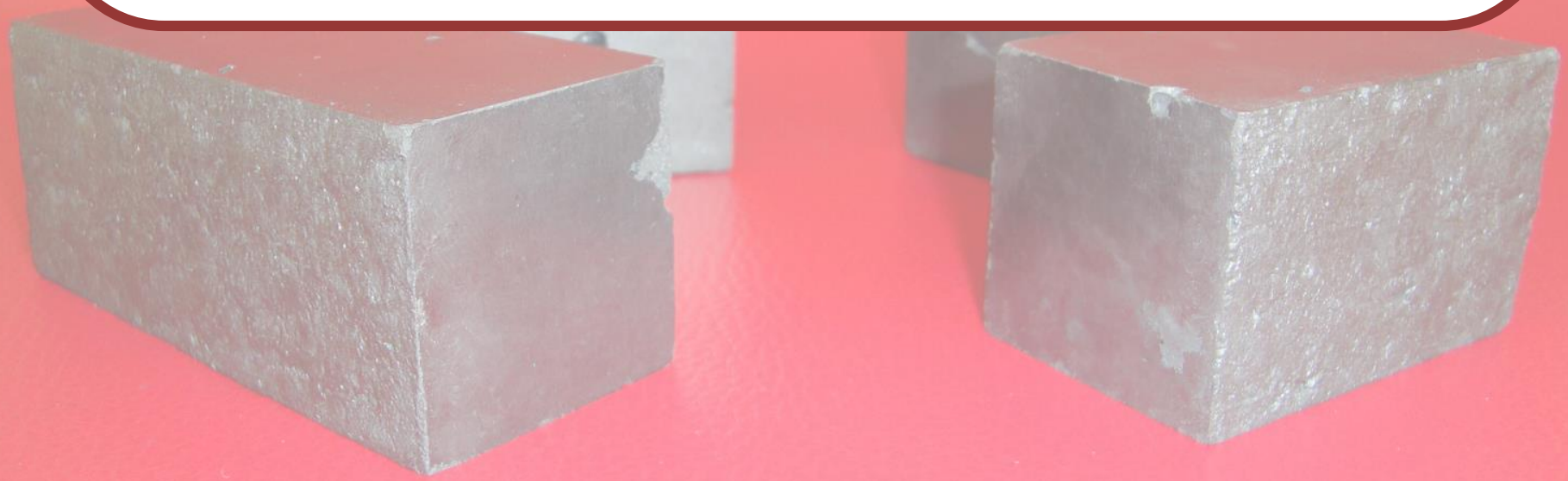
MERCURY STABILIZATION PLANT



MAYASA
MINAS DE ALMADÉN Y ARRAYANES S. A.

Mercury Technological Center

SEPI

BACKGROUND

Saint Aquilino headframe . XX century

- **Year 2001**

Almadén mine clousure

- **Year 2003**

End of mercury production

www.parqueminerodealmaden.es

- **Year 2011**

End of reuse and commercialization of European surpluses

United Nations Educational, Scientific and Cultural Organization

Heritage of Mercury. Almadén and Idrija inscribed on the World Heritage List in 2012

Parque Minero de Almadén

MERSADE Project main tasks (2006-2010):

1. Container for the safe **temporary storage** of metallic mercury

2. Stabilization / Microencapsulation technique for **permanent storage**

MERSADE

(MERcury **SA**fe **De**posit)

Design and construction of a **prototype container for temporary storage of mercury**:

- Confinement of **double barrier**

- **security mechanisms** and **ongoing monitoring** such as temperature, mercury level, pressure and stability.

DESCRIPTION OF THE TECHNIQUE

Stabilization

Metallic Hg **Elemental sulfur particles (< 60 µm)** **react to obtain HgS (Cinnabar)**

