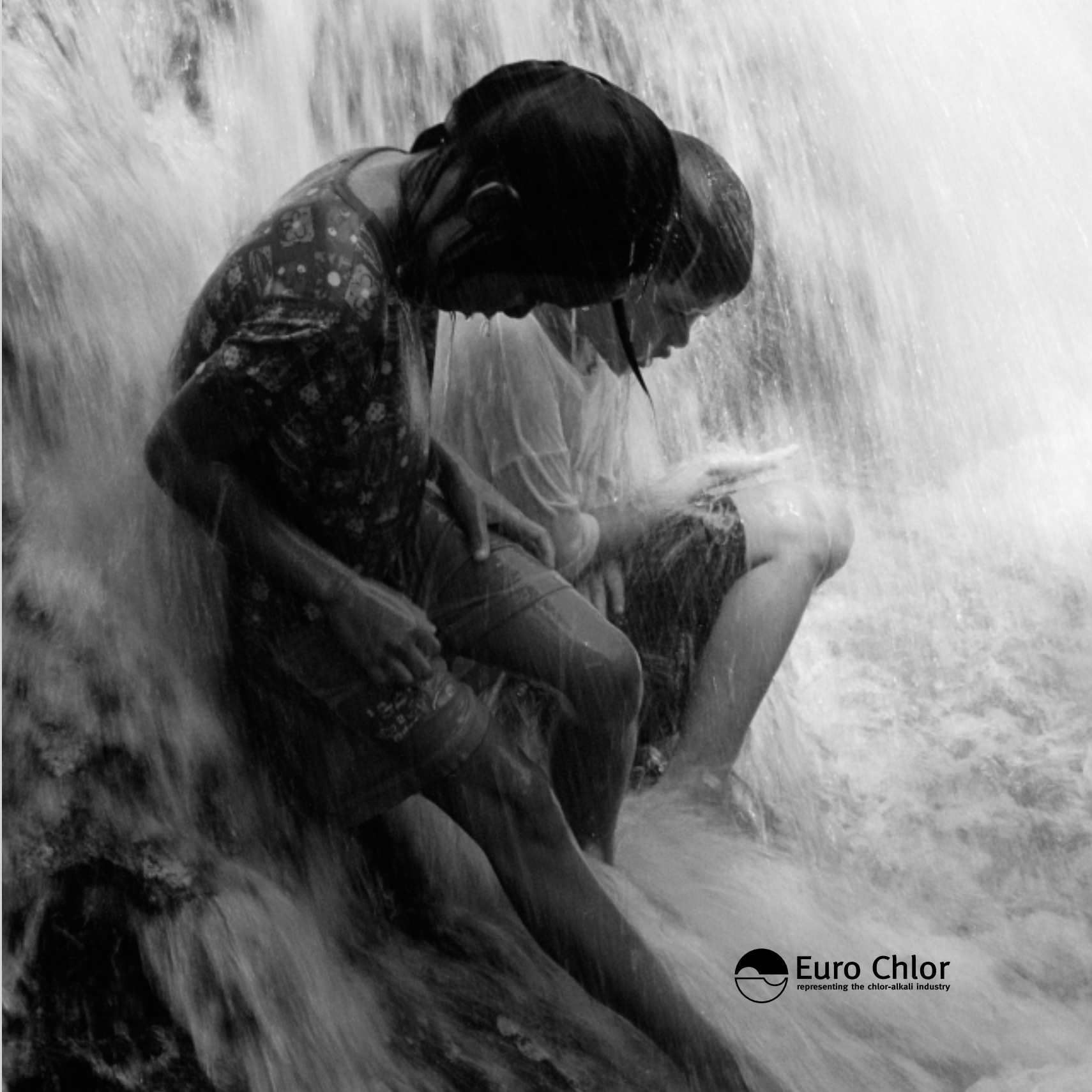

Euro Chlor
representing the chlor-alkali industry

COVER: Two Thai youngsters enjoying a refreshing dip under the cool cascading spray of a waterfall. This picture was featured in an Italian photographic exhibition sponsored by Euro Chlor associate member, Federchimica Assobase (see page 21). Mike Goldwater took this photo at the Mae Klang waterfall in the Doi Inthanon National Park, Chang Mai, Thailand. Photograph: Michael Goldwater/Network/Grazia Neri. Full details of all the main pictures in this Review can be found on page 46.

Chlorine Industry Review
2002 - 2003

Euro Chlor
representing the chlor-alkali industry

Contents

Is political expediency a threat to sound science?

