

# Safe disposal of liquid mercury by formation of mercury sulphide

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## mercury waste treatment services

- Experience since 1992 in treatment of mercury waste
- Located in Essen/Germany



Mercury containing waste from the chlorine alkali industry:



*Sludge*



*Contaminated soil*

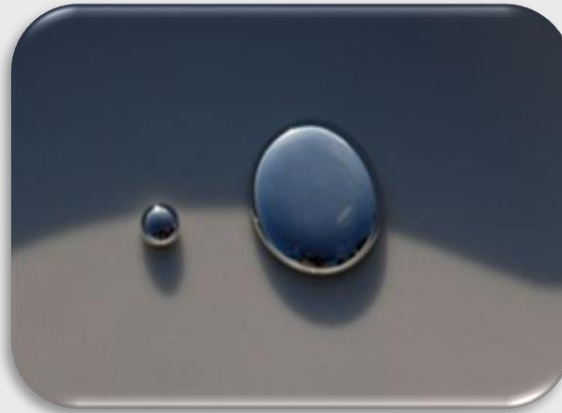


*Spent catalysts*



*Activated carbon*

# Surplus liquid mercury as waste



*Surplus liquid mercury*

Classified as waste from March 15, 2011  
according to EC-legislation 1102/2008;

**”Shall be disposed of  
in a way that is safe  
for human health and  
the environment”**



**Incentive for DELA to  
develop a stabilisation  
technology – a.s.a.p!**

# Stabilisation of liquid mercury



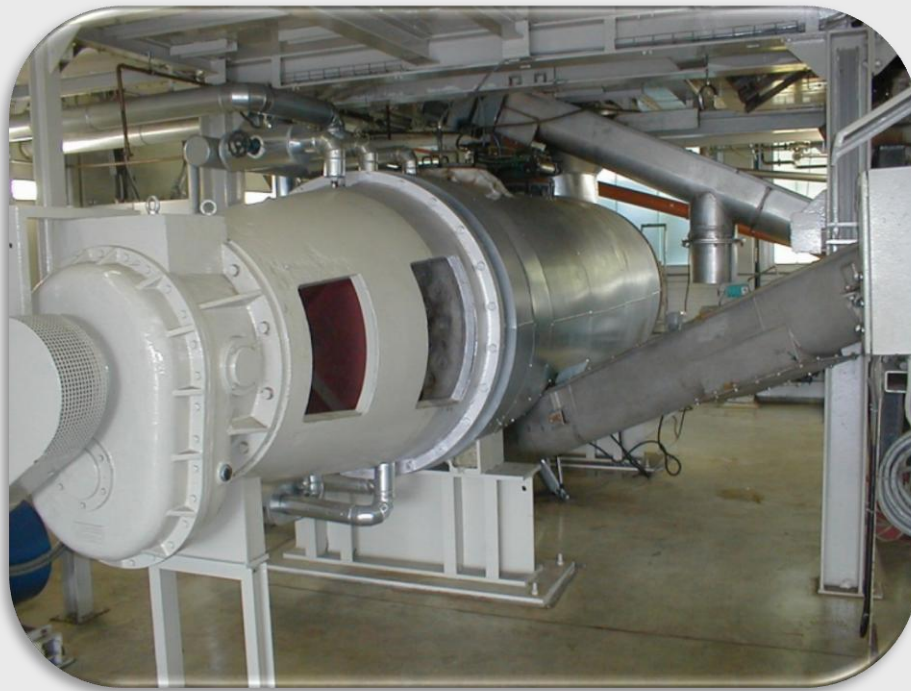
- Mercury and sulphur reacts to mercury sulphide
- Very toxic Hg is transformed into non toxic HgS
- Spontaneous reaction
- Exothermal reaction

## HgS identification

- The most stable mercury compound
- The most insoluble metallic-sulphide compound
- The natural mineral form known as cinnabar



# Adaptation of a well proven technology



## Vacuum mixer

- Mature and well proven technology for treatment of mercury waste
- No oxygen – operational safety
- Low emissions

## Successful bench-scale test runs in 2009

- Treatment capacity: 5 kg mercury / test run
- 75 test runs
- Using mercury from DELA GmbH and SAKAB AB



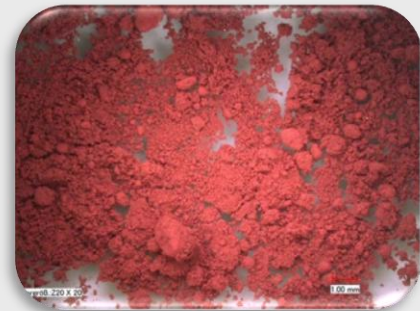
# Test runs - prerequisites and results

## Prerequisites

- Recipe sulphur and mercury 1:6 ~ stoichiometric ratio [kg]
- Find the parameters with optimum outcome for maximum red HgS

