

Checklist for Chloralkali Plants

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**UNEP/DTIE
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This Checklist was developed and applied on-site in the framework of the Chloralkali Project - Uruguay

This Checklist can be downloaded from

<http://www.unep.org/hazardoussubstances/Mercury/PrioritiesforAction/WasteManagement/Activities/tabid/4500/language/en-US/Default.aspx>

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Chloralkali Project - Uruguay

Chloralkali Plant Checklist

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Abbreviations and Acronyms

%	per cent
DINAMA	Dirección Nacional de Medio Ambiente (National Environmental Directorate of Uruguay)
DTIE	Division of technology, Industry and Economics
Hg	Mercury
NGO	Non-governmental organisation
UNEP	United Nations Environment Program
WCC	World Chlorine Council

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Questionnaire

1 GENERAL

This checklist was developed by the WCC Expert, Mr. Gilberto Marronato, and was applied in the pilot project on mercury management “Chloralkali Project – Uruguay” in April 2011. The project was financed by the Government of Norway and jointly implemented by the Government of Uruguay through Dirección Nacional de Medio Ambiente (National Environmental Directorate of Uruguay (DINAMA), the World Chlorine Council through Clorosur, Efice S.A., and UNEP/DTIE Chemicals Branch. The report of this project is available at the UNEP WebSite under Harmful Substances and Hazardous Waste <http://www.unep.org/hazardoussubstances/Mercury/GlobalMercuryPartnership/tabid/1253/Default.aspx>.

This checklist is still in DRAFT version and UNEP would welcome feedback on its suitability and applicability during further testing.

1.1 Objectives

Check if the WCC guidelines on mercury are applicable in chlorine-alkali plants in its present form or with improvements, if any.

Provide useful information for the chlor-alkali plant participating in the pilot.

1.2 Activities to Be Carried Out in the Plant

Check the mercury management, in particular the employed techniques and practices and the results. Check the relation between the employed techniques and practices with WCC guidelines. Check which are the concerns or needs that the leader team of the plant considers the current situation. Check the knowledge and use of guidelines in the plant and how they can help the management in different manners (planning, implementation of control and monitoring measures, improvements of existing practices, internal audits, communication and cooperation with stakeholders).

It will be performed applying:

- Interviews with the leading team and other key people in management and operation. Discussion concerning the guidelines during the interviews.
- Inspection visits and plant knowledge
- Verification of documents used in the management and performance results.

1.3 Use of the Checklist

This Checklist is extensive and goes beyond the pilot project needs of applicability assessment of WCC guidelines. For purposes of the pilot project an exhaustive exploration may be not needed since some items were identified:

- a) The development stage of company management in different components (*e.g.*, control measures) and items (*e.g.*, Maintenance – Cell Room); enabling the company to receive this information useful for improving management.
- b) Whether and how the guidelines can be useful for the key people in the improvement of existing practices and / or implementation of new management practices.

The checklist includes seven basic elements (management leadership, program coordination, control measures, checking, communication and cooperation) and thirty elements of verification.

MANAGEMENT LEADERSHIP

I. COMPANY GENERAL ORGANIZATION AND PLANNING

1. Desired results in the mercury management in the company

1.1 Health objectives and worker exposure to mercury

.....

1.2 Program of occupational health control

1.2.1 Is there a program of medical control of occupational health?

...

1.2.2 Is there a doctor appointed to this program?

...

1.2.3 Are there well-defined control standards?

...

1.2.4 Which aspects are reasons for company's attention in relation to medical control of occupational health?

...

1.2.5 Program of monitoring and control of mercury exposure in the workplace

...

1.3 Is there an environmental monitoring program and / or individual monitoring (homogeneous groups of risk)?

.....

1.3.1 Is there a person assigned to this program?

...

1.3.2 Are there defined standards with respect to monitoring mercury in the environment?

...

1.3.3 Is there a program for workplace control regarding workers exposure?

...

1.3.4 Are there defined standards defined for this control? (eg, procedures, regulations)

...

1.3.5 Which aspects are reasons for company's attention in relation to monitoring and / or control of workers exposure to mercury?

...

1.4 Objectives of environmental protection

1.4.1 Is there a monitoring program for mercury regarding environmental aspects (air, water, chemicals, waste, soil)?

...

1.4.2 Is there a responsible assigned to this program?

...

1.4.3 Are there defined standards regarding environmental monitoring?

...

1.4.4 Is there a program of environmental control on mercury?

...

1.4.5 Are there standards defined for this control? (*e.g.*, procedures, regulations)

...

1.4.6 Does the monitoring and environmental monitoring program include standards regarding reduction of and emissions of mercury in the plant? (balance of mercury)

...

1.4.7 Which aspects are for company's attention regarding the monitoring and / or environmental control of mercury?

...

2. Approach of mercury stewardship in the company

2.1 Regarding the workers exposure and occupational health, local/ national environment and global environment, how could be the mercury stewardship characterized in the company?

2.1.1 It is a systematic approach of product management (product stewardship) considering health aspects, safety and environment since product acquisition up to its company exit in all different forms?

...

2.1.2 It is an approach related to management system

() Occupational health or industrial hygiene?

() Environment?

(similar to the existing quality system)

3. Policy

3.1 Is there a policy declaration (or guideline) related to

- Mercury management?
 - Occupational health – industrial hygiene?
 - Environment?
- (similar to the quality policy)

4. Activities coordination

4.1 Are there coordinators who manage the activities set of evaluation, monitoring and control related to:

- Mercury management as a product in its entire route inside the company?
- Industrial mercury management? (mercury exposure)
- Occupational health management?
- Environment management?

5. Planning

5.1 How are the necessities and/ or opportunities for mercury control plans identified?

- Are the objectives defined and reviewed periodically (aiming for example, risks reduction, impact reduction, awareness promotion, etc)?
- Is the program (routine) evaluated periodically? (Occupational health indicators, exposure indicators, routine problems, surveillance results, personnel knowledge, others).
- Are internal or external evaluations concerning this issue performed? (Risks identification, impacts, legal requirements, good practices)

5.2 Improvement plans have been put into practice?

.....

6. External information resources

6.1 Which information resources are employed to improve evaluation and management related to mercury?

- Chlorine Institute pamphlets?
- Euro Chlor guidelines?
- WCC guidelines?
- UNEP data and guidelines? (Toolkit, others)?
- Visiting or contacting other companies of the sector?
- Attending meetings, congresses?
- Other sources:

Remarks:

7. Company information and communication

- 7.1 Are there one or more management documents to make clear for internal personnel what is needed in mercury control?
.....
- 7.2 How are mercury questions and improvement ideas treated by managers and directors?
- At the meetings
 - E-mails
 - Visiting inspection areas or doing specific inspections
 - Transmitting evaluation results and commentaries
- 7.3 Is the mercury issue treated between the manager and the staff? Which are the main topics?
- Supplying results and explanations of exposure evaluations
 - Supplying results and explanations concerning urinary Hg control
 - Routine tasks. Examination of specific tasks
 - Behavior observation
 - Other necessary information for supervision
- 7.4 How is mercury issue treated between the supervisor and operational personnel?
- Dialogues (“5 minutes of safety”)
 - Speaking directly to the personnel about behavior and carrying out tasks
 - Other:

8. Personnel Capacitating (training)

- 8.1 How the directors and managers became aware of Hg risks and information related to the management?
- Lectures
 - Training sessions
 - Other (for example, self learning from available information) :
- 8.2 How supervisors became aware of mercury hazards and other information related to its management?
- Training sessions
 - Lectures
 - Other :
- 8.3 How operational personnel become aware of mercury hazards and protection measures?
- Training sessions related to hazards and protection measures

- Application, by supervisors, of correct teaching methods
- Lectures about evaluation results and general monitoring
- Medical information about individual evaluation

9. Responsibilities

9.1 Is there a job description for managers and supervisors? Does it include responsibilities related to safety, health and environmental aspects? Is it used as a reference to guide individual actions in routine plans and improvements?