In last year's Review, we described plans for reducing our industry's environmental impact – or 'lightening our footprint' as it is more often called. This work continues and you can read more about it on the following pages.

LIGHTENING OUR FOOTPRINT

The European chlor-alkali industry has a long history of environmental improvement. For example, we began collecting data on mercury emissions from our plants as far back as 1977 when most of industry had barely heard the word 'environment'. Since then, emissions to air – the main dispersion medium – have been reduced by 94.5%. More improvements will come as we continue to convert the remaining mercury-based production plants to membrane technology.

Although there is no legal requirement to do so, the industry has voluntarily undertaken to complete the conversion process by 2020. The amount of chlorine produced in Western Europe by this technology has dropped to less than 50% today.

In 1985 we began measuring our manufacturing emissions of chlorinated organic compounds. By 2001, these had been reduced by 94%. For people who think of the industry as improving only slowly, these dramatic falls are often surprising and in this edition of our Review we have included (pages 23-24) charts showing emissions 1985-2001.

In last year's Review we detailed six qualitative measures of performance in areas such as energy efficiency, emissions and the use of resources. In 2002 we turned those six aspirations into 14 measurable indicators (see page 8-9). We are now setting long-term targets and deadlines for each and will report annually on progress.

All this work is a natural response to changing standards and public expectations. Society moves on and certain products and processes that were part of our lives 30 years ago are no longer acceptable. As the world changes, we endeavour to exceed expectations and to work constructively with legislators to ensure proper controls.

But there is a line to be drawn. Just as we as an industry are trying to establish sound, scientific data on our environmental performance, we ask that legislators take a similarly objective view of our products and their uses. If health and environmental concerns are based on political expediency rather than scientific evidence and ignore the many benefits of chemicals, we risk losing socially useful products and shackling an industry that makes a major contribution to the European economy.

Chlorine and its co-product caustic soda give us clean water, abundant food, life-saving medicines, effective insulation, clothing, information technology hardware and so much more that we all take for granted. Chlorine and caustic soda are essential in the synthesis of more than 50% of all other chemicals. These, in turn, comprise the third largest industrial sector in the EU, contributing 1.7 million jobs and more than €500,000 million to Europe's economy.

We aim to do our job with as light a footprint pressure as possible on our environment. We simply ask that legislators continue to work with us and not against us as we strive to meet society's needs.

Dr Barrie S Gilliatt
Executive Director

INDUSTRY INITIATIVES
Sustainable development

Measuring our progress
Euro Chlor published a sustainability strategy for the European chlor-alkali sector in early 2002 which contained six voluntary commitments made by its members. These required them to include environmental, social and economic aspects in all strategic business decisions; to optimise energy efficiency in chlor-alkali production; to reduce water usage through recycling; to continuously reduce polluting emissions to water, air and land; to use more of the hydrogen generated by the industry as a raw material or fuel; and to give high priority to the safe transport of chlorine.

At Euro Chlor's annual assembly in September 2002, the members adopted 14 measurable performance indicators based on the six qualitative aspirations. These were unveiled publicly in Brussels at a Euro Chlor conference 'Lightening chlorine's footprint... steps to sustainability' (see panel) in February 2003. Throughout this Review, you will find references to our performance against the indicators.

"First in chemical industry to develop key performance indicators"

In an effort to advance the debate regarding sustainability of chlorine, Euro Chlor organised a conference (24-25 February 2003) in Brussels for industry, government, media and environmental NGOs.

More than 150 delegates from 21 countries participated. The 12 speakers included Catherine Day, Director-General of the EU Environment DG; Aloïs Michielsen, chairman of Solvay's Executive Committee and Guido Sacconi, Italian MEP and rapporteur for the Green Paper on environmental issues related to PVC, which accounts for about a third of all chlorine consumption in Western Europe.

European Chemical News reported afterwards: "The European chlorine industry has moved into pole position. The sector has become the first in the chemical industry to develop key performance indicators in response to public concerns about the sustainability of chlorine."

"We in the chlorine industry will not maintain our credibility and licence to operate without relentlessly demonstrating better results on the three pillars of sustainability and without being more transparent and ready for an open dialogue with our stakeholders."

Philippe Goebel, Executive Vice President, Atofina

Key performance indicators

During the process of turning aspirations into commitments, questionnaires were developed for each indicator and distributed to member companies. The responses provide a snapshot of the sector's performance in 2001 and a baseline for measuring improvements. Once two years' data is available, long-term targets for appropriate indicators will be established. These will be made public and Euro Chlor will report on performance every year so that stakeholders can monitor progress.

