THE EUROPEAN CHLOR-ALKALI INDUSTRY

Steps towards sustainable development

Progress Report

August 2006

Euro Chlor

representing the chlor-alkali industry

The Euro Chlor Sustainability Programme

The long-term sustainability programme described in this publication is the first ever sustained initiative within the European chemical industry. It represents an important step for the chlor-alkali sector in its strategy to improve performance and earn public trust by addressing the "triple bottom line" of environmental, social and economic issues.

The seeds of this strategy announced by Euro Chlor in early 2002 were actually sown seven years earlier in 1995 when the industry undertook four voluntary initiatives. Over the following years, this resulted in the completion of a programme of 23 marine risk assessments for chlorinated substances; a 67% reduction in manufacturing mercury emissions; development of recycling technologies by the PVC industry, which consumes about a third of chlorine manufactured in Europe, and improved technology transfer to East European producers. Euro Chlor has held several health, safety and environmental conferences for these producers, and has recruited in the past ten years eight full members and three associate ones from Poland, Hungary, Czech Republic and Slovakia.

Euro Chlor developed a formal industry-wide sustainability strategy for its members, which contained six voluntary commitments. It required members to:

- Include environmental, social and economic aspects in all strategic business decisions
- Optimise energy efficiency in production
- Reduce water usage through recycling
- Continuously reduce polluting emissions to water, air and land
- Use more of the hydrogen generated by the industry as a raw material or fuel
- Give high priority to the safe transportation of chlorine.

From these commitments, 15 performance indicators were established with goals for 2010, which were endorsed by the membership in 2003. These goals together with the industry's progress towards them during the past five years are described in this document.

Euro Chlor full member companies (11 August 2006)

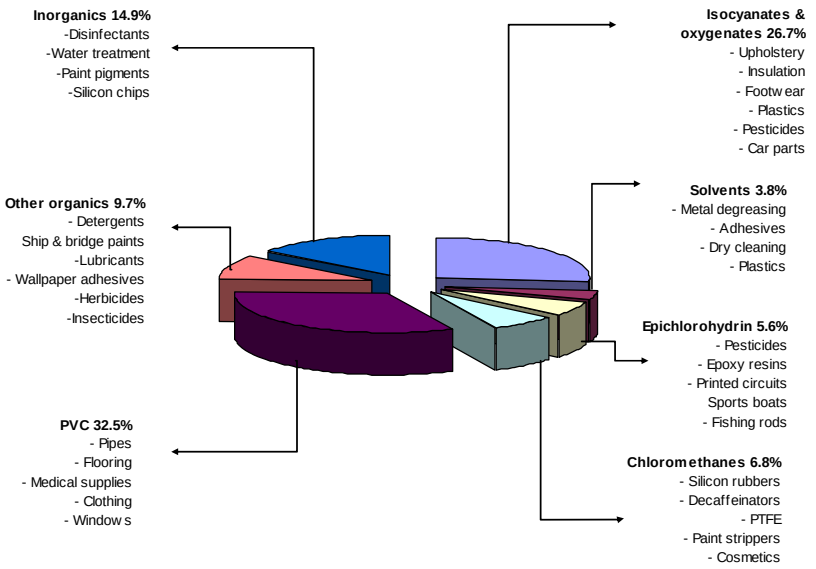
Akzo Nobel Base Chemicals
Albemarle Europe
Altair Chimica
Anwil
Arkema
BASF
Bayer MaterialScience
Borregaard Industries
BorsodChem
CABB
Caffaro
CUF – Químicos Industriais
Degussa
Dow
Dwory (until end 2006)
Electroquímica de Hernani
Electroquímica del Noroeste
Ercros
Finnish Chemicals
Hellenic Petroleum
Hydro Polymers
INEOS Chlor Limited
LII Europe
MSSA
Norsk Hydro
Novácke Chemické Závody
PCC Rokita
Produits Chimiques d'Harbonnières
Química del Cinca
Rhodia Eco Services Sulfurique
SF-Chem
Solvay
SolVin
Spolana
Spolchemie
Syndial
Tessenderlo Chemie
VESTOLIT
Vinnolit
ZACHEM

