



Horizon 2020 Initiative to de-pollute the Mediterranean by the year 2020

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in collaboration with UNEP/MAP

Training on mercury management and remediation of contaminated sites

"Decommission plan and management in the chlor-alkali industry and mercury waste"

Almadén, Spain, 18-19 November 2015



Salvador ASENSIO - Solvay Química Production Unit Manager Electrochemistry & Chlorinated



Content

- Solvay Who are we?
- Mercury and Chlor-Alkali Industry
- Decommisioning
- "Hermes" Project





Solvay – Who are we?







We are a world leader in the chemical industry



26,000 employees	119 industrial sites	SOLVAY Solvay aking more from chemistry*
Description of the second seco	€ 10,213 million of net sale	€ 1,783 s million of REBITDA

2014 figures





The Solvay spirit Making the impossible possible





Bringing together the leading scientists of the time, permitting major advances in quantum mechanics







Believing an airplane can fly on solar energy alone

Mercury and Chlor-Alkali Industry





Current situation

- Chlorine can be produced with three different technologies
 - Membrane
 - Diaphragms
 - Mercury or Amalgam technology
- Barcelona Convention (Mediterranean) force to <u>cease releases</u> of mercury from chlor-alkali plants by 2020 at the latest.
- After the issuing of new BREF (Best Available Techniques Reference Document) for Chlor-Alkali, Mercury Cells must shut down at latest on <u>30th November 2017</u>. That supersedes previous instruments as:
 - Commitment of European chlor-alkali industry for shutting down all mercury plants by 2020
 - OSPAR/PARCOM decisions about cessation of activity
- After Eurochlor figures, current nameplate capacity for mercury technology is
 - 2 753 kt (22.6% of total capacity) in West Europe
 - 576 kt (81.4% of total capacity) in Spain
 - About 6100-6200 tons of Hg to be disposed
- About 1 700 kt has already been decided to convert or close.
 - There are not yet a decision about 1043 kt of capacity (576 kt in Spain)



Decommisioning





Reference documents

- EuroChlor Guidelines
 - Env Prot 3 Guideline for decommissioning of mercury chlor-alkali plants (6th edition. August 2012)
 - Env Prot 15 Management of mercury contaminated sites (3rd edition. May 2012)
 - Env Prot 20 Guidelines for the interim storage of metallic mercury in shut down chlor-alkali plants (1st edition. May 2011)
 - Env Prot 19 Guidelines for the preparation of permanent storage of metallic mercury above ground or in underground mines (1st edition. October 2007)
 - Health 2 Control of worker exposure to mercury in chlor-alkali industry (7th edition. August 2012)
- European IPPC Bureau
 - Best Available Techniques (BAT) Reference Document for the Productions of Chloralkali. Chapter 4.1.3. (2014)
- Local documents (if any)
 - e.g. French S.H.D.
- Company Internal Documents (if any)



Eurochlor Recommendations (I)

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Awareness of Legislation

- Various subjects
 - Protection of the health and safety of workers
 - Protection of the environment (air and water emissions, soil contamination)
 - Handling, transport, treatment and disposal of wastes
- Different levels
 - Global (European Union)
 - Local (nationwide or regional)
- Project Management
 - Creation of a task force (Project Team)
 - Detailed planning
 - Contact with authorities (permits)
 - Estimation of mercury in different forms and decisions about destination
 - · Decision about re-use of buildings or equipment
 - Decontamination
 - Demolition
 - Disposal
 - In all cases, having into account
 - Issuing of procedures
 - Training of people
 - Monitoring of personal exposure.
 - Reduction of environmental impact,...



Eurochlor Recommendations (II)

- Health and Safety
 - Possible exposure levels are much higher than usual.
 - To reinforce
 - Training
 - Hygiene standards
 - People commitment
 - To establish clear working procedures
 - Clear rules about
 - Monitoring
 - see cited Eurochlor document Healt 2
 - Protection
 - Action plans
 - Medical examinations
 - Don't forget other risks
 - Work permits
 - Exposure to other chemicals or risky materials (asbestos...)