.....

9.2 How operational personnel became aware of their responsibilities regarding safety, health and environment?

- Setting company regulations
- Setting procedures of correct job performance
- Sessions to transmit and understand rules and changes

10. Relationship with stakeholders

10.1 Is there a procedure for managers and supervisors to deal with the mercury issue with stakeholders in order to inform, listen and dialogue?

- Internal workforce (own personnel and subcontractor)
- Customers
- Community
- Syndicate
- NGOs
- Authorities that deal with occupational health and environment aspects
- Press (media)
- Others:

11. Cooperation

11.1 Is there a company policy and practice for actions in order to work together with other chlor-alkali companies developing joint efforts in the management of mercury?

.....

11.2 Is there a policy and practice of undertaking cooperative participation directly or indirectly (through associations) in discussions of issues related to mercury with the authorities?

.....

PROGRAM COORDINATION

II. COORDINATION OF OCCUPATIONAL HEALTH (EXPOSURE TO MERCURY)

12. Preliminary information

12.1 How is the occupational health team formed?

- One physician? part-time or full-time
- Other:

12.2 Does the medical control include?

- Company personnel
- Subcontractor personnel which operates in mercury exposure area

12.3 Does the medical control of occupational health consider:

12.3.1 Control in the following situations?

- Admission
- Periodic control
- Change of function
- Return to function
- Designation

12.3.2 Medical control through:

- Clinical evaluation
- Complementary exams
- Examination of urinary mercury
- Examination of creatinine

12.3.3 Provision of individual results to each employee and clarification of eventual doubts?

.....

12.3.4 An individual record for medical control

.....

13. The program (or plan) for medical control of occupational health

13.1 Is there a formal program (or plan) for medical control of personnel exposed to mercury?

.....

13.2 The plan (or activity) includes:

- Carrying out exams as mentioned in item 10.3 above?
- Action criteria related to urinary Hg content
- Criteria based on other tests and professional trial?
- Set in motion according to criteria?
- Tabulation of results of all employees (in particular the data set on Hg urinary) considering working area and function?
- Use of these collective information to plan actions for eventual company improvements?

13.3 Biological monitoring

13.3.1 Is there a plan for biological monitoring? (involved personnel, examination frequency, rules and methods for collection and analysis, ...)

.....

13.3.2 Are the urinary exams carried out with subcontractors?

.....

13.3.3 How are individual and collective results used in exposure control? Does the company have a policy (a procedure) to distance employees with results above acceptable limits?

.....

13.4 In which percentage the medical exams are updated with program schedule?

: % (total of persons in chlorine plant :).

13.5 Is evaluation data set of urinary mercury used to exam the situation together with industrial hygiene coordination?

.....

13.6 Does the coordination of occupational health control participate on training plans and personnel information about mercury exposure?

.....

13.7 Which are the present sources of information the company and the physician dispose of that allows the elaboration/ review of the plan of occupational health medical control?

- Rule/ regulation?
- Information about mercury exposure from homogenous groups of risk or the air quality in the workplace?
- Pamphlets on best practices of the Chlorine Institute?
- Guidelines on good practices of Euro Chlor ?

() Benchmark information obtained on visits to other companies or contacts with colleagues?

() Other sources of information:

13.8 Are the guidelines about working exposure and health control known by the physician and/or by the company? (Brief review of guidelines and feedback of respondents)

.....

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PROGRAM COORDINATION

III. COORDINATION OF INDUSTRIAL HYGIENE (EXPOSURE TO MERCURY)**14. Preliminary Information**

14.1 How the industrial hygiene team is composed?

- coordinator part-time or full-time
 Other:

14.2 Does the industrial hygiene activities involve:

- Company personnel?
 Subcontractor personnel working in the area of mercury exposure?

14.3 Does the activity include:

- Identification of exposure risks?
 Exposure assessment and monitoring?
 Implementation, evaluation and improvements in control measures?
 Measures for emergency situations (mercury spilled)?
 Personnel training?
 Registration and processing of assessment and monitoring data?
 Communication with personnel?
 Use of information for immediate measures?
 Use of information for business planning?

15. Industrial hygiene program (mercury exposure)

15.1 Is there any formal program for mercury exposure monitoring and assessment?

.....

15.2 Has any exposure risks identification been performed?

- Emission sources?
 Exposure areas and/or functions exposed?
 Exposure characterization?

15.3 Are evaluations (monitoring) of mercury exposure performed in the workplace?

- Individual exposure assessment (homogeneous groups of risk)
 Mercury monitoring in the environment

- 15.4 Is there a plan and procedure of evaluation and monitoring? Does it include:
- Sites or heterogeneous groups of risk
 - Frequency of measurements
 - Method and measuring equipment
 - Equipment calibration
- 15.5 Are the evaluation and monitoring data used to study and plan control measures?
- Process engineering (operation)?
 - Design engineering of buildings and facilities?
 - Facilities Maintenance?
 - Working practices? (Involving handling of mercury, products, waste and pieces containing mercury)
 - Administrative measures?
 - Hygiene measures?
 - Personal protective equipment?
 - Emergency measures?
 - Personnel training?
- 15.6 Is assessment and monitoring data used to examine the situation together with the coordination of occupational health?
-
- 15.7 Which sources of information are used to manage industrial hygiene (mercury exposure)?
- Laws and regulations? Which ones?
 - Information on good practices?
 - Euro Chlor Guidelines
 - Chlorine Institute Pamphlets
 - Visits to other chlorine companies
 - Other:
- 15.8 Are guidelines that deal with employees exposure and health control known by the physician and/or the company? (Brief review of guidelines and feedback of respondents)
-

PROGRAM COORDINATION

IV. ENVIRONMENT AND COORDINATION (MERCURY)**16. Preliminary information**

16.1 How is the environmental management coordination team composed?

- coordinator part-time or full-time
 Other:

16.2 Does the activity include:

- Identification of emission sources?
 Evaluation of local/national and global environmental impact?
 Risks and key issues?

17. Environmental management program (mercury)

17.1 Is there any formal program for mercury monitoring and assessment?

.....

17.2 Have all emissions sources been identified and characterized?

- Sources of atmospheric emissions?
 Emissions from the process?
 Fugitive emissions?
 Products?
 Waste?
 Other:

17.3 Are mercury emissions evaluated (monitored)?

- Sources of atmospheric emissions?
 Emissions from the process?
 Fugitive emissions?
 Liquid effluents?
 Products?
 Waste?
 Other:

17.4 Is there any plan or procedure of evaluation and monitoring? Does it include:

17.4.1 Sampling and analysis

- Sources
- Frequency of measurements
- Sampling and analysis method and measurement equipment
- Equipment calibration

17.4.2 Calculation of mercury emissions?

.....