ECONOMIC CONTRIBUTION

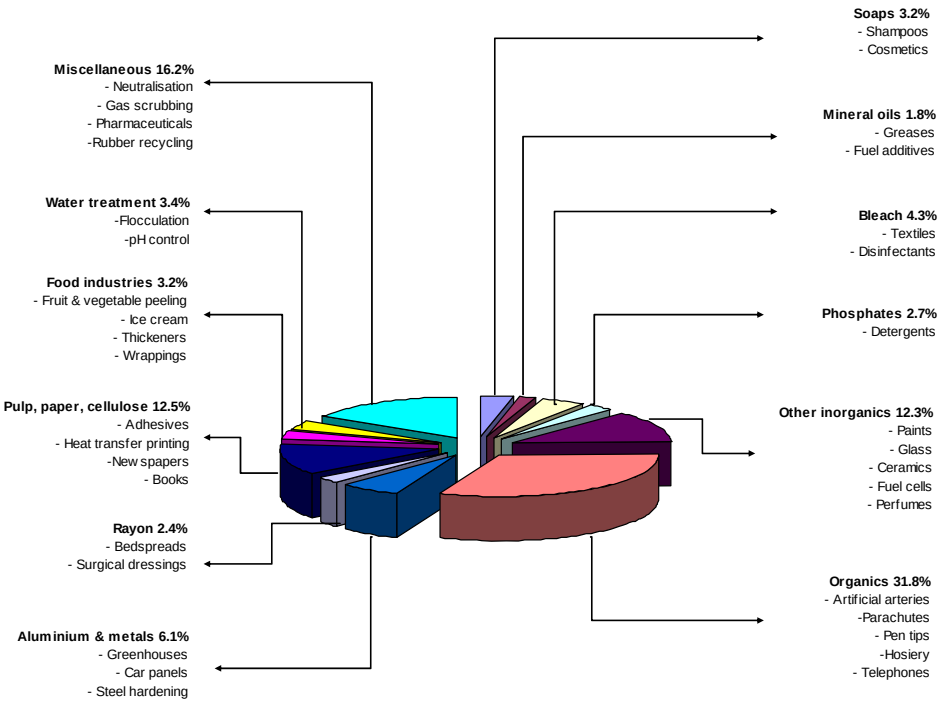
Economic Development

As well as their recognised and essential uses in public health roles, chlorine and its essential co-product caustic soda are invaluable for many manufacturing processes. They are used to make a vast range of products including pharmaceuticals, plastics and paints; cosmetics, clothing and cars; flooring and footwear.

European chlorine applications 2005
(10.23 million tonnes)



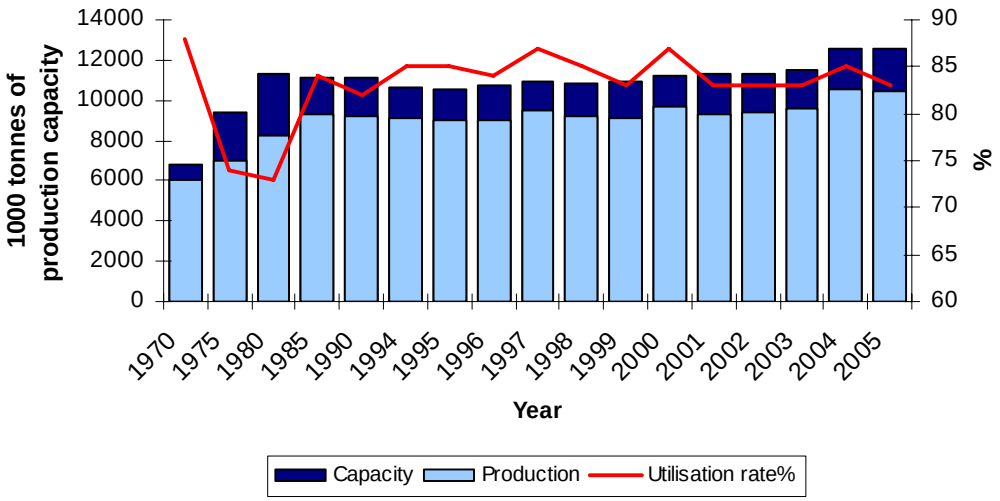
European caustic soda applications 2005
(10.02 million tonnes)



Manufacturing

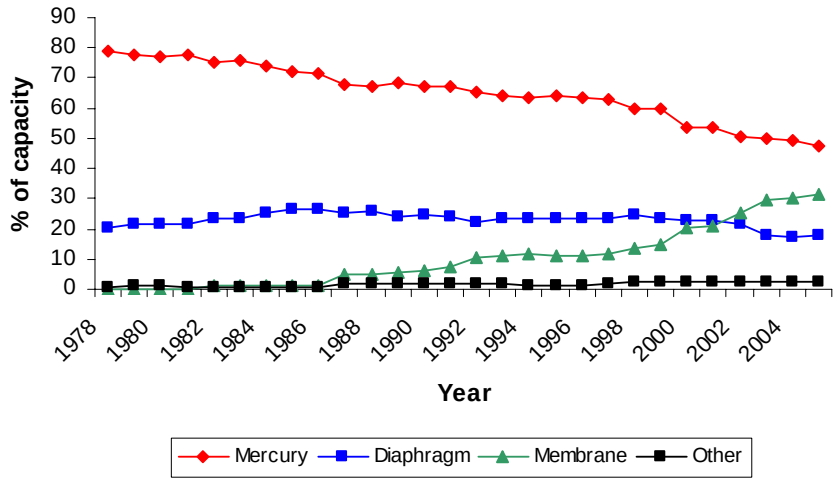
Chlorine, despite criticism from some quarters, continues to be an essential product for our way of life. Emissive uses, such as for pulp and paper bleaching, have been replaced by uses where chlorine is frequently not found in the
final product, such as in the synthesis of polycarbonates and polyurethanes. The production figures (below) were recast in 2005 to include data from Eastern European producers when it became available from 2004 onwards.