DESCRIPTION OF THE TECHNIQUE

HgS

S

S polymer

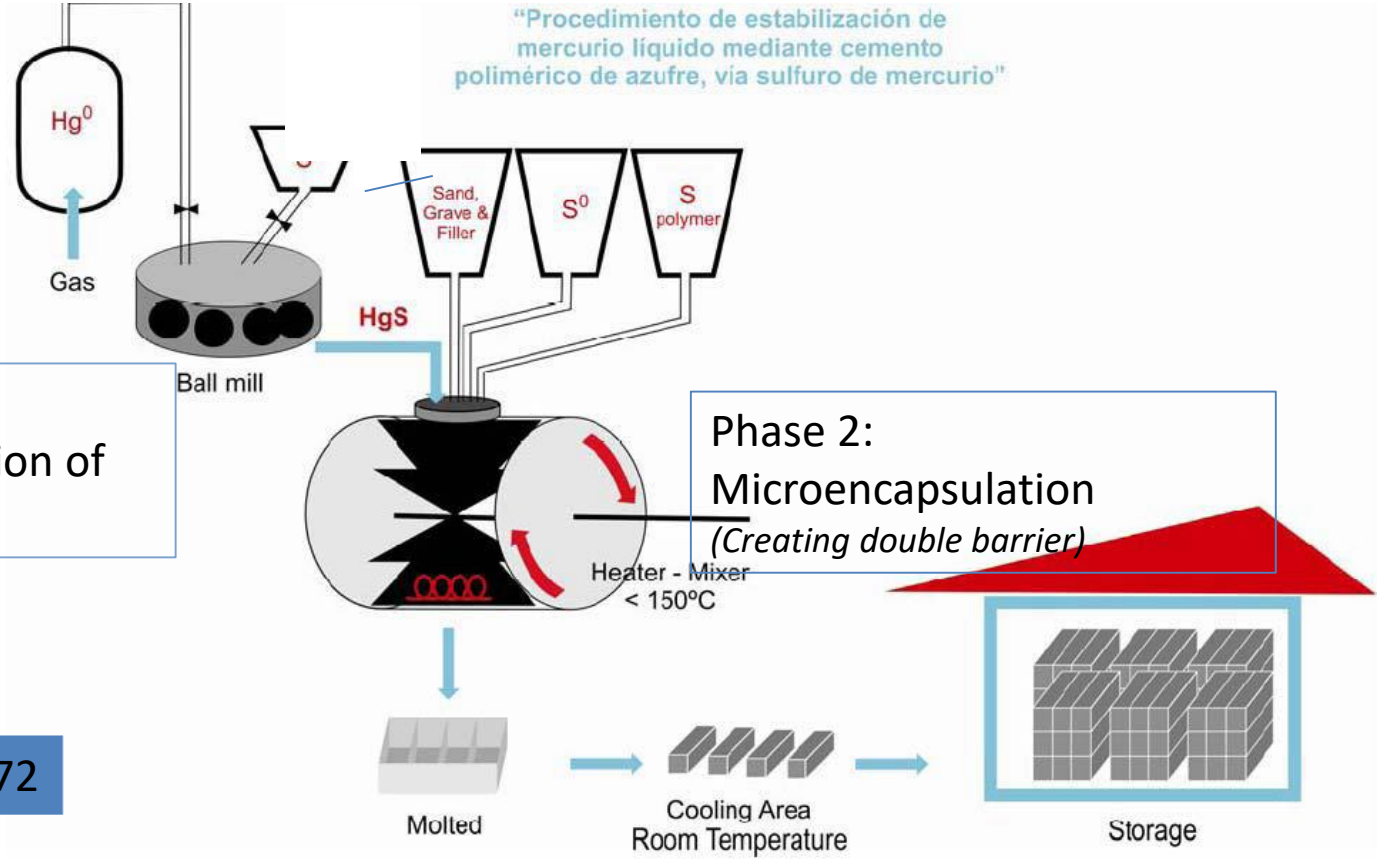
HEATER-MIXER (<140ºC)

POLIMERIC CEMENT OF SULPHUR (Artificial rock)

DESCRIPTION OF THE TECHNIQUE

MERSADE

Stabilization and Microencapsulation



Phase 1: Stabilization of HgS

Phase 2: Microencapsulation *(Creating double barrier)*

Patent: P200930672

ADVANTAGES AND GUARANTEES

European leaching limits values as acceptance criteria:

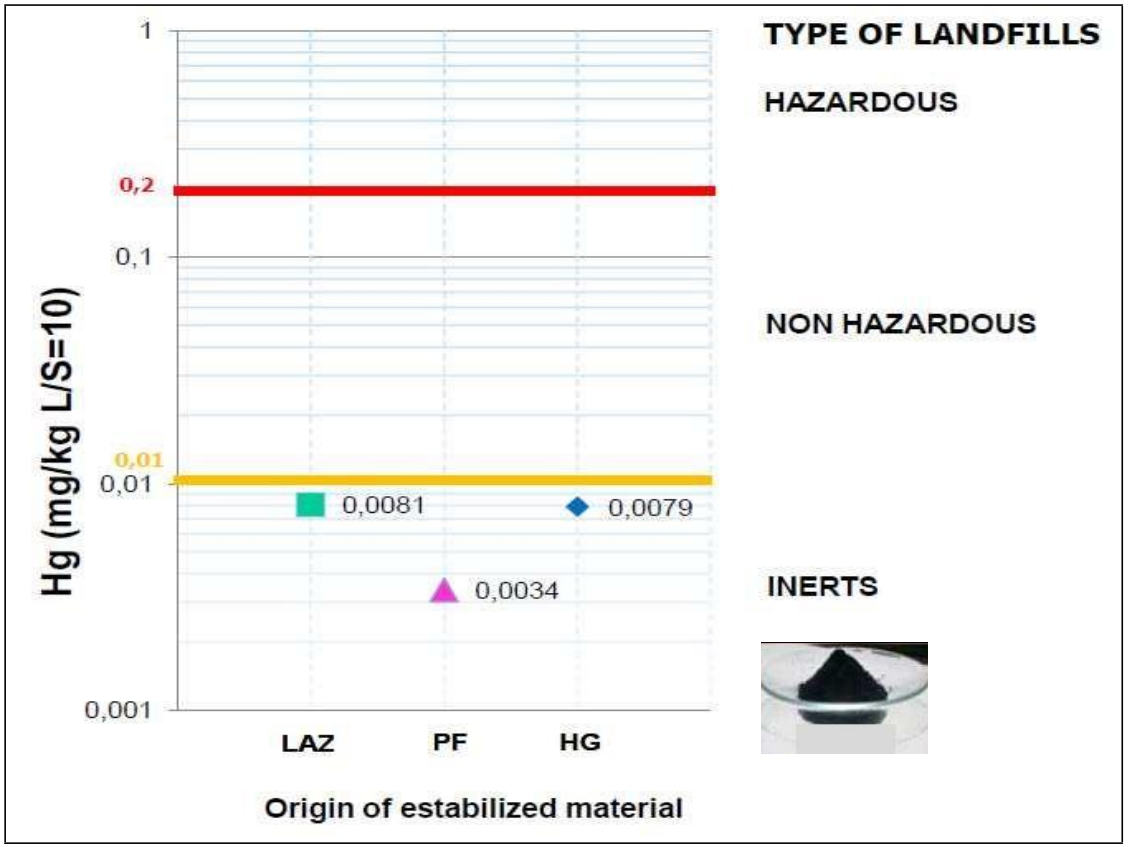
MONOLITHIC WASTE

- 0,0016-0,0034 mg/kg

GRANULAR WASTES (1)

- 0,0029-**0,0077 mg/kg**

TOTAL HG LEACHATE for L/S=10



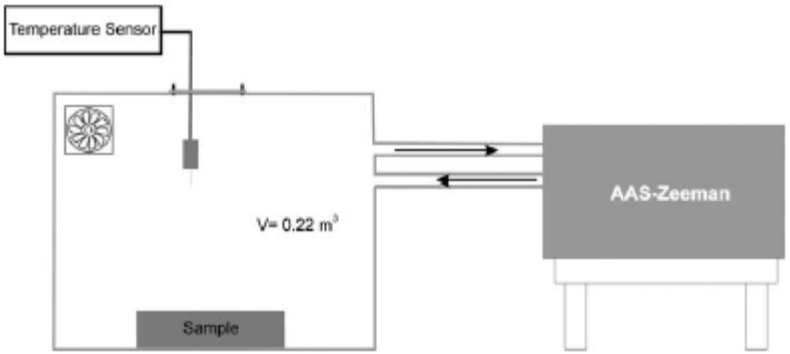
(1) CEN/TS 14405:2004 Characterization of waste – Leaching behaviour test – Up flow percolation test (under specified condition)

Ref.: A. López-Delgado, F. A. López, F. J. Alguacil, I. Padilla, A. Guerrero. "A microencapsulation process of liquid mercury by sulfur polymer stabilization/solidification technology. Part I: Characterization of materials". REVISTA DE METALURGIA, 48 (1), 45-57, 2012.

ADVANTAGES AND GUARANTEES

MERCURY EMISSION

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



Ref.: A. López-Delgado, A. Guerrero, F. A. López, C. Pérez, F. J. Alguacil. "A microencapsulation process of liquid mercury by sulfur polymer stabilization/solidification technology. Part II: Durability of materials". REVISTA DE METALURGIA, 48 (1), 58-66, 2012.