Environmental

Emissions

Industry-wide emission levels of chlorinated organic compounds (COCs) to air and water will be reported for a range of compounds.

Mercury emissions

Plant-by-plant mercury emissions to air and water, as well as that contained in products, will be published in addition to the report to the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic.

Product data

Euro Chlor and its members have taken responsibility for 31 chlorinated substances under the HPV (high production volume) initiative of the International Council of Chemical Associations (ICCA). The percentage of dossiers completed will be reported. In addition to the indicators, product data will be made available on the Euro Chlor website.

Transportation

The tonnage of chlorine transported as a percentage of the total chlorine produced will be recorded as well as mode of transport (sea, road, rail, pipelines and small containers).

Responsible Care
The percentage of member companies participating in national *Responsible Care* programmes will be reported.

Safety
Lost time injuries
These will be measured as the number of injuries per million working hours resulting in at least a day off work. Contractors as well as employees will be included.

Process incidents
These will be reported. A reportable production process incident is a fire, explosion or release of chemicals that involves a fatality, a serious injury or substantial damage to property.

Chlorine transport incidents
A chlorine transport incident is one which either involves death or injury, a spill of more than 5 kg, substantial property damage, public disruption of more than one hour or intervention of emergency services or media coverage. These will be reported as a rate per 1 million tonnes x kilometres transported.

Economic
Manufacturing technology
The percentage of chlorine produced by mercury cells, diaphragm cells, membrane cells and other technologies will be reported.

Economic development
Euro Chlor will continue monthly, quarterly or annual publication of data on European production of chlorine and caustic soda, including national production rates, utilisation rates, stocks, capacity and technology by plant and applications.

Energy
The energy (electrical and steam) used to produce one tonne of chlorine, weight-averaged across all producers, will be reported, expressed as kWh/t Cl2.

Water
Metrics to describe water utilisation have still to be determined.

Use of hydrogen
A by-product of chlorine manufacture, hydrogen is becoming a key 'environmentally clean' chemical. The amount used as a raw material in hydrogenation processes or as a clean energy source will be reported as a percentage of the total production.

Operations stewardship

Health and safety

As in any industrial process, the manufacture and transport of chemicals involves risks. For this reason, safety has always been a priority for the European chlor-alkali industry, which continues to work towards ever-higher standards.

The sustainability indicators developed last year include a measure of lost-time injuries. Data for the 2001 base year showed that the number of such injuries per million working hours was 8.42 for employees (compared to 10 for the chemical industry as a whole) and 15.72 for contractors.

A further indicator is the number of reportable process incidents (fires, explosions or releases of chemicals). Since the majority of chlorine manufacturing sites handle potentially-hazardous concentrated hydrochloric and sulphuric acids, caustic soda and sodium hypochlorite (chlorine bleach) as well as chlorine, the indicator covers all reportable incidents associated with these chemicals. The base figure for 2001 was 5.63 incidents per million tonnes of chlorine capacity.

During 2001, the first steps were taken to extend the incident gathering process from Europe to the rest of the world. Although the system still needs refining, the aim is to be able to record the industry's safety performance worldwide. Global data so far available for 2002 show 78 incidents, 27 injuries and no fatalities for the industry. They also indicate that 40% of incidents involved a chlorine leakage of less than one kilogramme and that 50% occurred at the point of use rather than during manufacture or transport.

As part of continuing work to help members in Accession Countries generally improve health, safety and environmental standards, Euro Chlor organised a meeting for Czech members in April 2002. Topics discussed included workers' exposure to mercury, electromagnetic fields (EMF) and chlorine occupational exposure limits.

Euro Chlor's technical library of about 150 documents is designed to help members run their operations effectively, safely and with due care for the environment. Previously published as paper documents, these are now being converted into an electronic format. Only 15 remain to be completed. As part of the goal that every recommendation and guideline should be updated at least every five years, 22 were revised during 2002.

Transportation

Euro Chlor members observe stringent safety standards for all modes of transport. Over the last 50 years there have been no fatalities caused by bulk chlorine shipments in Western Europe.