European production, capacity and utilisation



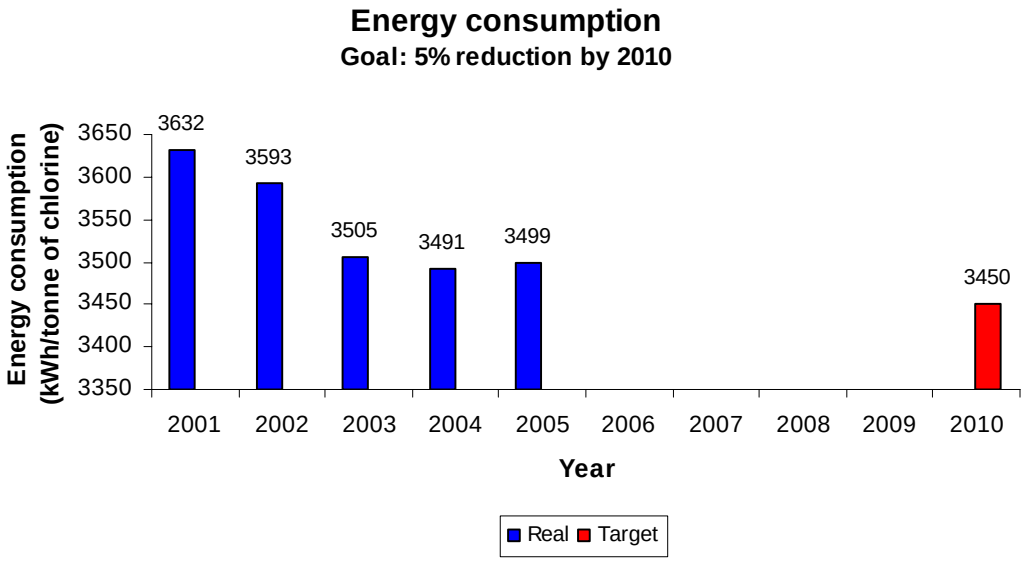
Chlorine is produced by three main technologies (mercury, diaphragm and membrane) and, in small quantities, by two others (electrolysis of hydrochloric acid and fused salt). Diaphragm technology has historically been based on asbestos. Companies are moving towards newly-developed non-asbestos separators or converting to membrane technology. Mercury cells, which represent at most 50% of capacity, are progressively being replaced by membrane technology. The voluntary commitment of the European producers is that all mercury plants will have been converted to alternative technology by 2020.