Sample	Hg ng/m3
Air (blank)	77
Hg20SC	233
Hg30SC	164
Cinnabar (ore)	25539
Metacinnabar	3220

ADVANTAGES AND GUARANTEES

- **Inert solid** with low porosity and impermeable.
- **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 **100-150 times** less mercury **than cinnabar**
- The MICROENCAPSULATION provides a **second and additional barrier** for avoiding mercury releases to the environment**.**
- Safer product and easier to be managed: **final disposal is possible in inert landfill** according its leaching conditions**.**
- During the process, **100% of Hg is transformed.**
- **Low energy consumption. No water consumption, and neither effluents nor wastes are generated.**

DESCRIPTION OF THE TECHNIQUE. OTHERS WASTES

STABILIZED WASTES

Hg fluorescent dust (FD) of recycling plants

Hg waste industry primary production of Zn

Hg waste industry primary production of Al

DESCRIPTION OF THE TECHNIQUE. OTHERS WASTES

Hg fluorescent dust (FD) of recycling plants

Density: 3.05 gr / cm3

Ø size: < 40 µm

[Hg] ≥ 20 ppm

Estabilized FD waste (66,5 % w. of waste)

DESCRIPTION OF THE TECHNIQUE. OTHERS WASTES

Hg waste industry primary production of Zn

Density: 6,15 gr /cm^3
Ø size: < 40 µm
Humidity: 33,2 %
[Hg] 40 – 70 %

Estabilized Zn waste (65,2 % w. of waste)

DESCRIPTION OF THE TECHNIQUE. OTHERS WASTES

Hg waste industry primary production of Aluminum

- AL_2O_3 production from bauxite as first steep of Al production. By mixing with caustic soda and increasing Tª.
- Pending from origin, Hg content in bauxite is <> (X = 0,11 ppm average)
- Hg vapor in gases from process.
- Hg extracted from gas treatment system and obtained as metallic mercury (99 to 99,9 %) by condensation.

Hg estabilized (65 % Hg)

PROJECT DEVELOPMENT

Diario Oficial de Castilla-La Mancha
AÑO XXXIV Núm. 204 19 de octubre de 2015 27839

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.

El titular aporta documentación adicional en escritos de fecha 18 de diciembre de 2014, entrada 32.369.746, 28 de enero de 2015, entrada 168.153, y 9 de abril de 2015, entrada 961.116, nueva revisión de proyecto y documentación adicional de la instalación.

IMPLEMENTATION OF THE PROJECT

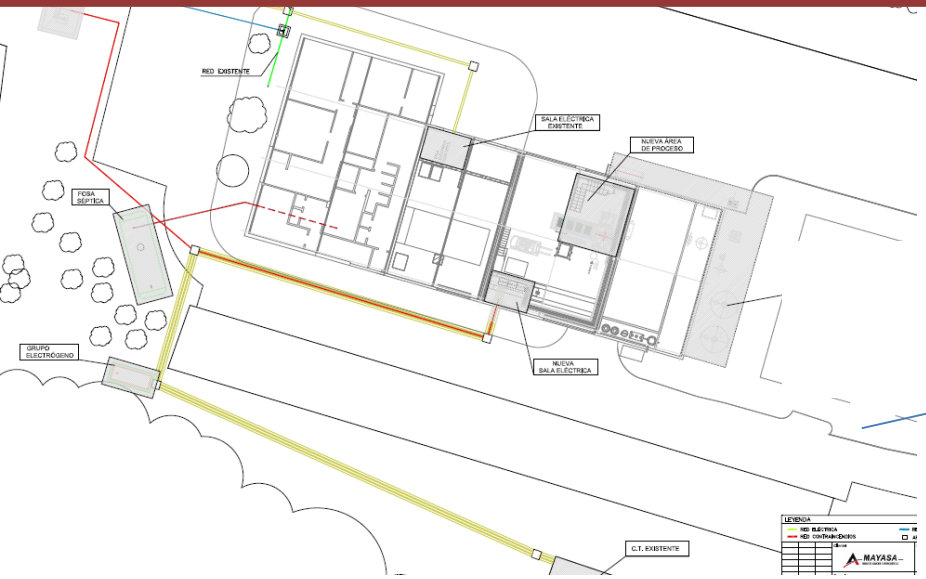
ON SITE: **LAS CUEVAS**

Situación GPS +38° 49' 15.11", -4° 45' 27.44"

Vista general del Almacén de las Cuevas junto a la mina del mismo nombre.