17.5 Are there any specific control procedures or plans related to:

- Atmospheric effluents (process and fugitive emissions)
- Liquid effluents
- Products
- Solid Waste Management
- Soil

17.6 Are evaluation, monitoring and control data used in the study and planning of environmental control measures?

- Practices and/or techniques for reducing emissions
- Techniques of mercury retention with recycling and end-of-pipe
- Treatment techniques of waste containing mercury to recover and/ or give it proper disposition
- Training personnel
- Communication with personnel
- Use of information for immediate action (e.g., concentration of output product after filtration)
- Use of information for business planning

17.7 Is a balance of use and mercury emissions performed for environmental management and / or control of the production process? Does this balance consider:

- Mercury acquisition?
- Use of mercury in the cells?
- Control of mercury placed in the cells?
- Mercury accumulated in equipment and facilities?
- Measurement of mercury amount into cells using radioactive mercury?
- Balance of emissions using data from sampling, analysis and measurements?
- Other:

- 17.8 Which sources of information are used for environmental management related to mercury?
- Laws and regulations? Which ones?
 - Information on good practices?
 - Euro Chlor guidelines
 - Chlorine Institute Pamphlets
 - Visits to other chlorine companies
 - Other:
- 17.9 Are the guidelines that deal with worker exposure and health control known by the physician and / or the company? (Brief review of guidelines and feedback of respondents)
-

CONTROL MEASURES

V. ACQUISITION

18. Property Acquisition

18.1 Is there identification (list) of products and critical pieces for mercury control?

For example:

- Mercury
- Salt
- End pieces
- Titanium electrodes
- Lateral cell
- Mercury pumps
- Gaskets used in cells and decomposers
- Personal Protective Equipment
- Measuring instruments
- Coal for mercury retention
- Working uniforms (areas of mercury exposure)

18.2 Are there clear specifications for mercury acquisition?

- Quality of the product?
- Product packaging?
 - Material?
 - A single hole?
 - Seal with mouth screw?
 - Use of Teflon to seal?

18.3 Are there empty containers available in the market if necessary? (Exchange or storage of decommissioned mercury of cells in maintenance)

.....

18.4 Is there appropriate specification for other critical items in the mercury control?

.....

18.5 Which is the internal procedure in case new suppliers of materials deemed as critical? (e.g., Mercury pumps or cell gaskets)

.....

18.6 Are there procedures to find new suppliers for products or pieces that do not give notices or explanations of use in the chlorine plant?

.....

18.7 How easy is to get the critical items in the region?

.....

19. Hiring external services related to mercury control

19.1 For which services related to mercury control, the company needs or prefers outsourcing contracts?

Transportation?

Waste treatment or storage?

Waste disposal?

Mercury analysis?

Measurement of mercury amount by radioactive method?

Maintenance of certain equipments? (E.g., portable Mercury meter)

19.2 Is there a specification and criteria to approve the use of these services?

.....

19.3 How ease/ difficulty are to find those services in the region?

.....

20. Hiring services from outside companies to operate in the mercury exposure area

20.1 Are there subcontractors working in the area of mercury exposure?

.....

20.2 For these companies, are there specifications of what must be followed to start and operate in these areas? (Relative to mercury)

.....

20.3 These requirements are contained in the contracts made with the company?

.....

20.4 Is the company appropriately informed about the exposure and medical exams of occupational health (or includes in its program of occupational health and industrial hygiene)?

.....

CONTROL MEASURES

VI. MERCURY: EMERGENCY AND SPECIAL SITUATIONS

21. Leaks, spills and accumulation of mercury

21.1 Leaks or spills of mercury in liquid form

21.1.1 Is there a rule or guideline to take immediate action in cases where leaks, spills, or accumulation of liquid mercury were detected?

.....

21.1.2 Is there a well-defined procedure for handling mercury and return the situation to normality? Does it include:

- () Liabilities for the detection and actions?
- () Collection of mercury and waste?
- () Site cleanup?
- () Normality verification? (portable detector)
- () Initial placement of mercury in a bottle covered with water?
- () Placement of mercury in a container with a lid as soon as possible?

21.1.3 Are there available containers, tools and other equipment needed for action?

- () Utensils and container for collection?
- () Vacuum (with a charcoal filter) or suction line?
- () Cleaning Water?
- () Closed containers for mercury placement?
- () Portable detector of mercury vapors?

21.1.4 Is the occurrence recorded? Is an anomaly investigation procedure applied to detect and correct the causes?

.....

21.2 Leakage of mercury vapor

.....

21.2.1 Is there statement or procedure in case of leak detection of Mercury vapor in equipments? (e.g., in hydrogen line, in end parts, in the decomposer)

- () Isolation in the vicinity, if necessary?
- () Actions for these cases?

21.2.2 Is the occurrence recorded? Is an anomaly investigation procedure applied (similar to accident investigation) applied to detect and correct the causes?

-
- 21.3 Special situations that may occur in high emissions of mercury
-
- 21.3.1 Are there instructions or procedures for situations in which the value of the mercury normal concentration can be overcome during the execution of a planned operation? (e.g., dismantling of the decomposer to remove mercury).
-
- 21.4 Leakage of mercury during outside transport
-
- 21.4.1 Is it determined that the company must intervene in cases of leaks of mercury (acquired) during transport?
-
- 21.4.2 If so, is there any instruction or procedure for this service?
-
- 21.4.3 Does the available material for internal operations of Hg collection allow external interventions?
-

CONTROL MEASURES

VII. HANDLING OF MERCURY AND PRODUCTS, PIECES AND WASTE THAT CONTAINS MERCURY

22. Handling of mercury in liquid form and products, parts and debris containing mercury

22.1 Handling mercury in liquid form

22.1.1 Are there instructions and / or procedures for mercury handling in different situations? For example:

- Addition of mercury cells?
- Collection of mercury in the cells?
- Collection of mercury in product tabs in the lines?
- Collection of mercury in drains and channels?
- Mercury bottling?
- Collection of mercury in disassembly cell and other equipment?

22.1.2 Are there instructions for mercury moving among the areas (closed containers and open containers)?

.....

22.1.3 Are there instructions regarding connection materials that should be used in operations with mercury (or prevented, for example, rubber hoses)?

.....

22.1.4 Do the instructions include how to proceed with the materials that had contact with mercury after the end of each operation?

.....

22.1.5 Is there necessary equipment for all types of handling with mercury?

- Empty bottles of mercury
- Containers and utensils for collections
- Carts for internal mercury transportation
- Devices for mercury transfer

22.2 Handling of pieces contaminated with mercury

22.2.1 Are there instructions on how to proceed with the pieces and equipment contaminated with mercury? (Preparation for process withdrawal, disassembly and cleaning)

.....

22.3 Handling of products and wastes containing mercury

22.3.1 Are there instructions on how to proceed with the waste products containing mercury? (Preparation for process withdrawal, disassembly and cleaning)

.....

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CONTROL MEASURES

VIII. MERCURY TRANSPORTATION AND MERCURY WASTE

23. Mercury transportation

23.1 Does the mercury transportation occur according to national regulation dangerous goods (UN recommendations for dangerous goods)? (Identified vehicle and packaging, documentation and compliance to transport requirements).

.....

23.2 Which is the plan in case of an accident involving spillage of mercury?

- Company warning?
- Presence of company personnel to collect the product and waste?
- Appropriate allocation of collected material? (Storage, treatment, recovery and disposal of mercury waste).

24. Transport of waste containing mercury

24.1 Does the Mercury waste transportation occur according to national regulation dangerous goods (ONU Recommendations for dangerous goods)? (Identified vehicle and packaging, documentation and compliance to transport requirements).

.....

24.2 Which is the plan in case of an accident involving spillage of mercury waste?

.....

24.3 In case of accident involving waste overflow, what is expected?

- Company warning?
- Presence of company personnel to collect the product and waste?
- Appropriate allocation of collected material?

CONTROL MEASURES

IX. MERCURY STORAGE AND COLLECTION

25. Design and installation of building

25.1 Does the storage location have the following characteristics?

- Is it well lit?
- Is it well ventilated?
- Are the floors, pillars, walls covered?
- Are the floors, pillars, walls in good condition? (Without cracks, breaks)
- Is possible to perform good cleaning (washing)?

25.2 Are there sufficient suitable containers for storage of mercury?

- Material?
- A single hole?
- Seal with mouth screw?
- Use of Teflon to seal?

25.3 What else is there of installation devices, containers, utensils, etc., in this place Do they not favor the accumulation of mercury, evaporation and / or hinder the cleaning?