Manufacturing processes



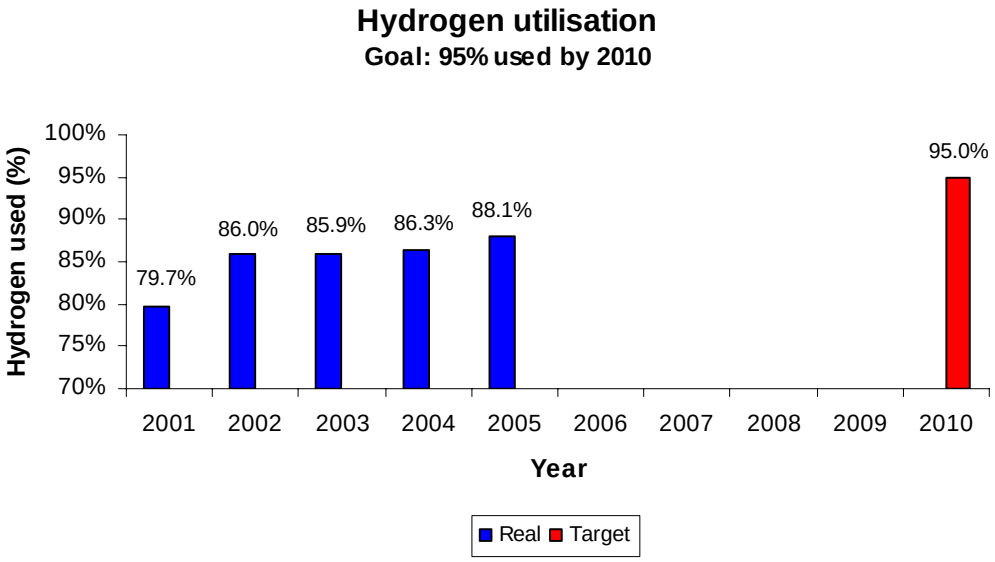
Energy Usage

The indicator is based on both electricity and steam. The electrical energy consists of power used for electrolysis (transformers, rectifiers and cells) and as motor power (pumps, compressors, centrifuges, utilities, etc). Steam is used principally for caustic soda evaporation but also for minor utility purposes. As electricity is actually a raw material of the chlorine production process, the basic consumption – corresponding to the electrochemical reaction – cannot be reduced. Only the additional consumption can be optimised. The goals fixed by the industry represent in fact a 10% reduction of this supplementary part.



Hydrogen Usage

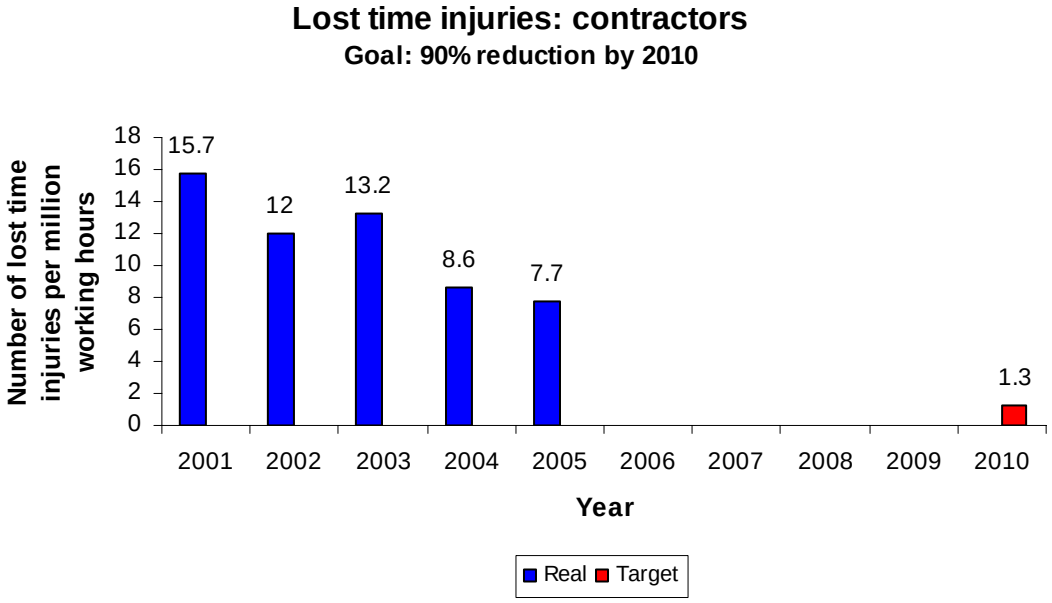
Hydrogen gas is co-produced with chlorine and caustic soda by the electrolysis of brine. The hydrogen is of high quality and can be used as a fuel or as a chemical raw material. The 2010 industry goal is that 95% of this product will be utilised and less than 5% will be vented.



