

**CENTRAL POLLUTION CONTROL BOARD**  
Parivesh Bhawan, East Arjun Nagar  
Delhi-110032

**CPCB Project on “Review of Environmental standards of Caustic Soda industry (Membrane cell) and preparation of COINDS on Caustic soda”**

The Central Pollution Control Board (CPCB) intends to take up a project on “Review of Environmental standards of Caustic Soda industry (Membrane cell) and preparation of COINDS on Caustic soda” for execution through engagement of outside Expert agency on Grant in aid/MoU/Agreement basis. Expert agencies/Organization is requested to submit in two bid system with technical and financial bids sealed separately. The bidder should put these two sealed envelopes in a bigger envelop duly sealed and submit the same to Incharge PCI-I, Central Pollution Control Board, Parivesh Bhawan, East Arjun Nagar, Delhi - 110032 on or before September 15,2014.

The background, objective, scope of work, time schedule and terms & conditions are given below:

**TERMS OF REFERENCE**

**1.0 INTRODUCTION:**

Chlor-alkali industries produce caustic soda, soda-ash, chlorine and hydrogen, which is either used as fuel or converted to HCl. These products are used in manufacture of paper, soaps and detergents, chemicals, water treatment chemicals, textiles, PVC, alumina, glass etc and play an important supporting role in economy. There are about 37 chlor-alkali units located all over India. The scale of caustic production of these units can be considered in three categories, viz, <50000 MTPA, 50000-100000 MTPA and >100000 MTPA. Together they have a installed capacity of 29,51,000 TPA with production of 21,61,000 TPA as of 2013<sup>1</sup>.

Caustic soda is produced by electrolysis of salt using mercury cell and membrane cell process. Owing to the environmental risks associated with mercury process and risks associated with handling chlorine, its vapors and hydrogen the industry is classified among the 17 polluting industry categories. To reduce the environmental risk of mercury the industry and to benefit from specific lower energy consumption requirements the units voluntarily accepted replacement of all mercury amalgamation production process with membrane cell process by 2012 under CREP program.

Besides the mercury problem, sludge is generated from purification of salt which is inorganic in nature and contain NaCl, KCl, water, CaSO<sub>4</sub>, BaSO<sub>4</sub>, Mg (OH) <sub>2</sub>, caustic soda/potash and Na<sub>2</sub>CO<sub>3</sub> etc based on impurities in salt, treatment chemicals used for purification and conditioning of return brine. BaCO<sub>3</sub> used in brine treatment which increases the toxicity of sludge. By adopting membrane treatment process barium chemicals usage can be avoided.

Wastewater is generated from backwashing in water treatment operations and from drying chlorine using H<sub>2</sub>SO<sub>4</sub> which are treated in ETP from where ETP sludge is generated. Besides scrapped cell parts (Used Membranes, Anodes and Cathodes) containing heavy metals are generated at the end of their service life.

The shift from mercury amalgam process to membrane process has not only lead to elimination of mercury bearing wastes and emissions but also to lead to reduction of wastes .To review the existing environmental standards and document for further improving environmental performance, CPCB proposes to take up the project for **Review of Environmental standards of Caustic Soda industry (Membrane cell) and preparation of COINDS on Caustic soda** with the following objectives.

## 2.0 OBJECTIVES OF THE STUDY:

The objectives of the study are as follows:

1. To review the existing effluent and emission standards of Chlor alkali Industry.
2. To assess techno-economical viability of different generation of membrane cell technologies for caustic production and treatment of brine to eliminate barium usage.
3. To revise the comprehensive document of Chlor-Alkali industries including different generations of membrane cell technologies which will include general information on the industry, its present status in India, its water and air pollution potential, existing air and water pollution control technologies, solid/hazardous waste generation and disposal etc.
4. Guidelines for safe disposal of Hazardous/Non hazardous waste

## 3.0 SCOPE OF WORK

To achieve the above said objectives, the following scope of work is envisaged:

### Phase-I: Collection, Collation of information (General)

1. Inventory of Chlor-Alkali industries based on scale of operation, their capacity and location
2. Classification of Chlor-Alkali industries, details of manufacturing process, material balance, pollution prevention and control technologies for pollution abatement.
3. Uses of caustic soda and chlorine.
4. Production and consumption pattern.
5. Data on raw material, water, energy and other chemicals usage.
6. Characteristics of wastewater and management practices.
7. Characteristics of emission ,Emission sources and priority pollutants at various point and non-point sources and technologies adopted to control.
8. Preliminary field visits to 10 industries in consultation with CPCB covering all products and process based on questionnaire survey for dry study.
9. Submission of interim report with following deliverables :
  - Summary of questionnaire & literature survey and dry study results,
  - Criteria for selection of units for detailed study and proposing units for detailed study for consideration of CPCB.
  - Tentative list of monitoring/sampling locations like
    - process streams,
    - emission and effluent inlets, outlets and other intermediate operations to carry out overall performance evaluation of control systems,
    - shop-floor locations and
    - Parameters to be analyzed in each emission/effluent sample monitored/collected.
    - The interim report will be submitted within six month from the date of award of work