.....

25.4 Are there precautions to prevent or reduce the number of items in this area?

.....

26. Security

26.1 Are the mercury containers kept in closed and locked places? (Except when in use, for example, the placement of mercury in cells)

.....

26.2 Is the access of people to this site limited?

.....

27. Mercury handling in the warehouse

27.1 Are there procedures concerning the storage of mercury? (Closed container and temporarily open container with the top covered with water)

.....

27.2 Are the packages with the caps in good condition? (sealed)

.....

- 27.3 Is there procedure for the case of spillage and leakage of mercury or detection of accumulated mercury? Does it predict the fastest response possible of mercury exposed to the environment in order to prevent evaporation?

.....

28. Mercury collection

- 28.1 Is there any program or procedure for collection of mercury in different tabs and drains and other situations of collection? Does it include:

- () Mercury transfer from open bottles (with a film of water on top) for closed containers in the shortest time possible (~ 4 hours)
- () The replacement of water that forms the film in certain cases described in procedures (once a day)?

29. Maintenance and disposal of mercury containers

- 29.1 Are the mercury containers inspected periodically in order to verify its condition and seal?

.....

- 29.2 Is there a procedure for disposal of used packaging?

.....

30. Personnel

- 30.1 Do personnel perform the following tasks in the warehouse?

- () Know the risks of mercury in this location and activity?
- () Were correctly trained to perform tasks?
- () Know the correct procedure for cleaning and especially the use of wash water at sites with mercury?
- () Know the personal hygiene measures they should adopt? (E.g., in case of stepping on mercury).

31. Physical control of mercury

- 31.1 Is there a daily control of the amount of mercury stored and handled? (mercury inputs, outputs and destination)

.....

CONTROL MEASURES

X. ELECTROLYSIS PROCESS – CELL ROOM**32. Design of buildings and installations**

(To avoid as much as possible mercury accumulation in the cell rooms)

32.1 Is the cell floor coated with material that:

- Is well resistant and do not absorb mercury?
- Resists corrosion from acids and bases?
- Allows easy cleaning?
- Facilitates the detection of mercury droplets leaked or spilled or accumulated?
(Color of the floor)

32.2 Is the cell room floor built / maintained to:

- Prevent the mercury accumulation in corners?
- Have regular floor (flat) to allow frequent cleaning?

32.3 Is the cell floor designed with a slope suitable for mercury and water collection and drainage channels that allows mercury retention? Does the design allow the maintenance of a water film over mercury in channels or drains?

.....

32.4 Are the pillars and beams also coated with this resistant material to avoid the mercury accumulation? (e.g. epoxy / acrylate)

.....

32.5 Is the lighting system suitable to allow visualization of leakage, spillage or accumulation of mercury?

.....

32.6 Does the construction allow good ventilation?

.....

32.7 Are there wood or other absorbent material used in the mercury cell room? (which absorbs mercury and is difficult to treat)

.....

32.8 Are there blind mercury spots in room designing? For example, cable trays and electrical materials, instrumentation, beams under the cells.

.....

- 32.9 Are there many items in the area underneath the cells that make it difficult to clean and can accumulate mercury?

.....

33. Design of cells and decomposers

- 33.1 Does each end piece have a cover plate and gasket to prevent leaks, and / or vapors from the headspace directed to a ventilation system (aspiration)? (Treatment of mercury vapor)

.....

- 33.2 Is there any mercury vapor outlet in each pump connected to a ventilation system (aspiration)? Is the connection maintained under negative pressure?

.....

34. Conservation and maintenance of the building and facilities

- 34.1 Is the cell room floor maintained regular (smooth) and free of cracks and crevices? (In order to prevent concealment of mercury and for frequent cleaning)

.....

- 34.2 Is the cell room floor maintained in a manner that will prevent the accumulation of mercury in "corners"?

.....

- 34.3 Is it avoided to put materials on the floor that may be obstacles to cleaning and permit accumulation of mercury?

.....

- 34.4 Is a water film maintained above mercury in channels or drains that are filled at least once a day?

.....

35. Operation

- 35.1 Operation that aim reduction of cell opening

- 35.1.1 Does the salt regularly used contain low amount of impurities? (Also allows the reduction of losses of mercury by the slurry)

.....

- 35.1.2 It has been kept a quality brine treatment?

.....

- 35.1.3 Does the company use metal anodes (titanium)? Do they have good life cycle?

.....

- 35.1.4 Is there a procedure for cleaning the communication net (for better distribution of current)? Does the company use metal anodes? (Titanium)
.....
- 35.1.5 Is there a procedure for controlling mercury pressure in the cells? (Less waste = better mercury) (pressure gauge)
.....
- 35.1.6 Have the amount of mercury cells been maintained optimized? (Is there procedure? (Avoid better mercury, reducing the opening of the cells)
- 35.1.7 Has the adjustment of anodes been normally performed in the entire cell extension? Is there procedure? (Reduction of cell opening, better mercury) (= heat generation issue)
.....
- 35.1.8 Is there a computerized control of the electrodes distance, current and voltage? (Less heat generation, lower emissions of mercury).
.....
- 35.1.9 Is there a computerized system to track the life cycle time of cell components (pumps, side), decomposer and equipment?
.....
- 35.2 Operations that aim decomposer opening reduction
.....
- 35.2.1 During normal operation: Is there a procedure for reactivation of the graphite inside the decomposer without opening it? (e.g. by treatment with sodium molybdate, or ferric sulphate, or cobalt?) (Increase the time of the life cycle of the decomposer)
.....
- 35.3 Operations that aim mercury evaporation reduction
.....
- 35.3.1 Is the operation of each cell, decomposer, end piece and mercury pumps to carried out in a way to minimize mercury releases?
.....
- 35.3.2 Is each end piece kept closed and in good condition when the cell is operating, or when mercury is flowing, except when activities require operation or maintenance access?
.....

35.3.3 (End Part): Are the screws and clips all kept in place in order to keep the lid in place when the cell is in operation or when the liquid mercury flows into the cell?

.....

35.3.4 (End Piece): Is each access canal to the end piece kept closed and in good seal conditions when the cell is operating or when the mercury flows into the cell?

a) Is each amalgam pot kept closed and sealed, except when operation or maintenance activities require short-term access?

.....

b) Are there procedures and well conceived equipment to reduce exposure and/or emissions of mercury during amalgam sampling for analysis?

.....

c) Is each mercury container kept closed except when operational or maintenance activities require its lid removal?

.....

d) Is a flow of water kept over the liquid mercury in each pump mercury container, at a temperature below the boiling point?

.....

e) Are the covers (end pieces) kept in continuous good condition?

.....

f) Are there any suitable control procedures (inspection) in order to verify the proper seal of mercury pumps?

.....

g) Are decomposers kept closed and well sealed, except when maintenance activities require the covers (cap) removal?

.....

h) Is each connection between the decomposer and the corresponding cells components, hydrogen pipe, solution of caustic soda and washing water pipe kept in good condition and closed (sealed), except when maintenance activities require disconnecting or opening these parts?

.....

35.4 Mercury handling

.....

35.4.1 Is there a written procedure regarding the mercury placement in the cells? Are there suitable devices for this task?

.....

35.4.2 Are there written procedures concerning the removal of mercury cells? Are there suitable devices for this task?

.....

- 35.4.3 Is the use of rubber hoses to transfer mercury avoided in the previous tasks? (due to the difficulties of decontamination of this material)
.....
- 35.4.4 Is a film of water maintained in each open container with mercury? Is there any procedure to place mercury in a closed bottle as soon as possible? In case of opened containers, is the film redone at least once a day as required in the procedure?
.....
- 35.4.5 Are the mercury containers (bottles) kept in the cell room only when in use? (otherwise, they remain in the storage location?)
.....
- 35.4.6 Are these mercury containers inspected to verify if the lids are properly sealed?
.....