SAFETY AND SOCIAL PROGRESS

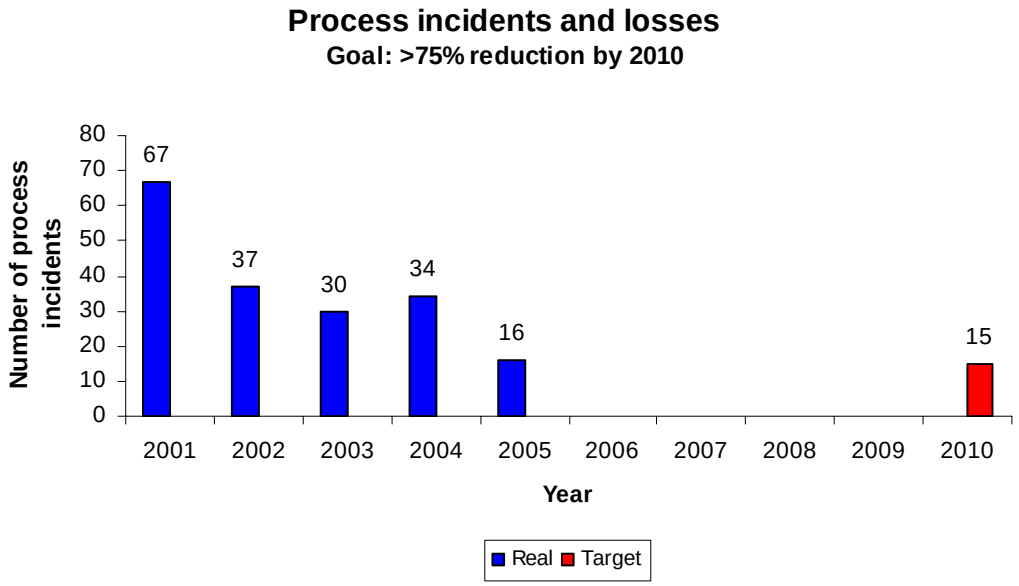
Lost Time Injury Rate

A lost time injury (LTI) is one resulting in at least one day off work. It is reported by producers as the number of lost time injuries per million working hours. Data is collected separately for company employees and for contractors working on company sites. Although LTI rates are currently different for the two groups, the same target of 1.3 LTIs per million worked hours has been set for 2010.



Process Incidents and Losses

Incidents are the number of serious events involving a fire or an explosion or the release of certain chemicals which cause a fatality, serious injury or property damage of more than €100,000. Losses include any spill of chemicals to air, water or land meeting pre-defined criteria such as human and environmental impact, property damage, evacuation and media coverage. The chemicals are chlorine, hydrochloric acid, sulphuric acid (used for drying of chlorine gas), sodium hypochlorite (bleach) and caustic soda.



Transport Incidents

A transport incident is defined as any incident in a public area due to the movement of chlorine by road, rail, sea or river resulting in one of the following:

- Death or injury
- Any spill greater than 5 kg
- Property damage
- Public disruption of more than 1 hour or intervention of emergency services
- Media coverage.

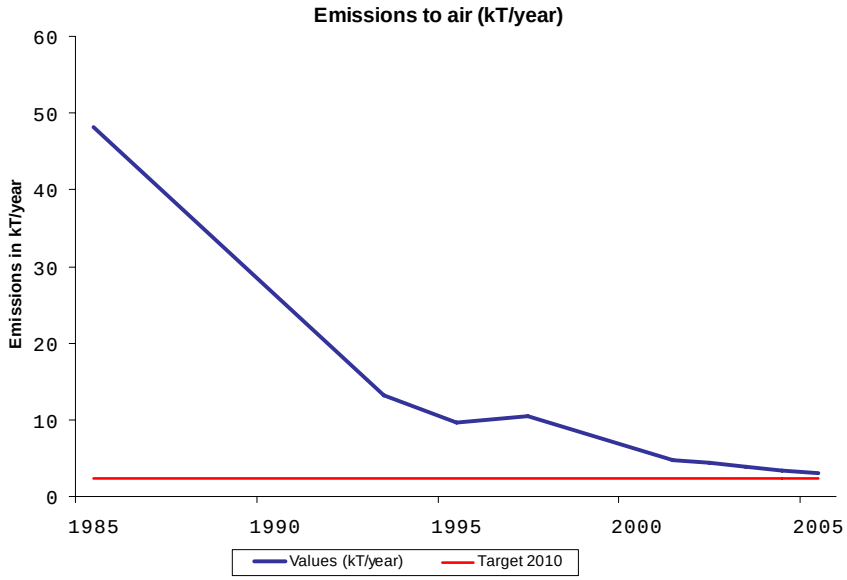
There were no incidents during the 2001-2004 period, but three were reported to Euro Chlor in 2005, including a potentially serious derailment of a bulk chlorine train in Sweden. There were neither injuries nor leaks as a result of this accident. And because company emergency teams at the incident followed best practices, there were no chemical releases when chlorine was transferred from the damaged tank cars. The target for 2010 is zero incidents.