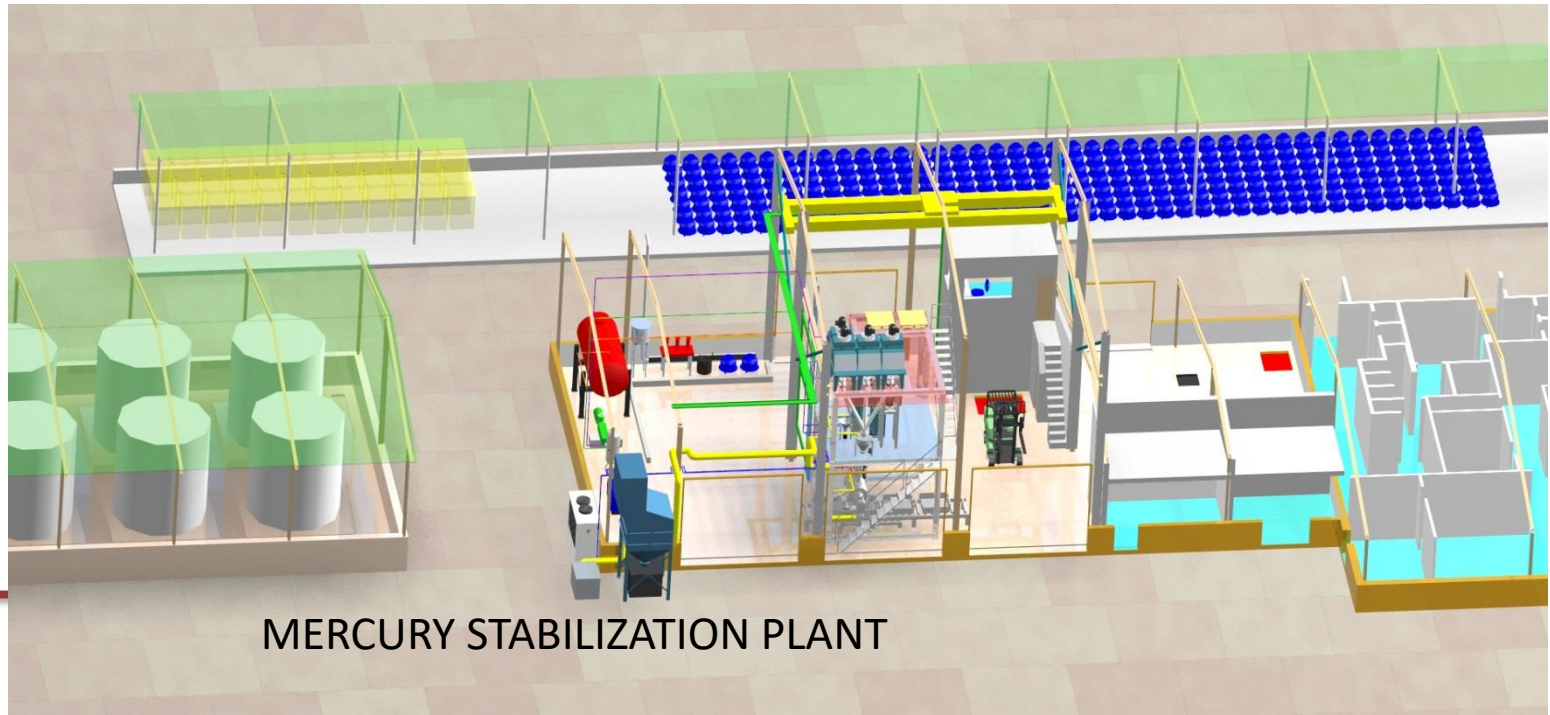
MERCURY STABILIZATION PLANT

DESARROLLO DEL PROYECTO



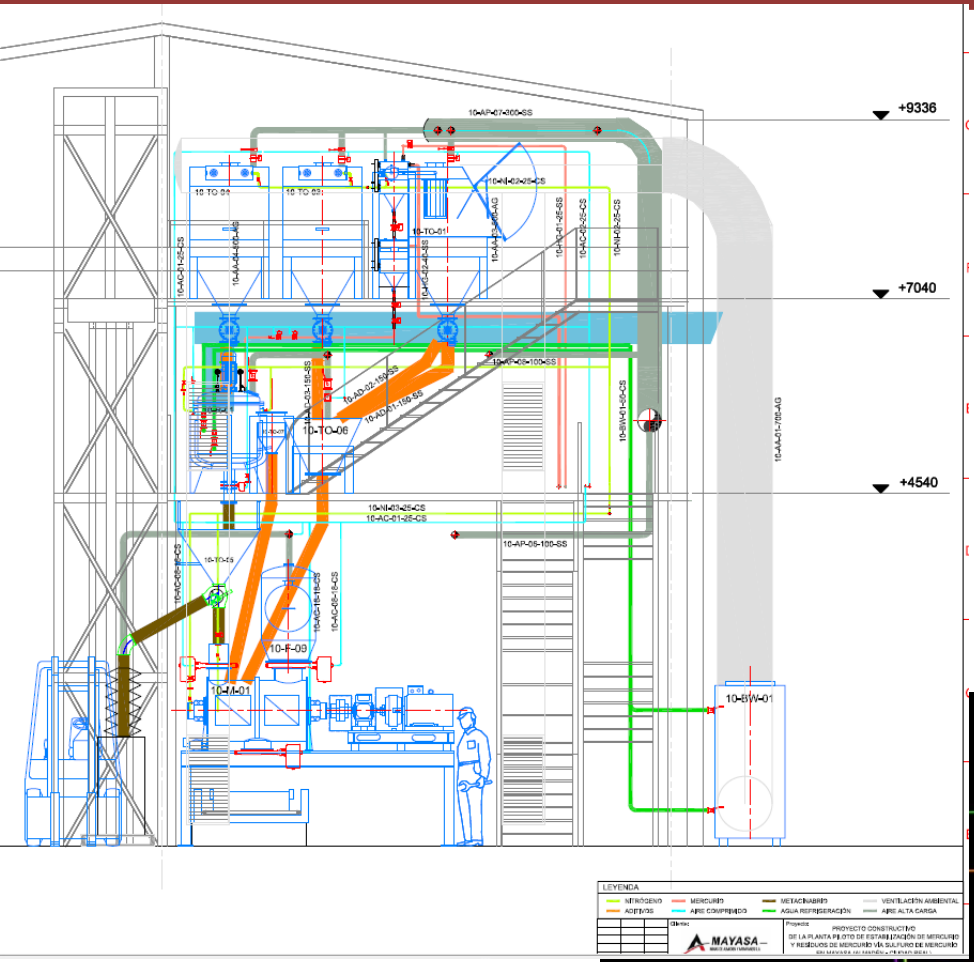
IMPLEMENTATION OF THE PROJECT

ON SITE: **LAS CUEVAS**



MERCURY STABILIZATION PLANT

PROJECT DEVELOPMENT



PROCESS SAFETY:

- **Rendered inert by means of N_2**

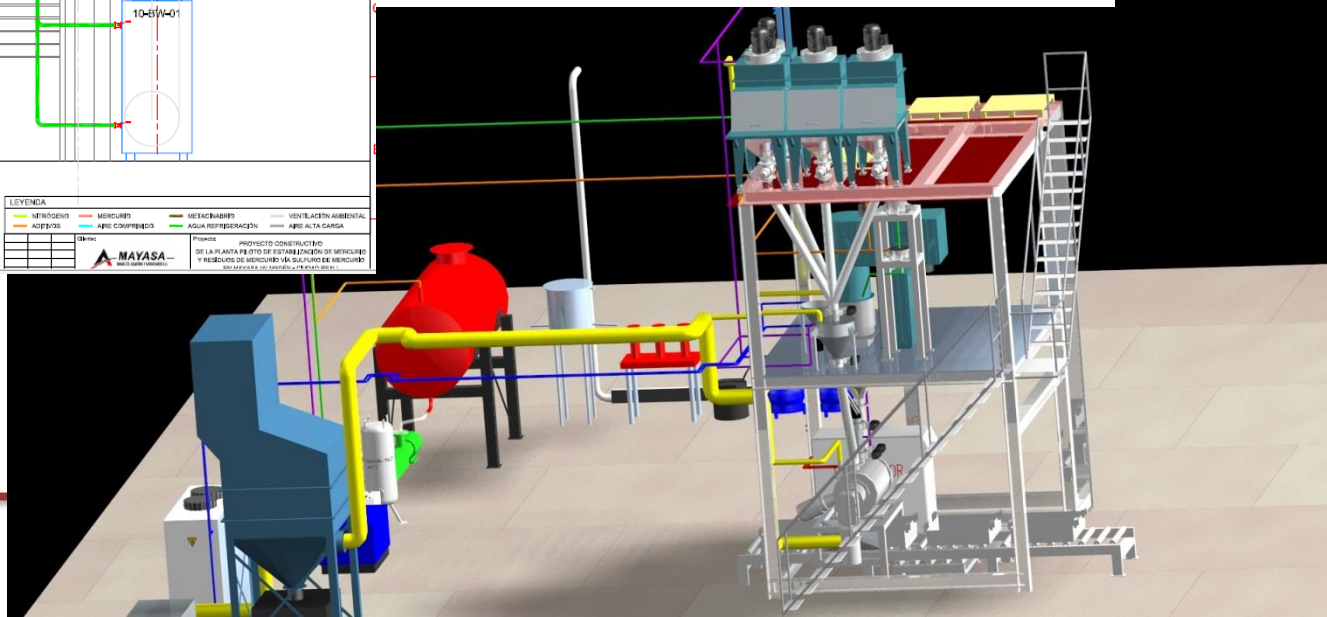
  SULPHUR (IN ROOM Tª) BLOWN

  SULPHUR (IN Tª(Inert atmosphere

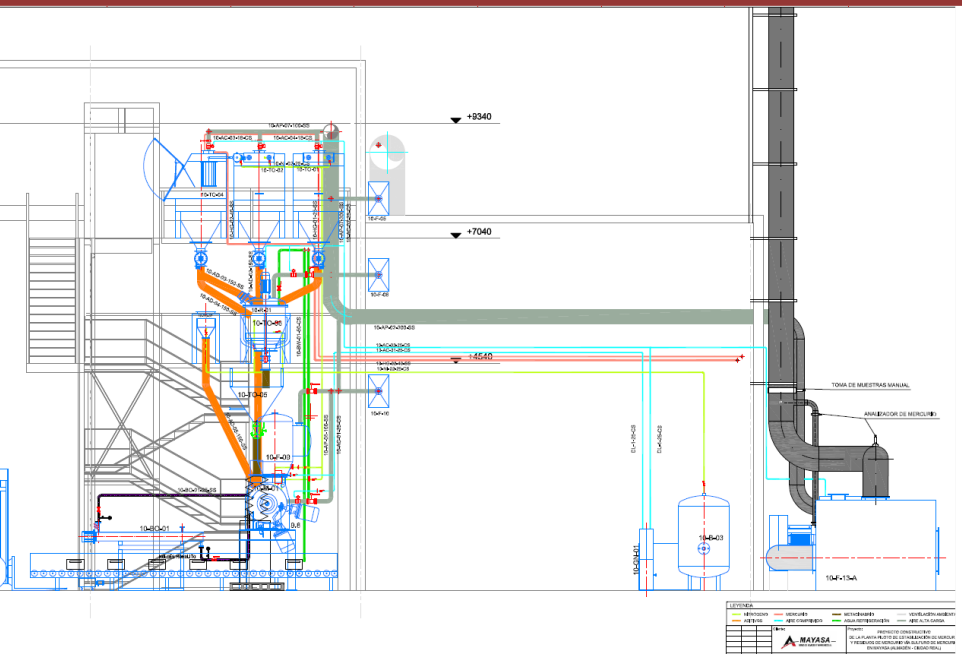