36. Cell removal for maintenance

- 36.1 Are there a written procedure regarding the cell preparation to be delivered to maintenance services? Does this procedure include:
- () The preparation of all possible activities before the opening of the cells to reduce the time required for complete maintenance when the cell is open?
 - () Fill the cell with an aqueous solution, when possible?
 - () Wait for the cell to cool down before opening?
 - () Setting the program (procedure) and the cell maintenance personnel to reduce the time of open cell? (Eg predicting the replacement of free parts, dimensioning the workforce required)?
 - () Cover the open cell in maintenance?
 - () If there were leakage or spillage of mercury during maintenance activity in the cell, is the cleaning done according to a general procedure for collection of spilled mercury?
- 36.2 When the cell anode boards brought up (lifted), are they washed before they are moved in order to remove any visible mercury?
.....
- 36.3 When the cell is opened, is the bottom kept covered with an aqueous solution or is a continuous flow of liquid maintained, when possible?
.....
- 36.4 When the cell is opened, is the cell bottom kept clean and covered during maintenance?
.....
- 36.5 In case of interruption of maintenance activities, are all parts that can lead to evaporation of mercury covered?

-
- 36.6 Is the use of rubber hose for the transfer of mercury avoided due to difficulty of decontamination?
.....
- 36.7 Does the procedure include reduction of walking over the cells, due to difficulty of decontamination of boots?
.....
- 36.8 If an employee need to tread on the bottom of the cell, is the mercury removal from the shoe or immediate replacement carried out after leaving the cell?
.....
- 36.9 If there is leakage or spillage of mercury during maintenance activity in the cell is cleaning carried out according to procedure for spill collection?
.....
- 36.10 When the cell side is exchanged, are any measures taken to ensure the liquid solution or the bottom cover flow is maintained, when possible?
.....
- 36.11 Before moving each piece of open cell to another area, all mercury is removed from the visible part and / or is it contained (wrapped) to prevent dripping of mercury during the move?
.....
- 36.12 Are there areas devoted to maintenance and repair of cells or mobile shield with ducts to carry the mercury removed?
.....
- 36.13 After complete maintenance in a cell, are flanges and connections checked for leaks of mercury?
.....

37. Removal of decomposer for maintenance

- 37.1 Before the decomposer opening are the following tasks performed?
- () Decomposer filling with an aqueous solution or drainage of mercury and decomposer liquid to the container according to specific procedures, including the collection of mercury?
 - () Wait for the decomposer to cool down before opening?
 - () Complete the activities that can be done before the decomposer opening?
- 37.2 Before the internal transport of each part of the decomposer (as the graphite basket) to another area, is all visible mercury of the pieces removed or is it contained (wrapped) to prevent dripping of mercury during transport?

-
- 37.3 Are precautions taken to avoid spillage when loading with graphite grids or spheres or packages in vertical decomposers? If a spill occurs, is cleaning performed in accordance with the procedure of spilled mercury collection?
-
- 37.4 In case of decomposer exchange: does the company maintain a full decomposer, including graphite spheres?
-
- 37.5 After each maintenance activity (using the proper inspection technique, according to procedure) is hydrogen leakage checked?
-
- 37.6 Is the storage of graphite used in the decomposers carried out in compliance with a well-defined procedure until the graphite were treated or disposed?
-

CONTROL MEASURES

XI. MAINTENANCE – CELL ROOM

38. Preventive maintenance

(Actions in order to reduce evaporation and to obtain better control of Hg emitted)

38.1 Is there a preventive maintenance program for equipment and other cells?

.....

39. Cell Maintenance

39.1 Are there written procedure for preparing the cell for maintenance?

.....

39.2 Is the cell maintenance carried out in a way to minimize the discharge of mercury?
Including maintenance of:

() Cell

() Decomposer

() Mercury pump

() End pieces

39.3 Are there procedures for implementation of cell maintenance?

.....

39.4 Is there an area dedicated to maintenance and repair or is there a mobile shield with pipelines to collect (conduct) the removed mercury?

.....

39.5 When necessary to interrupt business activities, are all the pieces that can cause mercury evaporation covered?

.....

39.6 Before moving every part of the cell to another area, is all visible mercury removed and is the part contained (packaged) in order to prevent dripping of mercury during transport?

.....

39.7 During normal operation: A computerized system to track the time of the life cycle of cell components (pumps, side) and decomposer of the equipment.

.....

- 39.8 Before the internal transport of each part of the decomposer (e.g., the basket of graphite) is all mercury from the visible part removed and is it contained (wrapped) to prevent the dripping of mercury during transport?

.....

40. Maintenance of other facilities

- 40.1 Are there procedures for preparation and delivery of equipment contaminated with mercury for maintenance?

.....

- 40.2 Are there procedures for performing maintenance on these devices?

.....

41. Maintenance - Store items that are contaminated with mercury

- 41.1 Are there closed storage (sealed) of contaminated parts with mercury (removed for maintenance or other destination)?

.....

- 41.2 Is there a specific area for equipment and pieces containing mercury that need to be clean prior to maintenance or other destination?

.....

- 41.3 Is the area of placement of mercury containing equipment parts for maintenance well ventilated?

.....

- 41.4 Is the storage area:

- Well-ventilated?
- Well lit?
- With floor covered with material impervious to mercury?
- With floor resistant to acids and alkalis?
- Without cracks or breaks?
- Easy to wash and clean?

- 41.5 Is the wash water collected and sent to wastewater treatment?

.....

- 41.6 Is the pieces and equipment maintenance area subject to monitoring or analysis of the air?

.....

42. Maintenance – Mechanical, electrical and instrumentation manufactory (handling of pieces that have contact with mercury or products and wastes containing it)

42.1 Are there procedures regarding delivery and maintenance of parts that may have contact with mercury?

.....

42.2 Are these sites subject to evaluation and monitoring of mercury?

.....

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CONTROL MEASURES

XII. CLEANING OF CELL ROOM AND OTHER SITES**43. Cleaning of cell room and other sites**

43.1 Is there a plan (procedure), citing the frequency of cleaning (washing) of the areas? What does it include?

- Central (side) crossing of the cells room?
- Cells?
- End parts and other surrounding areas?
- Decomposers and surrounding areas?
- Baskets of caustic soda and surrounding areas?
- Hydrogen treatment systems?
- Cell room floor?
- Tanks?
- Pillars and beams of the cell room?
- Storage areas of mercury parts and equipment for maintenance or other destination?
- Areas of repair (factory)?
- Working areas for the operators?
- Units of heat recovery of mercury?
- Storage areas for mercury?
- Storage areas for waste?
- Areas where there is a possibility of dismantling equipment containing mercury (e.g. caustic soda filters, hydrogen active coal bed, etc.)?
- Changing room?
- Canteen house?
- Other locations subject to the presence of mercury (mercury exposure)?

43.2 Is there an equipment to remove spilled or leaked mercury? (including the vacuum cleaner with charcoal filter or suction network in the cell room)

.....

43.3 Is the cell room regularly washed? How often?

.....

43.4 Is there mercury removal (traces and impurities)?

- Clean with a vacuum equipped with mercury carbon filter?

- () Monitoring
 - () Segregation of mercury (and waste)
- 43.5 Is water used for cleaning? Is the use of high water pressure avoided? (which can generate micro particles of mercury difficult to detect, especially when cleaning the cell floor)
-
- 43.6 Are there conservation procedures (methodologies)? Are they described and applied?
-
- 43.7 Is the wash water fully collected and sent to treatment unit?
-

CONTROL MEASURES

XIII. PROCESS – OTHER FACILITIES**44. Caustic Soda**

44.1 Design of buildings and installations

.....