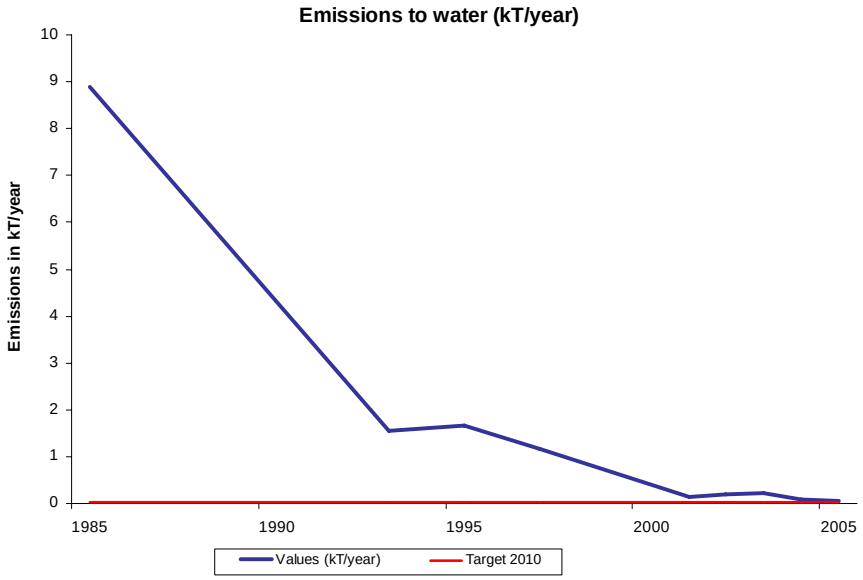
Despite the rail incident in Sweden, the stringent safety standards developed and applied by Euro Chlor members have resulted in an enviable safety record: no fatalities from bulk chlorine movement in Western Europe in more than 60 years.

ENVIRONMENTAL PROTECTION

Chlorinated Organic Chemical Emissions

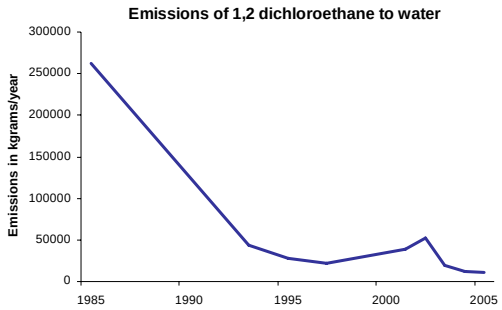
Emissions to air and water for 22* chlorinated substances have been collected since 1985. This data includes all the chlorinated products in the EPER (European Pollutant Emission Register) list but also several others. Between 1985 and 2004, emissions were reduced by 94% to air, and by 99% to water. A target of a further 50% reduction to air and 75% to water has been set for 2010 compared to the 2001 baseline.

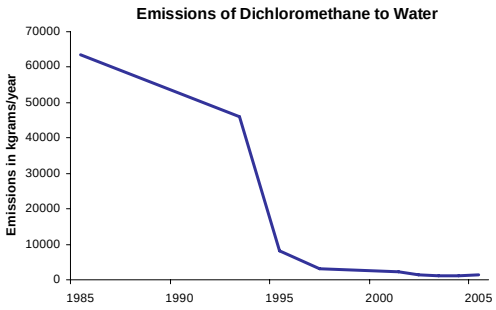


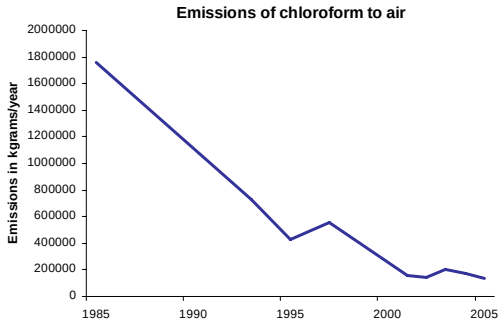


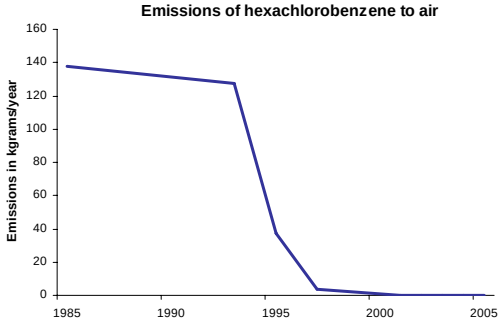
* 1,1,1-trichloroethane; 1,1,2-trichloroethane; 1,2-dichlorobenzene; 1,2-dichloroethane; 1,4-dichlorobenzene; 2-chlorophenol; 3-chlorophenol; 4-chlorophenol; carbon tetrachloride; chlorine; chlorobenzene; chloroform; dichloromethane; dioxins and furans (as Teq); hexachlorobenzene; hexachlorobutadiene; hexachlorocyclohexane; pentachlorophenol; tetrachloroethylene; trichlorobenzene; trichloroethylene; vinyl chloride.