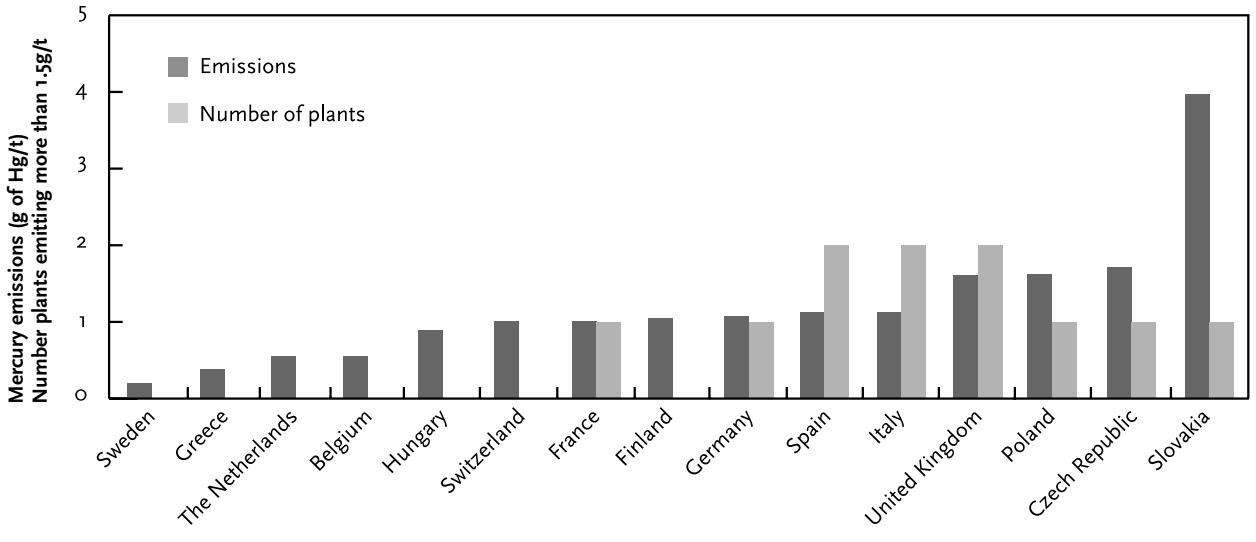
Only 10% of the chlorine manufactured in Western Europe is transported by road or rail. Where chlorine needs to be used at adjacent facilities, it is generally moved via inter-plant pipelines.

Of the 950,000 tonnes transported in 2002, 70% was moved in bulk by rail with an average distance of 419 km, 27% by road (average distance 202 km) and 3% in drums or cylinders (average trip 306 km).

"The voluntary approach can achieve environmental and sustainability objectives rapidly with flexibility and it will ensure that the commitments put in place will last."

Jakub Zak, Chlorine Business Director, Rokita, Poland.

Compliance with commitments during 2002 (Figure 1)



Managing process change

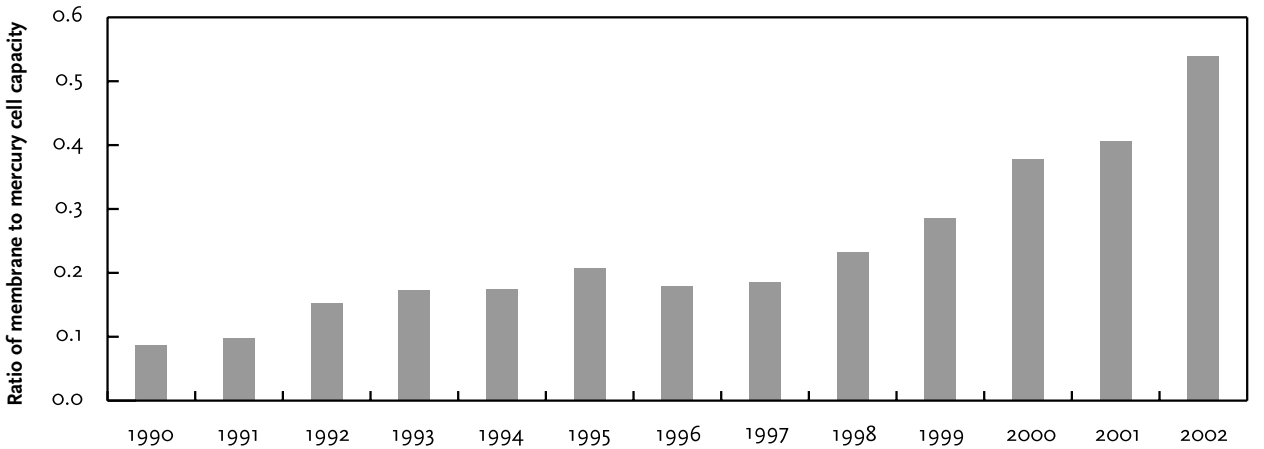
Three main challenges

The necessity to move away from traditional mercury and asbestos diaphragm technologies in many electrolysis plants presents the chlor-alkali industry with three main challenges – the reduction of mercury and asbestos emissions to the environment from existing plants; the investment for conversion to membrane or non-asbestos diaphragm technology; and what happens to the mercury that becomes available. Euro Chlor and its members have voluntarily addressed each of these issues, initially in Western Europe and increasingly with producers in the candidate Accession Countries.

