mercury electrolysis units
in USA/Canada/Mexico, Europe, Russia, India and
Brazil/Argentina/Uruquay**



Estimate of mercury still present in chlor-alkali plants (situation end 2010)

Country or region	Hg plants	kt Cl ₂ /yr	t Hg (**)
Europe	34	3966	<i>7540</i>
India	7	188	<i>360</i>
Brazil + Argentina (1) + Uruguay (1)	6	318	<i>600</i>
North America + Mexico	6	614	<i>1170</i>
Russia	3	402	<i>760</i>
Sub-total	56	5488	10430
Non WCC members estimate	About 43 (*)	About 1000	<i>1900</i>
Grand total	About 99	About 6500	12350

(*) but for less than 1 Mt Cl₂/yr on a total of 6.5 Mt/yr

(**) rounded values based on an average of 1.9 t Hg/kt Cl₂ capacity

Latin-America & Caribbean Chlor-Alkali Producers Installed Capacity by Technology (MT/Year – Cl₂) - 2010

Country	Plants	Mercury	Membrane	Diaphragm	Total MT/Year	Share (%)
Argentina	9	120,720	150,677	51,264	322,661	11.99
Brazil	9	217,000	343,000	971,000	1,531,400	56.96
Chile	1	-	55,180	-	55,180	2.05
Colombia	3	21,649	26,469	-	48,118	1.79
Cuba	1	7,120	-	-	7,120	0.26
Costa Rica	1	-	4,900	-	4,900	0.18
Ecuador	1	-	4,183	-	4,183	0.16
Guatemala	2	-	4,200	-	4,200	0.16
Mexico	6	154,000	38,500	304,672	497,172	18.48
Peru	1	75,650	-	-	75,650	2.81
Uruguay	1	14,240	-	-	14,240	0.53
Venezuela	1	-	125,490	-	125,490	4.66
Total	38	610,379	752,599	1,327,336	2,690,314	100.0
Average (%)		22.69	27.97	49.34	100.0	100.0



Handling and storage of mercury in CA industry

- Safe handling and storage of liquid mercury is long-standing practice in chlor-alkali industry
- Good housekeeping; continued training; regular controls are key elements
- WCC guidance documents shared; several topics, e.g. housekeeping, minimisation of emissions, analytical methods, decommissioning, mercury storage ...

<http://www.unep.org/hazardoussubstances/Mercury/PrioritiesforAction/ChloralkaliSector/Reports/tabid/4495/language/en-US/Default.aspx>