Trends for some individual products are shown below:



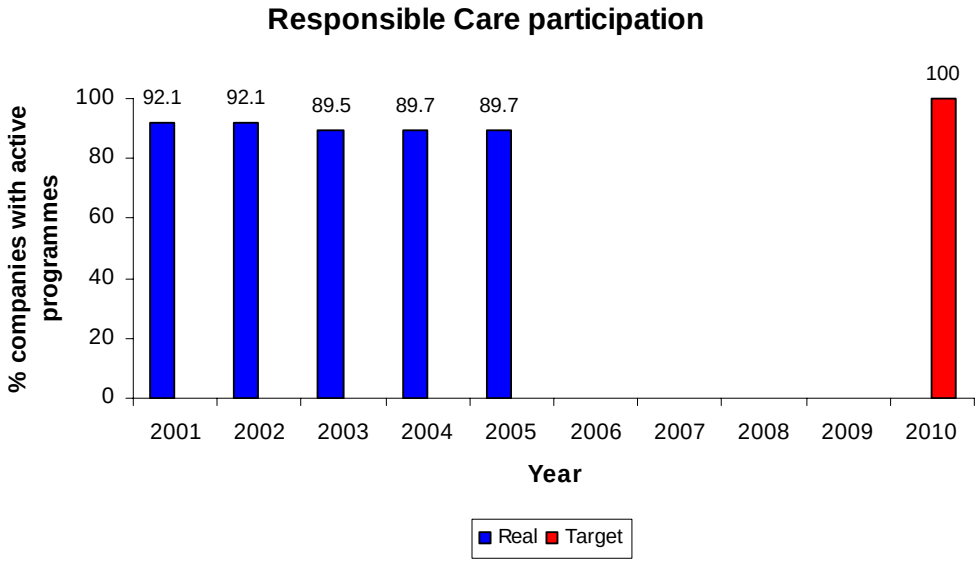






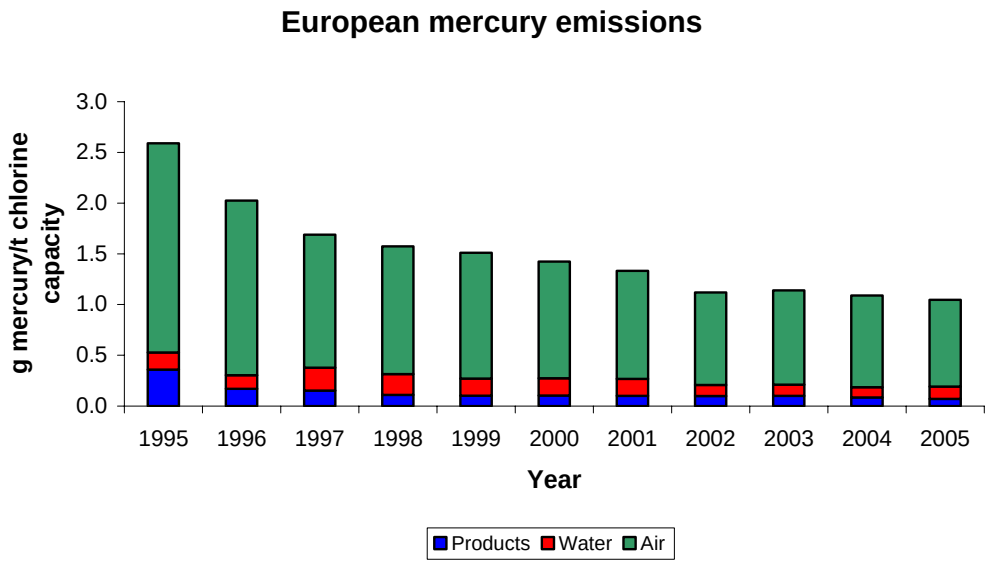
Responsible Care

Responsible Care is the voluntary stewardship programme of the chemical industry. The Euro Chlor target for 2010 is that every member company has signed up to a national *Responsible Care* programme.

