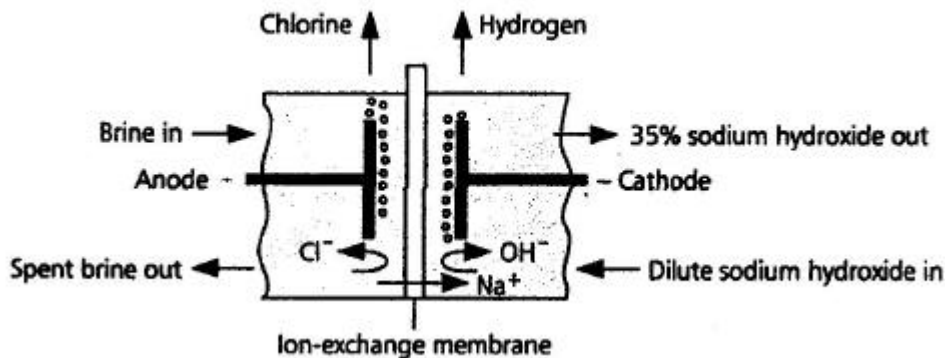


## The perfect process?

The production of chlorine, sodium hydroxide and hydrogen from the electrolysis of brine in the flowing mercury cell might appear to be the perfect chemical process. It uses cheap feed stock and requires a relatively low energy input. All the products can be sold, and at first glance the potential for pollution is low. Unfortunately, this is not the case. In the 1950s, a terrible disease occurred in Minamata in Japan. People, and also domestic animals that fed on fish, developed symptoms including loss of balance, muscle wasting, paralysis and eventual death. Babies were born suffering terrible physical deformities and mental retardation. Eventually the problem was pinpointed to mercury poisoning. One of the major sources of the mercury was the effluent released from a plant producing chlorine from brine using flowing mercury cells. By the mid-1960s, legislation was in place which placed much tighter restrictions on the amount of mercury that could be discharged from such plants, and in the ensuing years there has been a move by the chlor-alkali industry away from the flowing mercury cells to **membrane cells**. This involves the capital cost of replacing old plant, but does not carry the risk of poisoning the population.



**The membrane cell.** There is no net flow of liquid across the separating membrane. Sodium ions are able to pass through the membrane, while Chloride ions and hydroxide ions are not. In this way a current can flow through the cell, but there is no possibility of sodium hypochlorite being formed or of the sodium hydroxide solution being contaminated with sodium chloride.

The materials used for membrane construction are invariably synthetic polymers, designed and selected for their ability to transport cations rather than anions and for their resistance to the corrosive solutions and high temperatures (90 °C) inside the cell.

Texts and figures: Ann and Patrick Fullick, Chemistry, Heinemann Educational Publishers, Oxford 1994, S 180ff

feedstock (n): Ausgangsmaterial

domestic animals: Haustiere

poisoning (n): Vergiftung

pollution (n): Verschmutzung

mental retardation: geistige Behinderung

to pinpoint (v): daraufhinzeigend