Safe handling practices during operation



Cell room

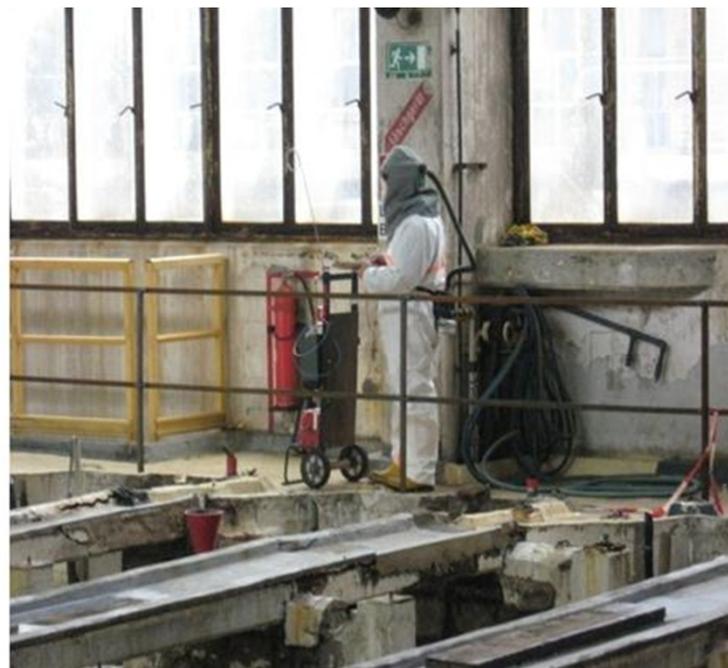


Respiratory equipment during cleaning

Safe handling during conversion



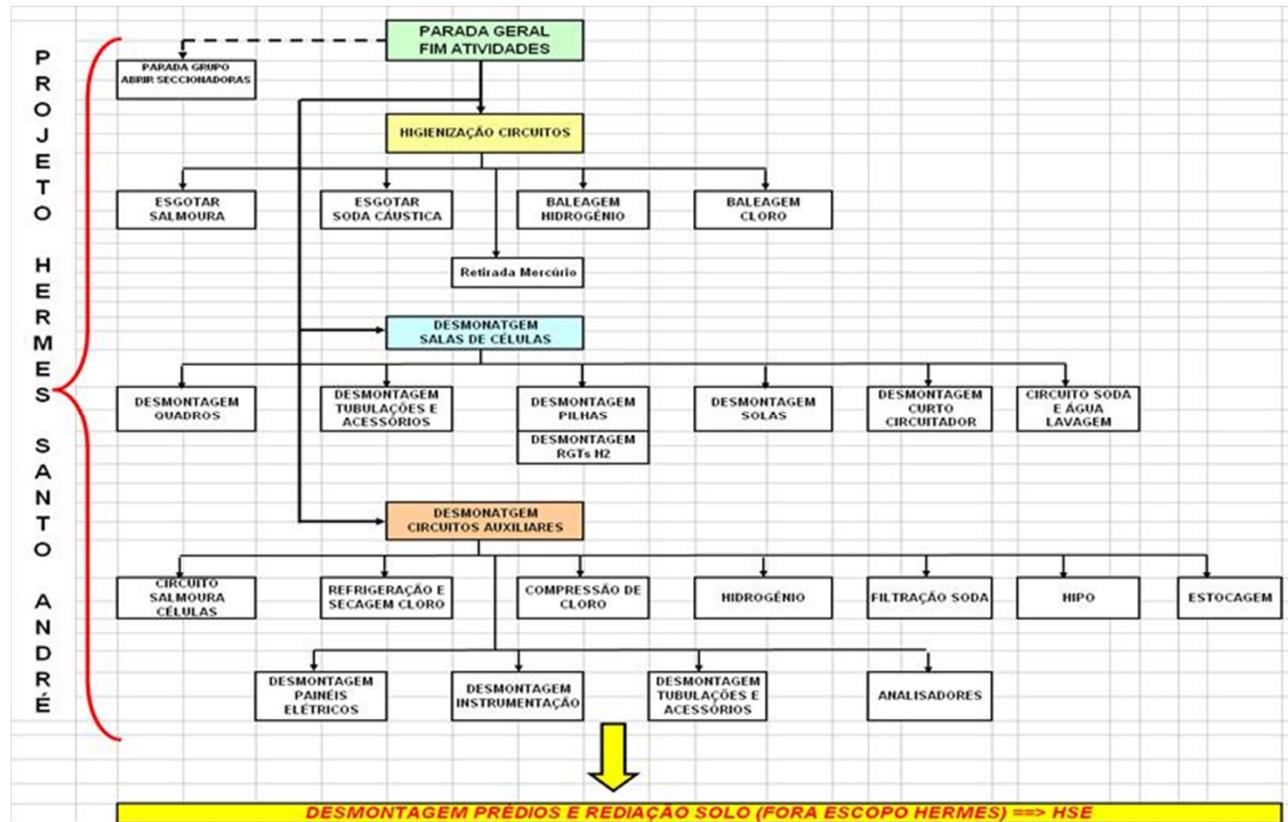