## Results - properties end product

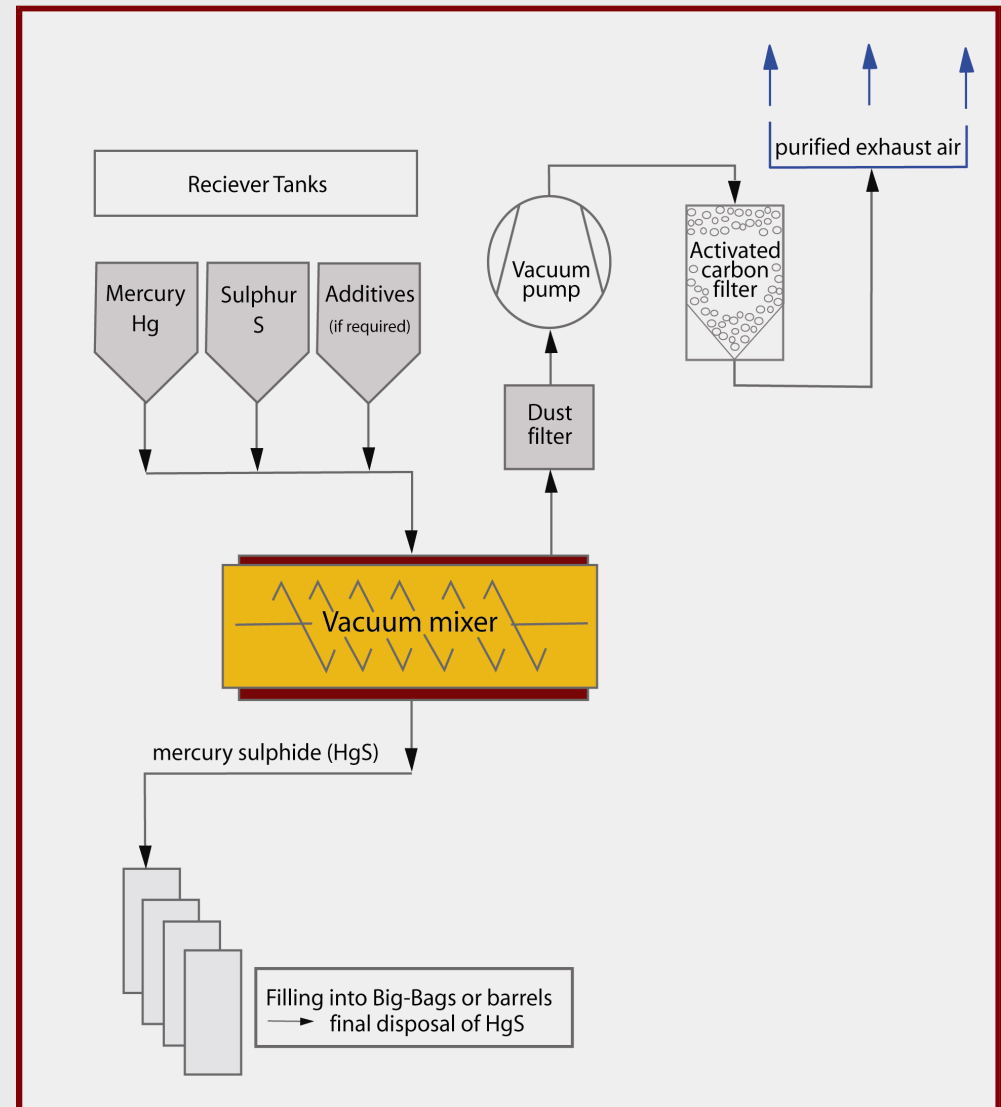
- Crystalline structure – 100% red HgS
- Thermodynamic stable
- Good values for leaching behaviour < 0.002 mg Hg/kg  
(EC limit for inert landfill < 0.01 mg Hg/kg)
- Final product free of Hg emissions and no remaining sulphur – total conversion to HgS



# Stabilisation Process

## Procedure steps

- Filling receiver tanks
- Pellets can be produced by using additives
- Create inert atmosphere
  - Nitrogen inflow
  - No oxygen
- Setting up vacuum atmosphere
- Total quantity of sulphur required is fed at once
- Defined quantity of mercury added evenly
- Defined parameters for mixing time, temperature, speed etc