## **Phase-II: Collection, collation of information with respect to pollution potential and control, and in Plant study**

Based on the interim report submitted in Phase-I, in-depth studies are to be carried out in 5 representative industries approved by CPCB. CPCB will approve the list of monitoring/sampling locations and parameters. The number of units to be monitored shall be 5 covering different size, level of membrane technology, practices adopted for treatment of their effluent & control of air emission and disposal system followed. The detailed study would involve:

- Study of manufacturing process in detail including all unit processes and unit operations.
- Identification and quantification of sources of pollution and pollutants in effluents and emission.
- Performance evaluation of ETP and air pollution control systems to review emission and effluent standards.
- Characteristics & quantum of gaseous emissions, effluent discharges and solid waste generation.
- Identification and characterization of Hazardous waste like ETP sludge, Brine sludge etc.
- Study of existing capped hazardous waste pits w.r.t Mercury, remedial measures and solid/hazardous waste disposal options.
- Preparation of material balance, water balance.
- Study pollution levels in each unit with a view to compare various generations of membrane technologies.
- The list of tentative parameters for monitoring is given in Annexure I
- Monitoring and sampling shall be conducted by MoEF recognized laboratory/NABL accredited laboratory
- The rates for sampling and analysis charges for environmental samples would be restricted to CPCB prescribed rates as per schedule-II notification on 15.06.2008. The charges for the parameters which are not notified shall be prevailing rate of MoEF recognized laboratory.
- The in-depth study will be completed within fifteen(15) months from the date of award of work

## **Phase-III: Preparation of COINDS & Formulation of Environmental Standards**

Based on information submitted in interim report and detailed information generated in detailed studies COINDS shall be prepared with following deliverables.

- Compiled detailed field study results and integrating with information presented in interim report giving environmental profile of the sector.
- Comparison of various generations of membrane technologies, their economies and environmental benefits.
- Techno-economic viability of adopting membrane process for treatment of brine to eliminate barium use.
- Overall performance evaluation of pollution control systems.
- The report should also include hazardous waste/Non hazardous waste generation and guidelines for safe disposal of Hazardous waste/Non Hazardous waste
- Best available techniques as observed in units studied and as identified in literature survey.

- Setting of Environmental Standards would evolve several considerations i.e. 1) Risk to Human Health, and 2) Risk to Other Environmental Entities, technical feasibility, cost of compliance and strategic considerations. The report shall cover the health and environment aspects based on detailed literature survey.
- The rationale for fixing of standards and scope of their achievability will also be described.
- International environmental standards followed in the chlor alkali industry

#### 4.0 Review/Development of Standards

Standards for effluents are to be modified, if necessary, and also new parameters may be added based on the project outcome. The existing emission standard also should be reviewed. The standards are desired in terms of concentration as well as load based.

#### 5.0 Time Schedule

A maximum of two years is allotted for the submission of final draft report to the Central Pollution Control Board from the date of receipt of first instalment. The final report shall be presented before Peer & Core expert committee meeting for finalization of standards proposed.

#### 6.0 Mode of Execution

The project can be executed on MOU/Agreement basis. The Private firms and their consortium /Reputed Institute including CSIR lab or IITs/International reputed firms may indicate the concept and submit an approach paper along with cost of project, break-up in different heads i.e. manpower, analysis charges, transportation, laboratory facilities etc.

#### 7.0 Mode of Payment

The payment will be made after submission of bill and utilisation certificate at different stages as detailed below in the following terms

- (i) 10 % of the consultancy fee after award and signed the MOU/agreement.
- (ii) 10 % of the consultancy fee after submission of inception report.
- (iii) 10% of the consultancy fee after completion of Phase - I and submission of dry study report.
- (iv) 20 % of the consultancy fee after completion of Phase - II and submission of in-depth study report.
- (v) 30 % of the consultancy fee after submission of draft final report after Phase - III.
- (vi) 20 % of the consultancy fee after acceptable the report to the Peer and core Expert committee of CPCB.

#### Terms and Conditions

- i. The Executing agency shall carry out the monitoring, sampling and analysis work in identified caustic soda units during the period as mutually agreed upon.