44.2 Operation

.....

44.2.1 Is the lid closure/ sealing of each caustic soda basket maintained and are the sealing joints and connections used appropriately?

.....

44.2.2 In order to prevent accumulation of mercury, do equipments, line, or new/ modified system have a polished and appropriate interior and low points or tabs to prevent mercury accumulation and to facilitate their collection and recovery?

.....

44.2.3 Are there mercury tabs in caustic soda network?

.....

44.2.4 Do these tabs allow proper recovery of mercury? (When a pot is installed with the purpose of collection and retention of mercury it should have (in the design or design change) a cone shaped bottom and a drain valve)

.....

44.2.5 Are there procedures to recover mercury retained on tabs or other vessels?

.....

44.2.6 Are the air tank and caustic soda lines that can emit mercury drained to a treatment system?

.....

44.2.7 Is mercury removed from the caustic soda?

.....

44.2.8 Is all the produced caustic soda filtered (charcoal) to remove mercury?

.....

44.2.9 Is the final product monitored (analyzed)?

.....

- 44.2.10 Are there procedures to prepare filter opening to remove the “cake”?
.....
- 44.2.11 Are there procedures for handling activated charcoal used in caustic soda filtration?
.....
- 44.2.12 Does the procedure consider the solid and liquid from the counter flow of the primary caustic soda filter do not contact the floor or drain through open channels?
.....
- 44.2.13 Is the solid waste and liquid counter flow of the primary filter of caustic soda collected in accordance with the procedure required?
.....
- 44.2.14 When a vessel (or separator) is installed aiming retention and collection of mercury is it fitted (by design or modification) of a conic shaped bottom with a drain valve (or other project) that effectively facilitates the collection of mercury?
.....
- 44.2.15 Are there mercury separators in the systems of caustic soda solution?
.....
- 44.3 Care and maintenance
.....
- 45. Hydrogen**
- 45.1 Design of buildings and facilities
.....
- 45.2 Operation
.....
- 45.2.1 Is there a cooling system in the decomposer outlet? (in order to retain Hg inside the equipment)
.....
- 45.2.2 Are there procedures to prevent degassing of hydrogen in a decomposer in maintenance (through blanketing and sending the hydrogen to a suitable system)
.....
- 45.2.3 Are joints and connections of the hydrogen container kept in good condition?
.....

- 45.2.4 Is employed appropriate technique after maintenance [TABLE 6] in order to inspect all the flanges of the hydrogen lines and connections against leaks?
.....
- 45.2.5 In order to prevent mercury accumulation, do each equipment piece, line, or new / modified systems have a polished and appropriate interior and low points or tabs to prevent mercury accumulation and to facilitate its collection and recovery?
.....
- 45.2.6 Are there mercury tabs in the hydrogen network?
.....
- 45.2.7 Are there procedures to recover the mercury retained on tabs or other vessels?
.....
- 45.2.8 Do these tabs allow proper mercury recovery? (When a vessel is installed with the purpose of collection and retention of mercury it should have (in the design or design change) a cone shaped bottom and a drain valve)
.....
- 45.2.9 Are condensates from hydrogen line tabs collected and placed into containers, applying procedures? (These condensate should not be released on the floor or in open channels)
.....
- 45.2.10 Is there mercury removal of hydrogen?
.....
- 45.2.11 Is all the produced hydrogen mercury purified? (cooling, activated carbon filter, another solution)
.....
- 45.2.12 Is the voluntarily burned or released into the atmosphere hydrogen also purified?
.....
- 45.2.13 Is the purified hydrogen monitored? (analyzed)
.....
- 45.2.14 Is the hydrogen burned or released into the atmosphere analyzed / monitored?
.....
- 45.2.15 Are there procedures for handling the charcoal used in the hydrogen treatment?
.....

45.2.16 When a vessel (or separator) is installed in order to retain and collect mercury is it endowed (by design or modification) with a conical bottom with a drain valve (or other project) that effectively facilitates the collection of mercury?

.....

45.2.17 Are there mercury separators in the hydrogen system?

.....

45.3 Care and maintenance

.....

46. Brine

46.1 Design of buildings and facilities

.....

46.2 Had the possibility of working with chlorinated brine been considered for salt purification?

.....

46.3 Operation

.....

46.4 Care and maintenance

.....

CONTROL MEASURES

XIV. PROCESS – ENVIRONMENTAL FACILITIES**47. Atmospheric mercury effluent**

47.1 Design of buildings and installations

47.1.1 Design: When a vessel (or tab) is installed with the intention of mercury retention and collection is it endowed with (by design or modification) a conic shaped bottom with a drain valve (or other project) that effectively facilitates collection of mercury?

.....

47.1.2 Are there mercury tabs in the system of caustic soda solution, hydrogen and air from the process?

.....

47.1.3 Operation

.....

47.2 Are there mercury vapor collection in the process? Doe it include:

End cell and end tabs?

Vacuum cleaning at the cell room?

Seal of mercury pumps?

Brine circuit ?

Gases from mercury recovery retort?

Lines and containers of caustic soda?

Containers and lines of end parts washing water?

Mercury vapor and any maintenance activity involving mercury?

Other? Specify

47.2.1 Are there collection of mercury vapor in the cell end parts for treatment in a system?

.....

47.2.2 Is the air from the tanks surface which may emit mercury vapor (primarily the caustic soda and end part washing water tanks) exhausted to a treatment system?

.....

47.2.3 Are all effluent gases that potentially contain mercury collected and processed (absorber column, carbon filter, any other workaround)?

.....

- 47.2.4 Is mercury vapor collected from mercury pumps to a ventilation system? Is the collection maintained under negative pressure?
.....
- 47.2.5 Are there mercury tabs in air network with mercury vapors of the process?
.....
- 47.2.6 There are tabs for mercury?
.....
- 47.2.7 In order to prevent mercury accumulation, does each piece of equipment, line, or new or modified system have adequate and polished interior and lows or separators to prevent mercury accumulation and to facilitate their collection and recovery?
.....
- 47.2.8 Do these tabs allow proper recovery of mercury? (When a vessel is installed with the purpose of collection and retention of mercury it should have (in the design or design change) a cone shaped bottom and a drain valve).
.....
- 47.2.9 Are there procedures to recover the mercury retained on tabs or other vessels?
.....
- 47.2.10 Have all the possibilities to recycle all containing mercury for the brine network been examined? (case of atmospheric mercury effluent treatment with chlorine solution)
.....
- 47.2.11 Is there is monitoring of mercury in the atmospheric effluent treated?
.....
- 47.2.12 Is mercury monitored (analyzed) in the exhausted gas from the retort treatment?
.....

48. Liquid Mercury effluent

48.1 Design of buildings and facilities

.....

48.2 Operation

.....

48.2.1 Are there a mercury retention site in the system of liquid effluent collection?

.....

- 48.2.2 Is the washing water of cells fully collected and sent to a treatment plant?
.....
- 48.2.3 Is the washing water used to clean pieces contaminated with mercury collected and treated?
.....
- 48.2.4 Had all the possibilities to recycle all liquids contaminated with mercury to the brine network been examined? (Liquid from hydrogen purification mercury vapor).
.....
- 48.2.5 Are there excess of brine in the network? If so, is this brine sent to mercury wastewater treatment?
.....
- 48.2.6 Are all liquids that may potentially contain mercury collected and processed (resin adsorption, precipitation of mercury using sulfide or any other workaround)
.....
- 48.2.7 Is the liquid waste from the primary soda filter counter flow or the vessels waste collected according to procedures?
.....
- 48.2.8 Are there any places for mercury retention in the mercury effluent collection net?
.....
- 48.2.9 45.2.5 All liquids that may potentially contain mercury are collected and processed? (resin adsorption, precipitation of mercury sulfide or workaround)
.....
- 48.2.10 Are there procedures and devices for mercury collection?
.....
- 48.2.11 Is the mercury removed in the liquid mercury treatment?
.....
- 48.2.12 Is there monitoring (or sample collection and analysis) of mercury in the liquid effluent treated?
.....
- 48.2.13 How does the removal of sludge and accumulated debris in this system performed?
.....
- 48.3 Care and maintenance
.....