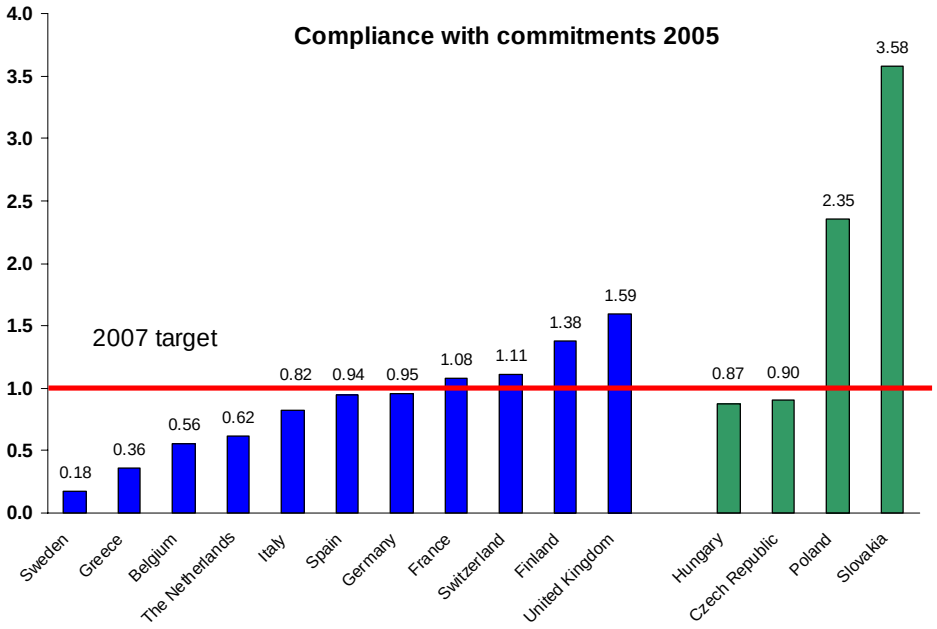


Mercury Emissions

Euro Chlor companies have collected data on emissions of mercury from their operations since 1977. A voluntary target of 1.0 gram of mercury per tonne of mercury cell capacity was set in 1998 to be reached on a national basis by 2007. The participating countries were initially those in Western Europe. Euro Chlor members from Eastern countries that subsequently joined the federation are progressively committing to the same target. Data for 2005 includes emission levels from plants in Eastern Europe as well as Western Europe.

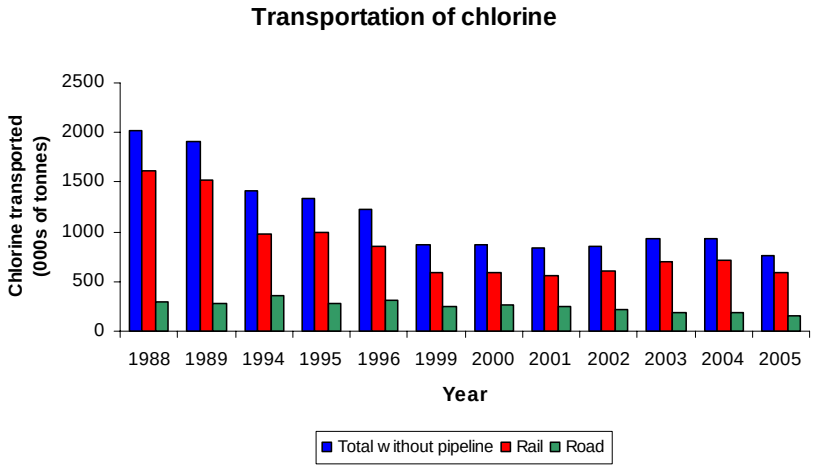


Note: East European members are not all part of the voluntary commitment yet, but are shown for completeness.



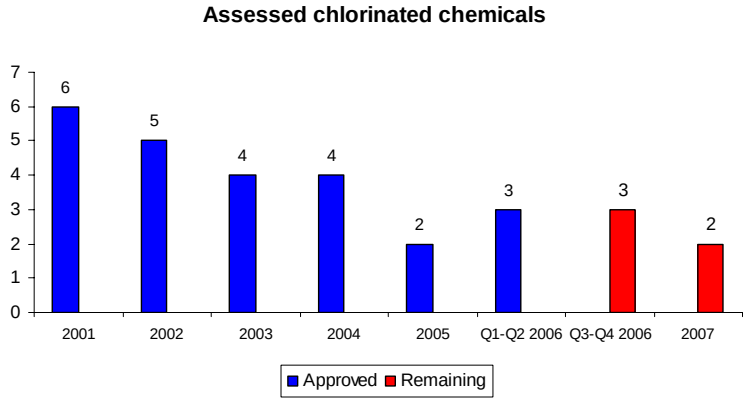
Transportation

During the last decade, the amount of chlorine transported by rail and road has been halved. In 2005, only 7% of all the chlorine produced in Europe was transported. Chlorine movement has been decoupled from production through supplier/customer relocations and increased use of pipelines. Rail transport dominates; road transport for bulk supply is used only in the UK and, to a limited extent, in Spain. Refillable containers (less than 1 tonne) are used by small users (e.g. water treatment plants) and are generally moved by road.



Product Knowledge

Under the International Council of Chemical Associations/OECD voluntary initiative on high production volume chemicals, Euro Chlor member companies committed to providing full eco-toxicological and environmental data on 29 chlorinated substances. The summary information is made publicly available on *Chlorine Online* website at www.eurochlor.org.



Conclusion

Good progress has been made since 2001 when the industry adopted a formal sustainable development strategy and since 2003 when Euro Chlor set 15 measurable environmental, recycling, safety, and energy efficiency performance improvement goals for 2010. With a few exceptions, the industry is on track, but the effort has to be maintained. We will report periodically to stakeholders between now and 2010.