Health and safety considerations

- How to measure people exposure to mercury?
 - There are three main ways to measure:
 - Mercury-in-air area monitoring
 - It gives you just an exposure assessment.
 - Not clear usefulness in open-air cell rooms
 - Personnel monitoring (individual air samplers)
 - It does not take into account the use, misuse or not-use of Personal Protective Equipment
 - Biomonitoring
 - It must be frequent (at least once a week)
 - It gives you an indication of real exposure
 - There is not a "global people exposure"
 - People exposure is individual and related to
 - Tasks
 - Hygienic habits
 - Own commitment





"Hermes" Project





Solvay "Hermes Project"

- Framework:
 - Solvay managed mercury chlor-alkali plants in 15 sites (17 cell rooms) and with a total nameplate capacity about 1700 kt/y.
 - End 2005, it already decommissioned 7 cell-rooms with a capacity of 560 kt/y
 - It was already decided to decommission 6 more cell-rooms with an additional capacity of 730 kt/y
 - 4 cell-rooms (480 kt/y) was waiting for a decision.
- Project:
 - A multidisciplinary team was created
 - Project leader (Electrolysis expert)
 - HSE specialist
 - Purchasing specialist
 - with a clear mandate:
- To propose, before end 2006, a organizational process to be applied in all Solvay sites to carry on the decommissioning of mercury electrolytic units.
- Objectives
 - Definition of the process to be followed for Hg cell rooms decommissioning in the Solvay Group
 - Preparation of technical database for Hg contaminated equipment



Decommissioning management

- Creation of a Decommissioning Project Team on site
- Identification of general aspects or constraints (timing, provisions, recommendations...)
- Early estimation of the different contaminated wastes to be disposed of.
 - SOLVAY experience : 1.000 to 6.000 t of contaminated materials per unit.
 - Contaminated materials (not exhaustive):
 - Steal, other metals (Copper, Aluminum)
 - Mercury
 - Graphite, carbon
 - PVC, FRP, other plastics
 - "Hard Rubber" from rubber-lined equipment
 - Gaskets
 - Sand, sludge
 - Electrical equipment
 - Concrete, bricks
 - Classify expected wastes in
 - Mercury-containing
 - Not mercury-containing
 - To be treated
 - Definition of the treatment/disposal solutions for each contaminated equipment/waste, based on the techniques listed by the "Hermes team".

- · Provision of the containers for metallic mercury storage/transportation
- Treatment/disposal solutions for each waste can depend on national regulation.



Decommissioning management

- Definition of the equipment to be maintained in operation to reduce potential Hg exposure concerns.
- Definition of equipment or building to be conserved for future uses
- Early discussions with subcontractors for dismantling activities.
 - Technical solution proposed for each type of waste
 - Solutions for disposal
- Well documented action plan for discussions with local authorities
- Definition of people management during dismantling
 - Needs (local, external)
 - Medical and environmental monitoring
- Cost control



Decommissioning Phases

- Phase 1 : Health and Safety preliminary actions
 - Emptying of the equipment (mercury, other fluids)
 - Cleaning of the different equipment, tightening, covering with water if needed.
 - Dismantling of non-Hg equipment (incl. anodes, cell covers,...)
 - Skilled people from the plant (e.g. people in charge of the operation of the Hg cell room)
- Phase 2 : Dismantling of the equipment
 - Dismantling of all the equipment, except those kept in operation for HSE concerns
 - Can be subcontracted if no skilled people available.
- Phase 3 : Dismantling of all remaining equipment
 - Electrical equipment
 - Treatment units,...
 - Subcontracted in the most of cases.



After decommissioning

- Disposal of wastes
- Recovery of non-waste materials
- Soil remediation





New "blackstones" for Hg disposal

- Limited number of options
 - Currently it is not accepted permanent storage of metallic mercury in underground mine.
 - Several societies offer to stabilize mercury as mercury sulphide (HgS) or zinc amalgam previously to mine storage.
 - Enough capacity for treatment?
 - New options in next future?