49. Collection, treatment and disposal of mercury waste

49.1 Design of facilities

.....

49.2 Operation

.....

49.2.1 Is there a management plan for mercury waste? Does it include:

- () Routines (procedures) and necessary records to monitor recommendations?
- () Description of the different types of waste that is generated (in order to minimize it)?
- () Storage procedures for different types of waste?
- () Treatment Procedures (for recovery and recycling of mercury and / or) to destination (including, if appropriate waste stabilization)
- () Methods and frequency of sampling and analysis before and after waste treatment?

49.2.2 Is there an inventory of mercury waste? (source, characteristics, quantities, etc.).

.....

49.2.3 Which are the treatments and / or destinations of this waste?

.....

49.2.4 Is there mercury recovery in relation to:

- () Sludge / cake from caustic soda treatment?
- () Hydrogen recovery and other the gases collected in the process?
- () Sludge from wastewater treatment liquid mercury??
- () Area of handling contaminated parts (eg, decomposers graphite)
- () Other? Quote

49.2.5 Were identification, characterization and classification of waste produced carried out? (type, quantity, concentration of mercury, processing, etc.).

.....

49.2.6 Are all waste and sludge containing mercury collected?

.....

49.2.7 Is there segregation of different types of waste for treatment and disposal?

.....

49.2.8 There are procedures to collect (handle) charcoal used in caustic soda filtration?

.....

- 49.2.9 Are there procedures to collect (handle) the charcoal used in hydrogen purification?
.....
- 49.2.10 Are there collection of solid waste and liquids from the counter flow of the primary caustic soda filter in accordance with procedures?
.....
- 49.2.11 Is the waste containing mercury are stored in well defined areas? Are these places kept clean and organized?
.....
- 49.2.12 Is the access to these areas restricted to only involved personnel?
.....
- 49.2.13 Is the air in these places monitored?
.....
- 49.2.14 Is the waste containing mercury stored in a closed (isolated) site?
.....
- 49.2.15 Is the graphite used in the decomposers stored according to procedure until its treatment or disposal?
.....
- 49.2.16 Are any precautions taken to prevent emissions of mercury (and workers exposure) to stored (handled) waste? (waste packaging or coverage in order to avoid emissions)
.....
- 49.2.17 Is there any retort unit used by the company? Is it an owned or contracted service? Is it installed in floor protected from possible contamination?
.....
- 49.2.18 Is the retort treated to remove as much mercury as possible?
.....
- 49.2.19 Is mercury monitored in the exhaust air of this treatment?
.....

CONTROL MEASURES

XV. SOIL MANAGEMENT

50. Soil

50.1 Preventive measures

.....

50.1.1 Which are preventive measures related to soil contamination?

.....

50.2 Studies of contamination and actions in soil

.....

50.2.1 Have any study related to issue been carried out?

.....

50.2.2 Any methods of application for mercury are known?

- Characterization
- Evaluation
- Situation management

CONTROL MEASURES

XVI. WORKING PROCEDURES (TASKS)

51. Procedures

51.1 Are there any routines (procedures) defined and detailed for each function?

.....

51.2 Are there well established procedures regarding the tasks?(enabling the adoption of precautions for mercury exposure and to prevent or reduce mercury emissions)

.....

51.3 Are there procedures to evaluate and review critical tasks? (Identify / select; to involve staff of the operation, critically examine the task, review, if necessary)

.....

CONTROL MEASURES

XVII. CAPACITATING – PERSONNEL TRAINING

52. Personnel training

52.1 Do the own personnel and subcontractor personnel receive which kind of training related to mercury?

.....

52.2 The responsible personnel was motivated by:

Mercury handling

Mercury recovery

Keeping the floor clean

52.3 Is the motivation encouraged (training) among the personnel to achieve complete reduction of mercury emissions? (Influence of the human factor)

.....

52.4 Was the personnel motivated, trained and educated in relation to:

Personal Hygiene

Uniforms of work (use, exchange)

Detailed routines (procedures) in the task function

Application of methodology for the conservation of local

52.5 Are there training modules for supervisors regarding correct teaching techniques? (Motivate, demonstrate, verify the learning, control)

.....

52.6 Are training sessions (periodic) about mercury performed? (why and how to proceed with mercury)

.....

52.7 Which is the support material used in this trainings?

.....

CONTROL MEASURES

XVIII. RULES AND REGULATIONS RELATED TO MERCURY**53. Rules and regulations of the company (Mercury)**

- 53.1 Standards for the handling of mercury and pieces, products and waste that contains mercury
.....
- 53.2 Actions in case of spillage and leakage of mercury (or detection of accumulated mercury)
.....
- 53.3 Fastest reaction possible of mercury exposed in the environment to prevent evaporation
.....
- 53.4 Rules in water use for cleaning the cell room and storage areas, treatment of caustic soda solution, hydrogen treatment, storage of contaminated items and waste storage.
.....
- 53.5 Limited access to the cell area (in order to avoid transport of Hg (shoes) to other areas)
.....
- 53.6 Materials and equipment on the ground floor of the cell room.
.....

CONTROL MEASURES

XIX. HYGIENE MEASURES

54. Hygiene Measures

54.1 Clothing

.....

54.1.1 Are there a double changing room for the staff (own and subcontractor) working exposed to mercury?

.....

54.2 Uniforms and personal protective equipment

.....

54.2.1 Are there routines (procedures / rules) in the use of uniform at work (use, exchange)?

.....

54.2.2 Is there a forecast of immediate uniform changing in special cases? (e.g., after cleaning the area in which waste water or mercury have reached the uniform).

.....

54.2.3 When is needed to step on the bottom of the cell, are there procedures for cleaning or replacing the shoe immediately after the operation?

.....

54.2.4 When the worker steps on mercury elsewhere are there a similar procedure for cleaning or replacement of shoes?

.....

54.3 Procedures related hygiene measures

.....

CONTROL MEASURES

XX. BEHAVIOUR MEASURES

55. Observations of risks at work (behavioral observations)

55.1 Are observations of behavior carried out at work? (mercury hazards, housekeeping)

.....

55.2 Does the company rewards positive behavior on mercury? (or punish negative behaviors?)

.....

55.3 Other measures related to behavior

.....

CONTROL MEASURES

XXI. PERSONAL PROTECTIVE EQUIPMENTS

56. Had the needs of respiratory protection equipment for different tasks with mercury been identified? Which equipment is used? Have the definition been taken based on possible mercury concentrations?

.....

57. Had the needs of other personal protective equipment been identified?

.....

58. Is there a procedure regarding how employees should proceed with personal protective equipment? (conservation, time to exchange)

.....

59. Have the staff been trained in the use of PPE

.....

60. Does the use occur as expected?

.....

61. Does the acquired equipment have the desired quality?

.....

CHECKING

XXII. INSPECTIONS**62. Inspections**

62.1 Inspection of leaks, spills, and accumulation of mercury

.....

62.1.1 Is there a well-defined inspection procedure regarding mercury? Does it include the verification of the following points? How often?