Fluorescent x-ray measurements



Frequent air measurements

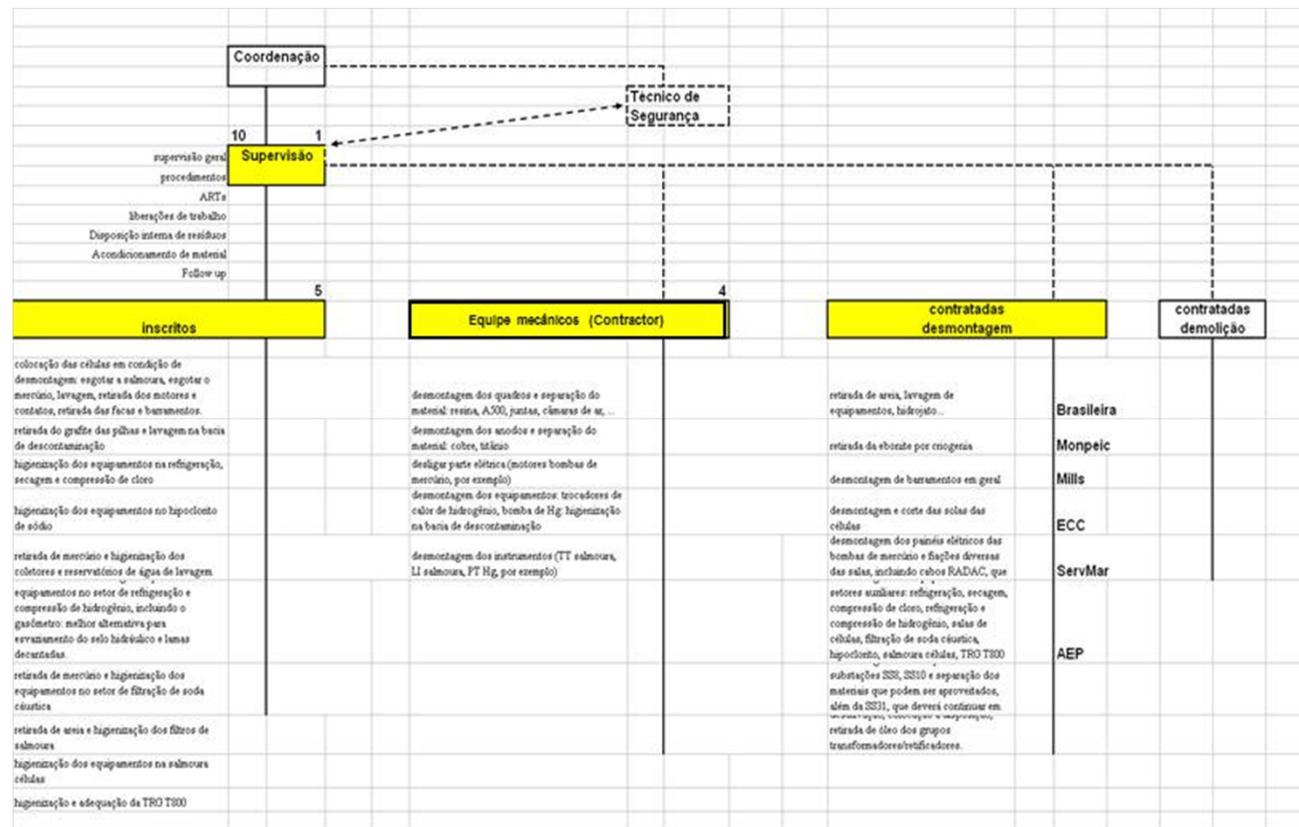
Solvay Indupa technology conversion project

Flowsheet



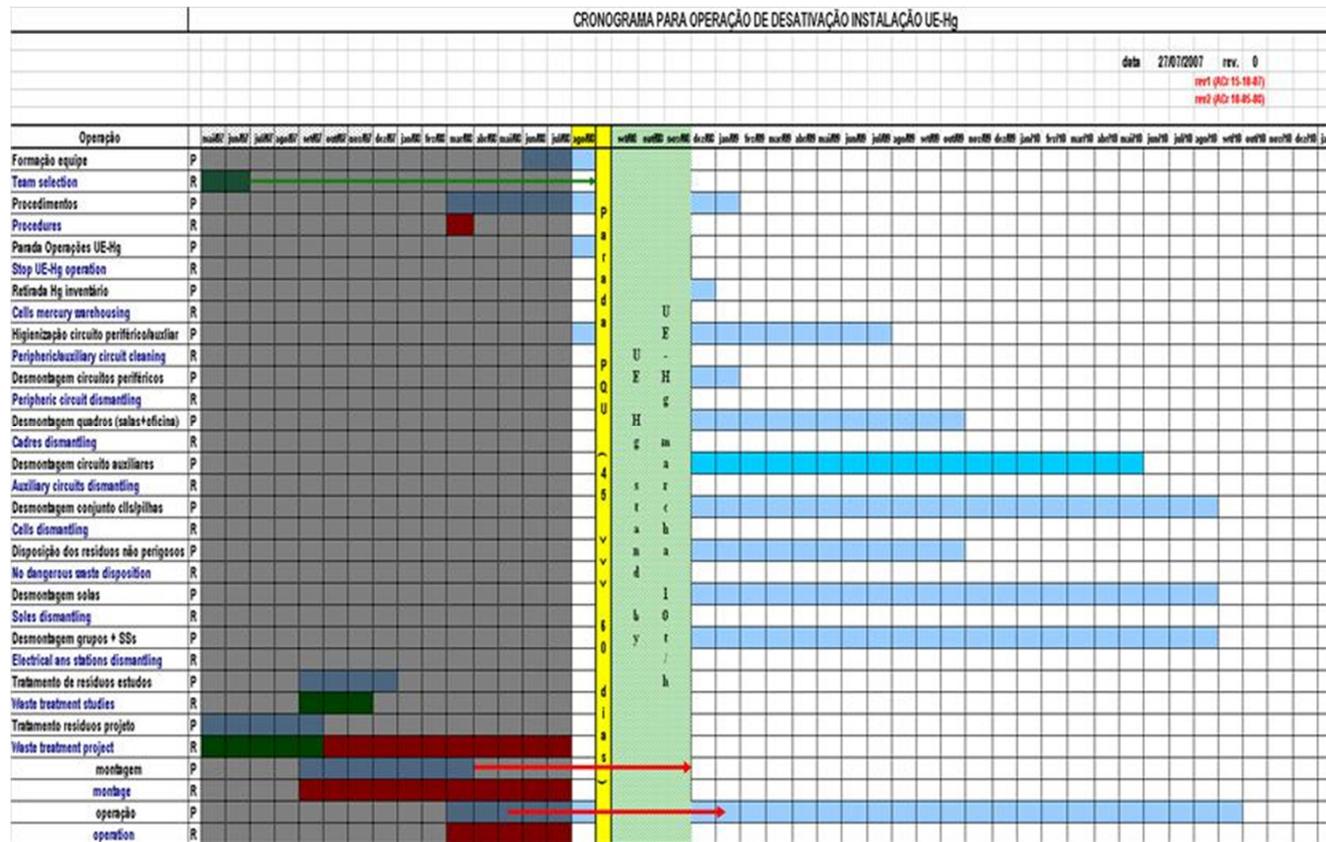
Solvay Indupa technology conversion project