- ii. The list of identified caustic soda units for which monitoring, sampling and analysis work shall be carried out shall be finalised after preliminary visit.
- iii. **Details of Project Team suitability & experience.** The proposal should contain the details of the infrastructure / laboratory facilities available with the interested party or third party (in case of laboratory) and also provide a list of personnel proposed to be deployed for the assignment, outlining specifically the qualifications & experience of each person relevant to this project and each member's role and responsibility.
- iv. The evaluation of the 'Technical Bid ' shall be undertaken based on the following criteria-

Sl. No.	Criteria	Overall Qualifying Marks required
1	Work Experience of the organization with documentary proof	Overall score of the Agency should be more than 75 out of 100.
2	Specific Experience relevant to the assignment with documentary proof	
3	Technical approach and methodology	
4	Qualification and competence of key staff with documentary proof	
5	No of scientific and technical persons	
6	Facilities for analysis of parameters (In case of agency / third party)	

Agency(ies) having overall score more than 75 for technical bid, will only be considered for financial bid(s).

- v. The agency can quote rates in lump sum for full project i.e. consultation and analysis costs.
- vi. The rates for monitoring, sampling and analysis (including transportation & all other miscellaneous charges) should be clearly quoted. Charges per sample per location for monitoring should be clearly mentioned.
- vii. Service tax shall be paid as per the applicable norms and TDS shall be made as per rules applicable. Applicable Taxes shall be deducted at source.
- viii. Procedure for Ranking: For the purpose of ranking of bids called on two bids basis, weight age shall be given in the ratio of 65:35 w.r.t. technical bid and financial bid respectively.
- ix. All the shortlisted organisation are required to give technical presentation at CPCB, Delhi and technical presentation be a part of technical evaluation of the bids.
- x. The Executing agency shall deposit 10% of the project cost as bank guarantee after award of work against advance payment.
- xi. The Executing agency shall carry out the monitoring, sampling and analysis works as per the procedure and norms stipulated in 'Standard Methods or any other recognized method like IS or USEPA'.
- xii. The Executing agency shall co-ordinate with the concerned Zonal Offices of CPCB and local SPCBs officials for efficient monitoring and sampling works.

- xiii. The Executing Agency shall also provide the monitoring schedule to the concerned SPCBs /PCC and Zonal Offices of CPCB to ensure their participation in the monitoring & sampling works.
- xiv. All the information and data generated or collected during the execution of the work shall be treated as confidential and sole property of CPCB and the findings of the study shall not be published without prior permission of CPCB.
- xv. The project shall be implemented as per the rates finalized and CPCB will not provide any additional fund on account of any further cost escalation due to delay in project implementation or due to any other reasons.
- xvi. CPCB shall not bear any responsibility for the personnel engaged under the project.
- xvii. During the course of implementation of the project, the executing agency shall provide the information to the participating CPCB's officials regarding the methodologies/ techniques being adopted for implementation of the project.
- xviii. The Executing Agency shall submit 3 copies of final draft report along with CD (Soft copy) on completion of the project. For any delay in submission of the final report beyond the specified period, penalty @ 1%per week of the project cost shall be charged subject to maximum penalty of 15% of the project cost.
- xix. It shall be at the sole discretion of the Competent Authority, CPCB either to award the entire project or part of the project or reject any proposal without assigning reasons thereof.
- xx. Proposal being submitted must be signed by an authorized person representing the company/ firm.
- xxi. The parties submitting the proposal are requested not to erase or mutilate any word(s) or figures occurring in the quotation. The overwriting is not allowed.
- xxii. It may be noted that mere quoting the lowest rates will not entitle any firm to get the work order.
- xxiii. The bids shall be valid for a period of 06 months from the date of their opening.
- xxiv. In case of any dispute, the decision of the Chairman, CPCB will be final and binding to both the parties.

## Monitoring Basis for Project

Sampling	Parameters	No. of Industries	No. of samples per industry
Process vent / stack (Source emission/)	HCl, Cl <sub>2</sub> , Heavy Metals	05	Minimum 2 stacks per industry and 2 integrated samples per vent = 20 samples
fugitive emission	Hg, HCl, Cl <sub>2</sub> ,	05	Minimum two sample per industry
Ambient air	HCl, Cl <sub>2</sub>	05	Minimum two sample per industry
Wastewater samples	pH, Conductivity, flow measurement, BOD, Oxygen Demand (COD), Arsenic, chromium hexavalent, mercury, lead, cadmium, TDS, SS, Sulphate, Chloride, Chlorine Residual, Ammonical Nitrogen, Bio-assay test /Toxicity Factor (TF)	05	Composite sampling (6 hourly) 5 samples per industry ETP- inlet, outlet RO- feed, permeate, reject
	Waste characterization	05	3 samples of waste streams before ETP per industry
Solid / Hazardous waste samples for relevant parameters	Identification/characterization of Hazardous stream notified in Schedule 1/schedule 2 of Hazardous Waste (Management, Handling & Transboundary Movement) Rules, 2008 particularly brine sludge from Membrane cell plant including chlorates, barium compounds except barium sulphate, bromates, (As, Pb, Cd, Cr and their compounds)	05	3 samples from each industry
Ground/ surface water samples	Same Parameters as mentioned in waste water	05	Minimum 2 samples in and around industry (one ground water and one surface water)