- **ATEX:**

  Explosion risk in areas with

  an explosive atmosphere

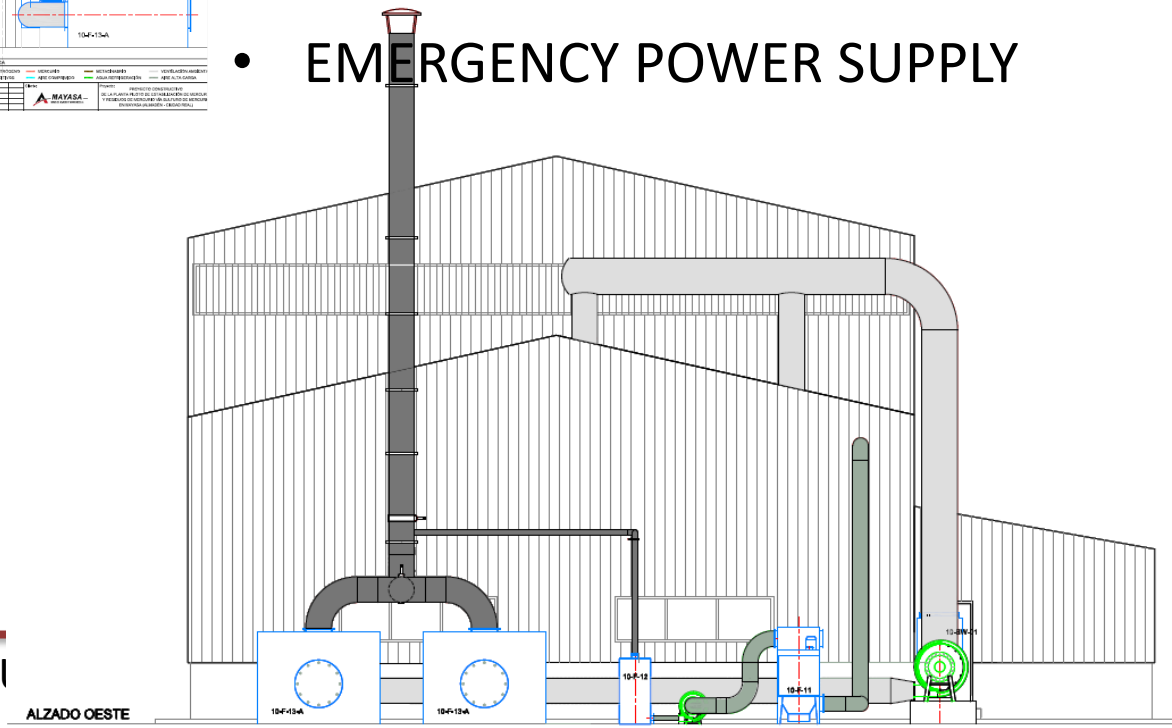


PROJECT DEVELOPMENT



EMISSIONS CONTROL:

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



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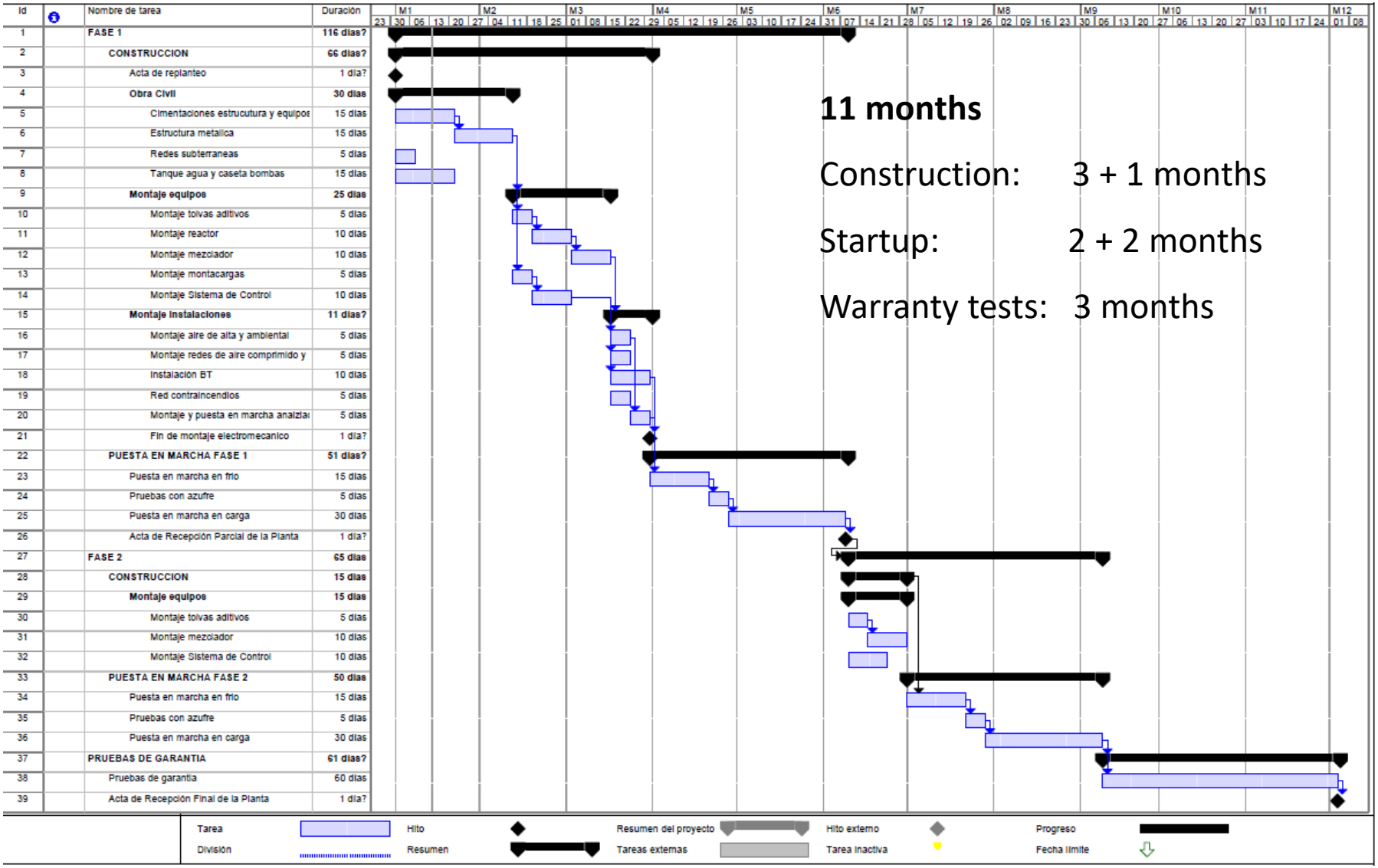
PROJECT DEVELOPMENT



MERCURY STABILIZATION PLANT

INSTALLATION AMOUNTS

TRANSPORT CAPACITY:	300 t
TEMPORARY STORAGE CAPACITY:	2.400 t
ANNUAL TREATMENT CAPACITY :	150 t a 300 t

(per shift 6 h a day)

Mercury storage tanks (6 tanks of 30 m^3 of capacity each).

THANKS FOR YOUR ATTENTION

fcojavier.carrasco@mayasa.es

MAYASA
MINAS DE ALMADÉN Y ARRAYANES S. A.

Mercury Technological Center

SEPI