Mercury stabilization and solidification technologies

Mercury Stabilization - Solidification Technology
MAYASA - MTC
• BACKGROUND

• MERCURY STORAGE

• MAYASA/MTC MERCURY STABILIZATION SOLIDIFICATION TECHNOLOGY
Almadén, the region with the largest mercury deposit in the world, and MAYASA, the state-owned company that has exploited and marketed these resources since time immemorial, are associated closely and historically with the mining-metallurgical activity of producing and selling mercury.

*Cinnabar from Almadén mine*
• Year 2001
  Almadén mine closure

• Year 2003
  End of mercury production

• Year 2011
  End of reuse and commercialization of European surpluses

**Saint Aquilino headframe. XX century**

[www.parqueminerodealmaden.es](http://www.parqueminerodealmaden.es)
MAYASA’s EXPERIENCE IN MERCURY TRANSPORT AND STORAGE

This situation has resulted in a deep knowledge and an unique technical expertise on mercury.

Since 1991 MAYASA extended its mercury marketing activity to include surplus mercury from the European chlor-alkali industry.

The company negotiated a framework agreement with the European Association of Chlorine Producers (EURO CHLOR), which was signed in May 2001 and valid for ten years.

Mercury vessel for transport of mercury

Capacity: 1 tn

Unids: 300

Facilities mercury storage «Las Cuevas» (Almadén)
MAYASA’s EXPERIENCE IN MERCURY TRANSPORT AND STORAGE

From 2001 to 2011, MAYASA has collected, treated and stored reuse the surplus metallic mercury from industrial facilities located in various European countries.

In all cases, these operations have been carried out under the most exacting international standards (ADR, RID, IMDG, etc.).

During the 10-year period, it is important to highlight that no accident or mercury leak has been recorded.

Facilities mercury storage «Las Cuevas» (Almadén)
Mercury deposit temporary storage of mercury

Capacity: 400 tn

Unids: 6

Total Current capacity of mercury store in facilities «Las Cuevas»: 2,400 Tn
The need to stabilize mercury and its residues before their permanent storage MAYASA/MTC, has developed the Sulphur polymer Stabilization and Solidification technology, which consists of the transformation of liquid mercury to an inert solid.
MAYASA/MTC MERCURY STABILIZATION SOLIDIFICATION TECHNOLOGY

DESCRIPTION OF THE TECHNIQUE

Step 1
Stabilization HgS

Step 2
Solidification - Microencapsulation
(Creating double barrier)
Inert solid with low porosity and impermeable.

Safer product and easier to be managed.

1 ton of mercury produces 1.37 tons of residue (73% in Hg) and 1 liter of mercury produces 4.10 liters of residue.

Emits 100 times less mercury than cinnabar.

The MICROENCAPSULATION provides a second and additional barrier for avoiding mercury releases to the environment.

During the process, 100% of Hg is transformed.

Final product is non flammable product.

Low energy consumption. No water consumption, and neither effluents nor wastes are generated.

Final product. Monolithic block.
ADVANTAGES AND GUARANTEES

STANDARDIZED TEST. LEACHING TEST
Leaching values of final products fulfill the EU acceptance criteria for landfills for inert wastes (<0.01 mg/kg, Decision 2003/33/EC).

Mercury Technology Centre has certified its quality management system in accordance with UNE-EN-ISO 9001: 2008 by OCA Certification Institute. (*) Laboratory area of Mercury Technological Center are in progress for Accreditation in ISO/IEC 17025:2005
MAYASA/MTC MERCURY STABILIZATION SOLIDIFICATION TECHNOLOGY

ADVANTAGES AND GUARANTEES

MERCURY EMISSION

Measurements taken in a chamber of 0.22 m³ with temperature at 19 ± 2 °C / Lumex RA 915