Team: Mixed team, with its own experienced staff merged with outsourced staff familiar with mercury



Solvay Indupa technology conversion project

Schedule



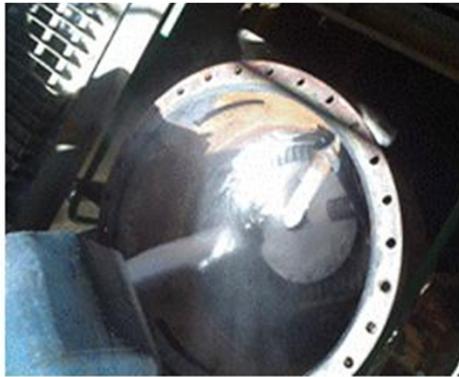
Solvay Indupa technology conversion project

Cell room: Cells and panels dismantling and lining removal



Solvay Indupa technology conversion project

Electrolyzer: H₂O₂ hygienization + sodium carbonate inertization + concrete encapsulation



Solvay Indupa technology conversion project

Mercury shipping to Almadén mine



Solvay Indupa technology conversion project

**Dismantling of auxiliaries circuits without mercury contamination:
Drying and chlorine compression, brine treatment**



Solvay Indupa technology conversion project

Authorities participation: Union, Regional Labor Agency, CETESB



Solvay Indupa technology conversion project

Results:

- Cells (101 sets) disassembled in 21 months. All the electrolysis dismantled in 32 months.
- 120,000 working hours distributed among Solvay staff and third parties.
- Accidents with and without waste of time = 0 (zero).
- First aid = 2 (two minor incidents).
- Hg in urine: < 20 ug/gC (Brazilian legislation \leq 35 ug/gC). Monthly analyses of all involved people.
- Medical interview and checkup to every new employee and when leaving de project.
- Mercury recovered (180 Ton) sent to Almadén mine in approved containers.
- Minor mercury quantities sent to Solvay Indupa chlor alkali plant in Bahía Blanca/Argentina. Also sent to Brazilian chlor alkali producers affiliated to Abiclor, with previous registration of transactions and authorization by IBAMA/MMA.

Mercury storage

- Storage options under consideration globally:
 - Aboveground – belowground (e.g. salt mines)
 - Liquid – solid (stabilized)
 - Studies ongoing on feasibility and safety
- Chlor-alkali industry interested in pursuing permanent storage solutions

Mercury storage - stabilization (1)

Mercury sulphide disposal in landfill and salt mines has been applied since many years

- Technical solutions being studied and developed in Germany (industrial unit), Spain (lab scale) and US
- Results show transformation of mercury is complete; no metallic traces detectable in solid
- Germany: industrial installation running successfully since >1 year (200 tonnes treated)
- Larger installation under construction

Stabilization of mercury (German company)

