Brine Recovery - Brine Recovery in the production of polycarbonate
LIFE06 ENV/NL/000178

Project description

Background

Most chlorine plants in Europe still use diaphragm- or mercury-electrolysis cells in their production process, as stand alone or in combination with membrane cells. Diaphragm and mercury cells are fairly insensitive to impurities in the brine and can use recycled brine from the polymerisation process. However, they are also outdated and cause environmental problems related to mercury and asbestos. Furthermore, these technologies produce a lower quality caustic and require considerably more energy.

There is an urgency to find a way to convert plants using these technologies to membrane cell technology, which is the Best Available Technology (BAT) for the chlor-alkali manufacturing industry according to the Intergovernmental Panel on Climate Change (IPCC). The change to membrane cells has been slow in Europe as most of the existing chlorine plants that were installed in the 1970’s with a plant life of 40-60 years have not been driven to change their technology.

Sabic Innovative Plastics uses membrane cells for electrolysis. These have many advantages compared to mercury- and diaphragm cells. However, the membranes are very sensitive to impurities in the brine. The brine from the polymerisation process contains considerable levels of organic and inorganic impurities. In the current situation, the brine is therefore not suitable for re-use in membrane electrolysis cells and should be disposed of as waste.
Objectives

The main objective of the Brine Recovery project was to demonstrate substantial savings on raw materials and energy in the production of polycarbonate at Sabic Innovative Plastics in Bergen op Zoom, the Netherlands, through the recovery of brine. In this production process, sodium chloride solution (brine) is used in the electrolysis in order to make chlorine. The chlorine is used in the next step of the process, polymerisation, which produces brine as a waste stream. Theoretically a closed loop of brine could be created, but the re-use of brine is currently impossible because the brine from the polymerisation process contains a number of impurities, that could seriously damage the membranes in the chlorine.

Recently, Sabic developed a new technology that is capable of removing all the relevant impurities from the brine. Thus, it could be re-used in the chlorine cells by creating a closed loop cycle. The project aimed to demonstrate this new technology for the first time on a full scale and produced the positive effect on phasing out environmentally unfriendly mercury and diaphragm cells in chlorine plants as envisaged by the European Commission.

Results

The Brine Recovery project developed a process that recovers the brine by removing the impurities in a number of process steps. Membrane cells using recycled brine performed similar results compared to cells using fresh brine. This project is the first full-scale application of brine recovery in the production of polycarbonate using membrane electrolysis in Europe. The process comprises the following stages:

- Separation by means of a decanter of the effluent from the polymerisation reactor, which consists of a brine phase and an organic phase;
- Removal of methylenechloride from the brine via steam-stripping;
- Filtering of the brine over a sand filter to remove small particles;
- Removal by activated carbon of organic impurities such as phenolics and methylene chloride;
- Removal of Carbonates/CO2 by reducing the pH-value to 2-3 and stripping with air;
- Elimination of ammonium salts using a dedicated type of activated;
- Purging of a part of the lean brine flow from the membrane cells in order to prevent accumulation of components;
- Combining of purified brine with the lean brine from the cells and its increase in concentration from 20 to 25% by adding additional fresh NaCl in a saturator; and
- Introduction of the combined brine to the electrolysis membrane cells to produce chlorine.

The project achieved around 75% of the following target saving: a reduction in salt (NaCl) consumption of 72,000 tons a year; a reduction in water consumption of 225,000 m³ a year; and yearly energy saving of 147,375 GJ. The annual saving of 73,000 ton NaCl will result in the economic benefit of a yearly saving of approximately € 3 million, resulting in a sustainable competitive advantage, whereby Sabic IP is able to invest in additional
innovations. By these new technologies, Sabic IP will be able to stay ahead of their competitors with environmental friendly and cost effective innovations. Another economical benefit will be the elimination of 75% of the current transport costs for brine.

The Brine Recovery project won the the ENERGY GLOBE award. Only projects that conserve and protect the Earth’s resources or employ renewable energy are showcased and can win this very prestigious award recognised worldwide.

Further information on the project can be found in the project's layman report and After-LIFE Communication Plan (see "Read more" section).

Environmental issues addressed:

Themes

Environmental management - Cleaner technologies
Industry-Production - Chemicals

Keywords

raw material consumption

Target EU Legislation

- Industry and Product Policy

Natura 2000 sites

Not applicable

Beneficiaries:

Coordinator: Sabic Innovative Plastics B.V
Type of organisation: International enterprise
SABIC, Saudi Basic Industries Corporation, is one of the world’s leading manufacturers of chemicals, fertilisers, plastics and metals. Created in 2007, SABIC Innovative Plastics has a major manufacturing facility in Bergen op Zoom that produces polycarbonate (Lexan®), polyphenyleneoxide (PPO, Noryl®), compounds of PBT and polycarbonate, silicones and glass-fibre reinforced polymer sheets.

Partners
None

Administrative data:

Project reference  LIFE06 ENV/NL/000178
Duration  01-DEC-2005 to 01-DEC -2008
Total budget  7,986,431.00 €
EU contribution  1,200,000.00 €
Project location  Noord-Brabant(Nederland)

Read more:

Project web site  Project's webpage (EN)
Publication: After-LIFE Communication Plan  Title: After-LIFE Communication Plan (EN) Year: 2008 No of pages: 1
Publication: Layman report  Title: Layman report (EN) Year: 2008 No of pages: 8