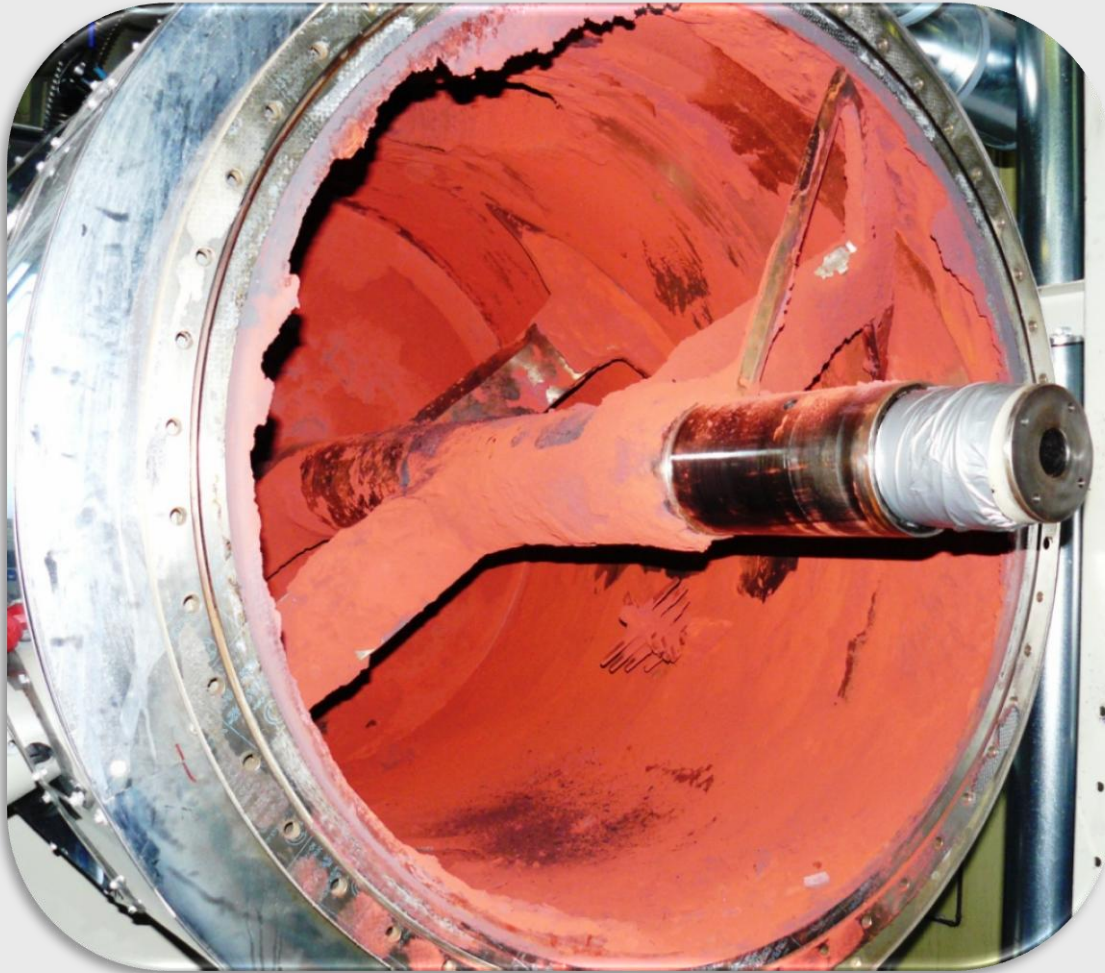


# Large scale plant

- 800 kg/batch
- Capacity ~ 3 t/day → 1,000 t/a
- First runs accomplished in May 2010
- Over 100 tonnes stabilised up to now
- Additional capacity for 3,000 t/a planned
- Patent registered by DELA GmbH
- Plant approved by the competent authority
- Supported by German Ministry of Economics and Technology



# End product - red mercury sulphide



All properties of the end product from the test runs were confirmed in the full scale plant.

# Acceptance criteria and possible pre-treatment

## Acceptance criteria

- Purity of 99.9 %
  - or coming directly from the mercury cells
- UN-certified packaging



## Distillation

- If necessary as pre-treatment for metallic mercury before stabilisation and before intermediate storage (99.9% purity required)
- Can be done on site
- Purities of 5N to 8N



# Metallic mercury from different sources

**Deliveries or agreements on stabilisation of liquid mercury from:**

- chlorine alkali industry
- battery recycling
- gold mining
- non-ferrous mining

**Permits, technical solutions etc. for the whole handling chain is already in place!**



# Stabilisation of metallic mercury - from mercury cells to final disposal

## 1. Mercury cells



Photo: BASF

Hg purity 99.9 %

Hg purity < 99.9 %

Distillation of Hg

## 2. Packaging metallic Hg

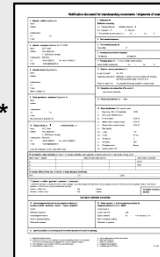


Photo: DELA GmbH

UN approved & certified flasks/containers

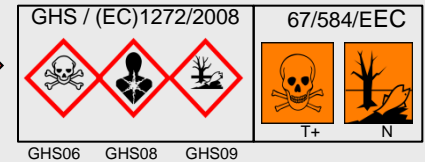
## 3. TFS/Notification

EWC 06 04 04\*



UN 2809

## 4. Transport metallic Hg



GHS / (EC)1272/2008

67/584/EEC



GHS06 GHS08 GHS09



Photo: DELA GmbH

## 5. Reception DELA

## 9. Final disposal (Salt mine)



Photo: K+S Entsorgung GmbH

## 8. Transport HgS



EWC 19 03 05

## 7. Packaging HgS

Steel drums, Big-Bags



Photo: DELA GmbH

## 6. Hg stabilisation

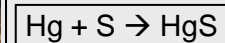


Photo: DELA GmbH



Photo: DELA GmbH

**Looking forward to welcome  
you in our exhibition stand!**

Susanne Kummel

Miriam Ortheil



**Thank you for your attention!**

**DELA GmbH**

**[www.dela-recycling.com](http://www.dela-recycling.com)**