Brought to full scale, licensed and commercially used



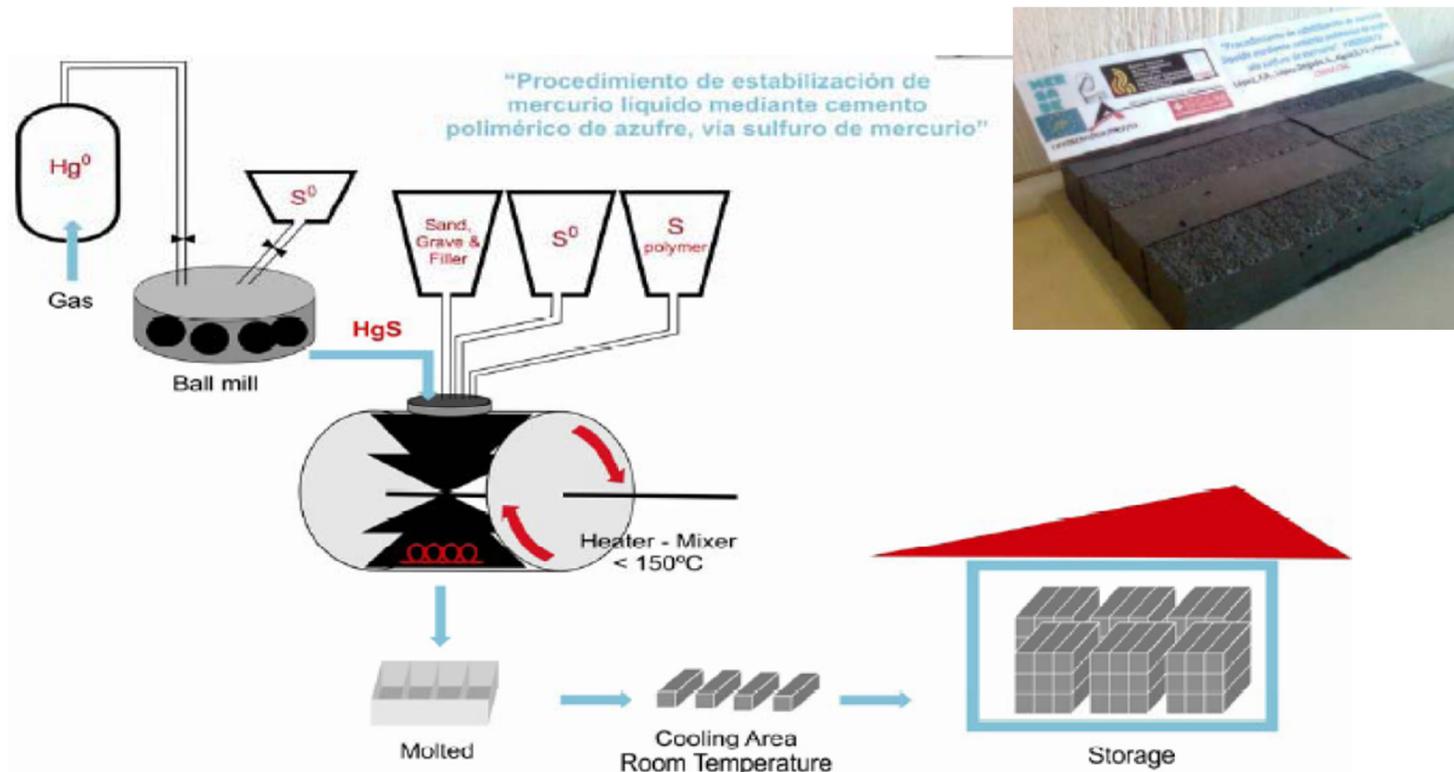
The end product from the stabilisation is the non toxic mercury sulphide, also known as cinnabar.

Mercury storage - stabilization (2)

- Spanish project for building industrial plant launched summer 2011 including collection and transport
- In operation before end 2012, economic details to be confirmed
- In US-Mexico commercial stabilization also considered but still preliminary
- Another option considered is long-term waste disposal based on amalgamation using zinc

Stabilization of mercury (Spanish company)

- After stabilization, encapsulation in liquid sulphur /sand/polymer



General information

- Visit to Carbocloro (Cubatão/Brazil)
 - September 17, 2011 Mr. Fernando Lugris (chair of the negotiating Committee of the UNEP Mercury Convention) visited to Carbocloro.



General information

- Visit to Efice (Uruguay)
 - March 7th, 2012 Mr. Timothy Kasten (Deputy Director of UNEP's Division of Environmental Policy Implementation) and Mr. Fernando Lugris with Uruguayan authorities visited to Efice.



Thank you for your attention

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