- Each exhaust hose for each sink?
- Each container surface (open) containing mercury?
- Each end part?
- Each amalgam seal pot?
- Each mercury seal pot?
- The floor of the cell room
- The pillars and beams of the room
- Each caustic soda decomposer
- The entire network of caustic soda solution?
- Any other surface that can accumulate mercury in the cell room?
- Any other place where there is handling of mercury? (Storage, recovery area of pieces containing mercury, changing room)
- Each cell bottom, side, end pieces, pot of amalgam, decomposer, mercury pump, heat exchanger of hydrogen and other vessels (eg wash water) and pipes in the cell room
- Each decomposer and hydrogen lines above the outlet of the decomposer?
- All equipment from system of output hydrogen to the last control device?
- The entire network of caustic soda solution until the last control device?

62.1.2 After each maintenance activity in the decomposer (using proper technique), possible leaks are checked?

.....

62.1.3 After maintenance activity on decomposer (using proper technique) is there an inspection of all flanges and hydrogen connections to verify possible leaks?

.....

62.1.4 Which are the technical resources used to aid the inspection?

- a) Visual inspection?
 - Leaks in hoses and connections?
 - Mercury in containers without water film?
 - Uncovered mercury in pieces end parts
 - Decomposers covers not fixed in place? (Or poor seal)
 - Cracks, breaks on the cell room floor, columns or beams?
 - Mercury accumulation in the cell room?
 - Mercury leaked?
 - Leak mercury (or mercury vapor) in equipment?
- b) Visual inspection and / or use of Portable UV Analyzer or Portable gold film analyzer or portable UV lamp (qualitative) or detonation meter
 - During the inspections in the hydrogen network
 - Inspections of mercury vapor leaks
- c) UV Analyzer, Au film Analyzer, sampling and analysis with potassium permanganate.
 - Measurements of mercury vapor concentrations of in the cell room and other areas

62.2 General Inspections of the facilities

.....

62.2.1 Are inspections conducted in facilities related to mercury?

.....

62.2.2 Is the possibility of withdrawing equipment and other materials not needed evaluated? (in order to facilitate inspection and cleaning)

.....

CHECKING

XXIII. MONITORING EXPOSURE AND/OR AIR QUALITY AT WORKPLACE**63. Monitoring**

- 63.1 Is there monitoring of mercury in order to control employees exposure? What kind of monitoring?
- Area sampling (static)
 - Individual sampling (Homogeneous group of risk- HGS +)
- 63.2 Does the monitoring plan include:
- Details of the monitoring plan?
 - How representative sampling can be conducted?
 - The quality assurance / quality control monitoring system for mercury?
 - Data for establishing the level of action?
- 63.3 Is there a plan for monitoring the floor of the cell room? Does it specify:
- Locations in the cells rooms where measurements of mercury are carried out?
 - The equipment or the sampling method used?
 - Frequency of measurement?
 - Number of measurements?
 - A level (concentration of action)?
- 63.4 Are there air monitoring in the cleaning area of contaminated pieces? (decontamination)?
-
- 63.5 Is the room atmosphere monitored at the mercury waste storage room?
-
- 63.6 What are the technical resources used to assist in the monitoring of mercury
- Portable UV Analyzer?
 - Portable gold film analyzer?
 - Sampling and analysis with potassium permanganate?
 - Individual evaluation with NIOSH sampling method?
- 63.7 Does the company have monitoring equipment or continuous sampler / periodic analyzer in the cell room?
-

- 63.8 Is there a plan and procedures to perform this monitoring? Which are the features of this plan?
- Sampling points (or GHS)
 - Sampling frequency
 - Results usage
- 63.9 Is a periodic measurement (analysis) performed in working areas? (by the company or external staff)
-
- 63.10 Are monitoring records carried out?
-
- 63.11 Is the staff told about the results?
-

CHECKING

XXIV. MERCURY MEASUREMENT METHODS**64. Methods for sampling and analysis of mercury for different needs**

64.1 What methods are used for mercury measurement in gases? (including sampling of air, if applicable)

.....

64.2 What methods are used to measure mercury in industrial liquid?

.....

64.3 Which methods for measuring mercury in waste and other bodies are used? (for example, graphite, metal parts)

.....

64.4 Which method is used for measurement of mercury in urine? (or blood)

.....

64.5 Which method is used for measurement of creatinine in urine?

.....

64.6 Comments about precision, quality assurance and difficulties/ easiness in employment of the above methods.

.....

65. Other measurement methods employed in the industry for the mercury measurement.

65.1 The method of Hg measurement by Hg radioactive is used? (measurement of quantity of mercury in cells)

.....

65.2 Portable monitors to measure the mercury in the air, or other equipment is used? (e.g. measuring the presence of hydrogen in air)

.....

65.3 Other devices for detection of mercury or qualitative measurement are used?

.....

65.4 Comments on the accuracy, quality assurance and difficulty or easiness in use of such equipment)

.....

CHECKING

XXV. BALANCE OF USAGE AND EMISSIONS OF MERCURY AT THE PLANT**66. Balance of mercury**

66.1 Method

66.1.1 Are the following aspects taken into account in the balance of mercury (to eliminate differences in balance)?

- () Adoption of methodology for calculating the balance of mercury?
- () Accurate inventory of mercury in cells and in the warehouse?
- () Opening and emptying, to the extent possible, of all equipment where mercury can accumulate before balance?
- () Implementation of monitoring high performance system to minimize differences in calculation / balance due to the imperfections of measures for mercury emissions?
- () Reliable method of measurement of mercury by radioactive mercury?
- () Acceptable mercury measuring method in air and fugitive emissions?
- () Other acceptable methods of measuring mercury in products, wastes and effluents?

66.1.2 Accounting acquired mercury

.....

66.1.3 Accounting used and emitted mercury

.....

MANAGEMENT END OF LIFECYCLE OF PLANT OPERATION

XXVI. AUDITS OF SYSTEMS OR PROGRAMS**67. Audits of mercury management**

67.1 Are audits of the program of medical occupational health control carried out?(Part mercury)

.....

67.2 Are audits are of program of monitoring and worker exposure control carried out? (Part mercury)

.....

67.3 Are audits of the program of environmental monitoring and control carried out? (Part mercury)

.....

67.4 Are other audits related to mercury performed? (e.g. on the balance method of mercury)

.....

MANAGEMENT END OF LIFECYCLE OF PLANT OPERATION

XXVII. DECOMMISSIONING**68. Decommissioning of plants with mercury technology**

68.1 Information about methods, performed cases, etc, have been received?

.....

68.2 Comments on the general orientation information

- Management Plan
- Mercury speciation
- Decontamination
- Transportation and storage of materials
- Arrangement
- Mercury analysis
- Safety, health and environment
- Residual contamination (soil and buildings)

MANAGEMENT END OF LIFECYCLE OF PLANT OPERATION

XXVIII. LONG-TERM MERCURY STORAGE**69. Long term Mercury Storage**

69.1 Information about methods, performed cases, etc have been received?

.....

69.2 Comments on the general orientation information

- Management Plan
- Mercury packaging
- Filling Packaging
- Loading, transportation, unloading
- Storage installation
- Safety, health and environment

COMMUNICATION

XXIX. COMMUNICATION WITH STAKEHOLDERS**70. Communication with internal staff**

70.1 Is information related to mercury measures in the air and/ or personnel exposure provided? (including urinary Hg by homogeneous group of Risk)

.....

70.2 Is information related to urinary Hg provided individually to each employee? What about the medical exams results?

.....

70.3 Is other information about mercury control and monitoring provided? (Hg emissions, other)

.....

71. Communication with other parties

.....

COOPERATION

XXX. COOPERATION ACTIONS AMONG COMPANIES AND BETWEEN COMPANIES AND STAKEHOLDERS**72. Cooperation**

72.1 Is there a company policy and practice for actions in order to work together with other chlor-alkali companies developing joint efforts in the management of mercury?

.....

72.2 Is there a policy and practice of undertaking cooperative participation directly or indirectly (through associations) in discussions of issues related to mercury with the authorities?

.....