Planning

PROJET HERMES 2013 DEMANTELLEMENT CELLULES ELECTROLYSE A MERCURE DES SALLES 3 ET 4

Planning DED 10.10.00152 Ind A du 27 Avril 2012

8																									PRE	a 10a	
TACHES	Durée	Mois 1	Mois 2	Mois 3	Mois 4	Mois 5	Mois 6	Mois 7	Mois 8	Mois 9	Mois 10	Mois 11	Mois 12	Mois 13	Mois14	Mois 15	Mois 16	Mois17	Mois 18	Mois 19	Mois20	Mois 21	Mois 22	Mois23	Mois 24	Mois 25	Mois26
Préparation etudes M1 -2 Mois	2 M		(· · · · · ·						1	
Installation de chantier	2 sem																· · · · ·			· · · · ·							
Cadres Anodiques														1 1											1		
Traitements des cadres	2 M			-																							
Montage Tente 1000m ²	1 M			1																						-	
Installation Traitement de l'air	3 sem		-				5	<u> </u>		1		<u> </u>	-	-		-	<u> </u>						-				
Travaux commun pour les 2 salles										-																	
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d'analyses	1 sem																										
Montage du SAS entre salle 3 et 4	3 sem			<u> </u>						<u> </u>		<u> </u>															
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Démontage des liaisons électriques	2 M						-																				
Démontage des tuyauteries non pollué	2 M						-	-		-																	
Installation des moyens de levage et	2			1						1																	
essai	3 sem																										
Démontage des annexes aux cellules	5 M													1						<u> </u>							
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Mise en sécurité des étages	1 M		1	-			-					5	-														
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Dépose des ventilateurs sur toiture	1 M			-																							
Remise en état toiture	1 M		-	-			L			-		<u> </u>				-											
Lavage des elements	2 Sem																										
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Dépose des moyens de levage	2 sem		-	-			L			-		<u> </u>	-			-										6	
Démontage du Traitement de l'air	1 Sem		-	L			L		—			<u> </u>	-					L							1 1	-	
Demontage de la tente	2 Sem									-		<u> </u>															
Demontage des barrières et base vie	2 Sem			1					1	1										1						5	-



Communication to authorities



ARPAT DIPART. PROVINCIALE LIVORNO Via Marradi, 114 57126 LIVORNO LI

GGc-ADL

2 luglio 2008

OGGETTO : Trasmissione documentazione.

Vi trasmettiamo in allegato la proposta di "PIANO DI SMANTELLAMENTO SALA CFLLE A MERCURIO" al fine di concordare con ARPAT le operazioni di snantellamento della Sala Elettolsi con celle a mercuno dell'Unità Produttiva UP-UE dello Stabilimento di Rosignano Solvay, così come richiesto nel Decreto DSA/20005/12003 in data 11 maggio 2005 della competente Direzione del Ministero dell'Ambiente e della Tutela del Territorio.

Nella predisposizione del "PIANO..." succitato, la proponente ha tenuto conto anche delle indicazioni di fonte associativa, sia internazionale (EUROCHLOR) che nazionale (FEDERCHIMICA) ed in particolare dei seguenti documenti, qui trasmessi unitamente al "PIANO...":

- copia (autorizzata) del draft del documento "Guideline for decommissioning of Mercury Chlor-Alkali Plants" (Edition 5, may 2008),
- copia del documento di FEDERCHIMICÀ "Linee Guida per l'elaborazione del piano degli interventi da effettuare per la dismissione di un impianto cloro-soda con celle di elettrolisi a catodo di mercurio" (novembre 2006).

Restiamo a disposizione per ogni ulteriore chiarimento e collaborazione. Distinti saluti. SOLVAY CHIARCONTRACAS AA.

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Preparation for dismantling

























































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THANK YOU!