Energy-Saving Project for the Manufacturing Process of Caustic Soda & Chlorine Through Brine Electrolysis in Mexico & Other Latin American Countries

New Energy and Industrial Technology Development Organization (NEDO)
Asahi Glass Co., Ltd./Sumitomo Mitsui Banking Corporation/ERM Japan Ltd.
To examine the specific design and construction plan for actual caustic soda manufacturing plants and to investigate the impact in terms of energy-efficiency and reduction of GHG emissions, the business feasibility and possibility of financial support.

Caustic soda plants in Mexico employ conventional mercury process in their manufacturing processes, yet some plants have plans to convert to ion exchange membrane process. By working towards actual demonstration of the JCM project, we aim to disseminate the Japanese ion exchange membrane process, which has beneficial effects in energy conservation. Further, by communicating with Peru and Brazil, where conventional mercury and asbestos diaphragm processes are still used for the manufacture of chlorine products, we strive to deepen their understanding towards the ion exchange membrane process and fasten its conversion.

Summary

Survey Items

1) Overview of the situation, policies, market related to climate change
2) Feasibility assessment of the project
3) Brush-up of the MRV methodology
4) Expected emission reductions, economic impacts from the project
5) Consideration of applicable financial schemes

Partner/Site

- Mexico, Cydsa S.A.B de C.V.
- Peru, Quimpac S.A.
- Brazil, Produquimica S.A.

Estimated Reduction Amount

Based on actual measurements made at 2 manufacturing plants in Mexico (study targets), average emissions in the past were 242ktCO$_2$/y. Reference emission is estimated to be 240ktCO$_2$/y, on the basis that the electrical emission factor was the lowest (most conservative value) over the past 5 years.

- Present: 242ktCO$_2$/y
- Reference: 240ktCO$_2$/y
- After Implementation: 187ktCO$_2$/y

Energy consumption can be reduced by implementing ion exchange membrane process at the 2 manufacturing plants in Mexico, where investigations will be conducted. This leads to an emission reduction of approximately 54.6kt.

Present/Reference

- Present CO$_2$ emissions: 242ktCO$_2$/y
- Reference CO$_2$ emissions: 240ktCO$_2$/y
- Emission reductions: 54.6ktCO$_2$/y

After Implementation

- CO$_2$ emission reductions: 54.6ktCO$_2$/y

55 ktCO$_2$/year (estimated based on Mexico) Expected emission reductions approx. 23%
NEDO's Feasibility Studies with the Aim of Developing a Joint Crediting Mechanism

Mexico, Peru, Brazil/Energy Efficiency

**Technology Outline**

**Mercury Method**
- Saturated brine
- Chlorine
- Anode(+)\(\rightarrow\) \(\text{Cl}_2\)
- Na\(^+\)
- Cathode(-)
- Na-Hg amalgam
- Decomposer
- Recycled mercury
- Hg

**Diaphragm Method**
- Saturated brine
- Chlorine
- Anode(+)\(\rightarrow\) \(\text{Cl}_2\)
- Na\(^+\)
- Cathode(-)
- Hydrogen
- Porous diaphragm
- (Asbestos / Polymer)
- Caustic soda and Sodium chloride
- Depleted brine
- Diluted (10-12%)

**Conversion**

**Ion Exchange Membrane Method**
- Saturated brine
- Chlorine
- Hydrogen
- Water
- Ion-exchange membrane
- Concentrated (32-33%)

**Benefits from conversion:**
- Reduction in consumed energy (approximately 20%)
- Reduction in hazardous chemical substances (mercury, asbestos)