<table>
<thead>
<tr>
<th>Sample</th>
<th>Hg ng/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air (blank)</td>
<td>77</td>
</tr>
<tr>
<td>Hg20SC</td>
<td>233</td>
</tr>
<tr>
<td>Hg30SC</td>
<td>164</td>
</tr>
<tr>
<td>Cinnabar (ore)</td>
<td>25539</td>
</tr>
<tr>
<td>Metacinnabar</td>
<td>3220</td>
</tr>
</tbody>
</table>

## MERCURY EMISSION TESTS

<table>
<thead>
<tr>
<th>Sample</th>
<th>Hg ng/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air (blank)</td>
<td>150</td>
</tr>
<tr>
<td>S-3.K</td>
<td>736</td>
</tr>
<tr>
<td>M.T.1</td>
<td>1.215</td>
</tr>
<tr>
<td>M.T.2</td>
<td>1.300</td>
</tr>
<tr>
<td>Cinnabar (ore)</td>
<td>20.222</td>
</tr>
</tbody>
</table>

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Disposal in specially engineered landfills

“Wastes containing mercury or mercury compounds that result from a stabilization and solidification of wastes consisting of mercury or mercury compounds which meet the acceptance criteria for specially engineered landfills defined by national or local regulations may be disposed of in specially engineered landfills with additional measures to minimize releases and methylation of mercury such as prevention of rainwater/groundwater inflow, prohibition of different wastes to be mixed in a landfill site, maintaining records of waste amounts and areas landfilled, leachate collection and long term monitoring of releases of mercury and methyl mercury from the landfill site e.g. into air and groundwater.”

(*) BASEL Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds

Landfill site «Quinto del Hierro». Almadén.

MAYASA has an agreement to be able to dispose of final products in engineered landfills.
MAYASA/MTC MERCURY STABILIZATION SOLIDIFICATION TECHNOLOGY

MAYASA is authorised to build engineered landfills.
III.- OTRAS DISPOSICIONES Y ACTOS

Consejería de Agricultura, Medio Ambiente y Desarrollo Rural

Resolución de 15/09/2015, de la Viceconsejería de Medio Ambiente, por la que se otorga autorización ambiental integrada para la planta de estabilización de mercurio ubicada en el término municipal de Almadén, Ciudad Real, titularidad de la empresa Minas de Almadén y Arrayanes, SA (Mayasa). [2015/12292]

Expediente: AAI-CR-067

1. Antecedentes de hecho.

En cumplimiento de lo establecido en la Ley 16/2002, de prevención y control integrados de la contaminación, la Dirección General de Calidad e Impacto Ambiental recibe con fecha 20 de octubre de 2014, entrada 2.647.264, solicitud de aprobación de Autorización Ambiental Integrada para la planta de estabilización de mercurio ubicada en el término municipal de Almadén, Ciudad Real, titularidad de la empresa “Minas de Almadén y Arrayanes, S.A.”, Mayasa, CIF A-28.764.140.

Con fecha de registro 21 de noviembre de 2014, salida 946.059, 19 de enero de 2015, salida 37.315 y 25 de febrero de 2015, salida 166.020, la Dirección General de Calidad e Impacto Ambiental requiere documentación adicional a la aportada para la continuación del trámite.


Vista general del Almacén de las Cuevas junto a la mina del mismo nombre.
IMPLEMENTATION OF THE PROJECT
ON SITE: LAS CUEVAS
PROCESS SAFETY:

- Rendered inert by means of N$_2$
  
  SULPHUR (IN ROOM T°) BLOWN
  SULPHUR (IN T°) Inert atmosphere

- ATEX:
  
  Explosion risk in areas with an explosive atmosphere
EMISSIONS CONTROL:

- DOUBLE SYSTEM OF EMISSION CONTROL: HIGH LOAD AREAS AND AMBIENT AIR
- AUTOMATIC CONTROL IN AIR Hg (6 sampling points).
- EMERGENCY POWER SUPPLY
11 months

Construction: 3 + 1 months

Startup: 2 + 2 months

Warranty tests: 3 months
THANKS FOR YOUR ATTENTION

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