FROM MERCURY TO MEMBRANE

TECHNICAL INFORMATION
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Conversion of chlor-alkali technology -
Key considerations and progress

Legally binding deadline for EU existing plants not needed

Euro Chlor believes that the current voluntary agreement put in place by European chlor-alkali producers to close or convert their mercury cell plants[1] no later than 2020 is the most appropriate measure.

THE TIMETABLE: THE AGREEMENT WORKS

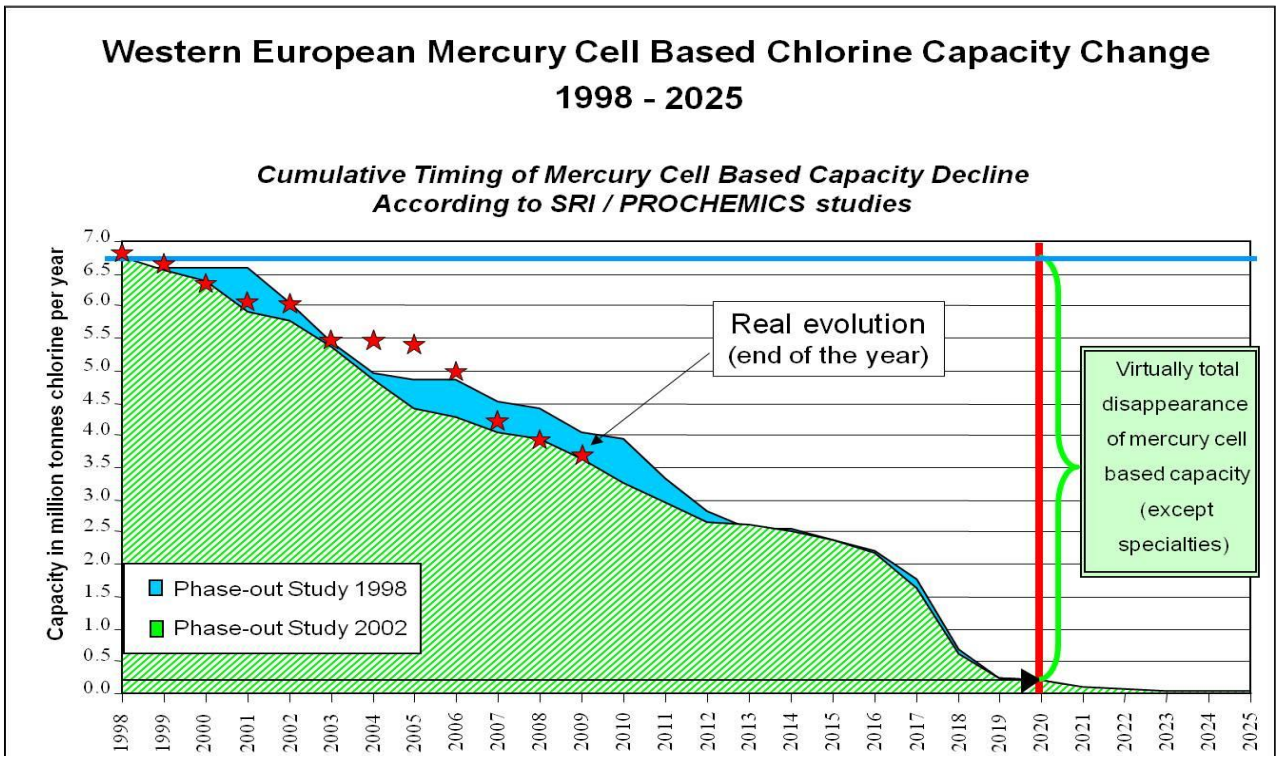
The adopted timetable ensures environmental protection without unnecessary damage to the competitiveness of the European industry and the many downstream industries depending on it. The timetable also allows for the environmentally sound management of the pure mercury that will become available upon closure or conversion of existing mercury cell rooms.

A gradual conversion allows producers to absorb the investments involved in managing the change-over whilst allowing producers to minimise both the social impact and the potential effect on their global competitive position. Conversion can only be financed if there is good economic justification and it should be emphasised that the economics of a technology switch are highly site-specific.

The graph below shows the projected phase-out of mercury cells in Western Europe. It shows the actual conversion between 1998 and 2009 and the projections, based on a study made in 1998 by Stanford Research Institute (SRI), an independent consultant.

The study shows a virtual disappearance of mercury cells by the early 2020's. The study was confirmed

[1] for the production of chlorine, alkali-hydroxides and hydrogen



later in 2002 by another consultant, Prochemics, with similar results. Based on the same plants that were considered for the 1998 study, the actual mercury cell capacity decrease is following the expected trend which is expected to continue.

ECONOMICS OF CONVERSION VARY GREATLY

UNEP is currently discussing an International Convention on mercury. At a global level the Indian chlor-alkali industry voluntary phase-out by 2012 is regarded as a significant step forward and is sometimes used as an example for other regions.

However, as stated before, the economics of conversion are highly dependent on local factors. Therefore this example cannot easily be transferred to other regions and specifically not to Europe, for the following reasons:

- *Energy use and cost of electricity*: cost of electricity is higher in India vs EU so energy saving was one of the major reasons for Indian companies to convert. Improving the purity of product was another incentive for converting to the membrane process.
- *Capacity upgrade opportunities*: 2009 Indian capacity on mercury (7 %) represents a very small amount compared to that in Europe (31 %). India planned to increase its chlor-alkali capacity due to increased caustic soda demand with good market prices.
  The capacity increased by 56 % between 2003 and 2010 for the plants converting. The more saturated market of caustic soda in Europe is less favourable and the capacity increase is much lower.
- *Emissions, trade and waste handling*: mercury emissions in India have dropped since 2003. EU reduction in emission started in the 70's with a value of 16.1 g/t in 1978. EU has in addition constraints on trade and waste handling (export ban from 2011).

Euro Chlor believes a phase-out date before 2020 will unnecessarily damage the European Chlor-alkali industry for the reasons given above. In addition it is clear that the voluntary phase-out in 2020 is respecting the commitments made and takes into account socio-economic considerations which are specific to each plant.

Context	*India*	*Europe*
Electricity cost	*4.75 INR ~ 85 EUR/MWh*	*45 EUR/MWh*
Capacity on Hg (2003)	*719 kt/yr (17 plants)*	*6,035 kt/yr (52 plants)*
(2009)	*200 kt/yr (7 plants)*	*3,974 kt/yr (37 plants)*
Total chlorine capacity upgrade		
From 2003	*2,500 kt/yr*	*12,209 kt/yr*
To 2010	*3,200 kt/yr*	*12,452 kt/yr*
Mercury emission levels		
In 2003	*20 g/t Cl2 (17 plants)*	*1.14 g/t Cl2 (52 plants)*
In 2009	*1.23 g/t Cl2 (7 plants)*	*0.93 g/t Cl2 (37 plants)*

[1] for the production of chlorine, alkali-hydroxides and hydrogen