During the past 25 years, the Western European chlor-alkali industry has reduced manufacturing emissions of mercury to air (94.5%), water (99.6%) and products (99.1%). Overall emissions in 2002 were just six tonnes or 1.05g/t of chlorine capacity.

Euro Chlor has set a target for Western European installations that by 2007, no individual plant will exceed 1.5g/t and that plants will average 1.0g/t on a national basis. Progress towards that target is shown in Figure 1, including member plants in the Accession Countries. The one plant in Germany and one of the two plants in Spain exceeding the 1.5g/t target converted to membrane technology during 2002.

Conversion to membrane cells (Figure 2)



Changes in technology

Every European chlor-alkali plant built in the last 25 years has used membrane technology. Nevertheless, older mercury and diaphragm cell plants still operate economically and safely whilst continuing to improve their environmental performance.

Until recently, all diaphragm plants used chrysotile asbestos as a separator within the cell. The inherent safety features of this type of separator were acknowledged by legislators and the use of asbestos in such cells remains the only derogation within the Asbestos Directive. Research and development by the industry and its suppliers has resulted in the availability of an alternative non-asbestos separator for certain geometric and electrical designs of cells. Of the nine diaphragm plants in Western Europe at the beginning of 2002, three are in the final stage of conversion to the non-asbestos substitute, one was closed permanently and announcements were made concerning the conversion of a further three to membrane technology.

In 2002, for the first time ever, the proportion of European chlorine produced in mercury cells fell below 50%. Membrane cell capacity continues to increase. The progress of conversion, expressed as the ratio of membrane cell capacity to mercury cell capacity, is shown in Figure 2 (page 13).

Responsible mercury disposal

The conversion of Europe's mercury cell rooms will progressively make available some 12,000 tonnes of the metal from Western Europe and a further 3,000 tonnes from the Accession Countries. Euro Chlor members believe that the most environmentally sound solution for this surplus mercury is to use it to replace metal that would otherwise be mined, hence the 2001 agreement with Minas de Almadén of Spain. This essentially means that, for every tonne returned by the chlorine industry, there will be one tonne less mercury mined by Almadén.

In 2001, the European Council of Environmental Ministers called on the Commission to report on the legal and environmental implications of the way mercury from closing plants is handled. Euro Chlor contributed information to the authors and the final report in September 2002 takes account of many of the views expressed. The report states that mercury from decommissioned cells should not automatically be defined as waste and acknowledges that the return of mercury to Spain has already resulted in less mining. It also noted that Accession Countries should be encouraged to follow Western European manufacturers in returning mercury to Almadén. The report concedes that the alternatives to the Euro Chlor/Almadén Agreement are neither fully developed nor economical and could have a negative effect on the competitiveness of the chlorine industry.

The Council welcomed the report and has asked the Commission to present by 2004 a coherent EU strategy on all aspects of production, use, waste treatment and emissions of mercury from all sources.

UNEP's recently-published Global Mercury Assessment report includes considerable discussion of chlor-alkali usage of mercury (and of the Euro Chlor/Almadén Agreement), but there are no recommendations specific to the chlor-alkali industry. At the UNEP Governing Council meeting in February 2003, the EU's push for a legally-binding instrument was defeated in favour of a proposal for a non-mandatory action programme particularly aimed at assisting developing countries. Nonetheless, the door was left open for the EU proposal to be re-examined at the 2005 Governing Council meeting. This coincides with the mandate given to the Commission to present the EU Council with a coherent strategy for mercury measures by the end of 2004.

PVC industry increases sustainability commitment

European PVC plastics producers continued to make progress with their 10-year plan for reducing the environmental impact of products and manufacturing processes. During 2002, producers increased funding by 74% from €2.6 million (2001) to €4.6 million for their voluntary commitment *Vinyl 2010*. This aims to improve PVC production processes and products, invest in technology, minimise emissions and waste and increase collection and recycling.

Water for the world

World summit

Together with other chlorine and PVC organisations, Euro Chlor was represented at the World Summit on Sustainable Development in Johannesburg in September 2002 to demonstrate our commitment and the industry's contribution to sustainability. At the accompanying exhibition, the World Chlorine Council (WCC) and the Global Vinyls Committee (GVC) presented a joint display to show the importance of chlorine chemistry and PVC piping in providing safe drinking water. They also distributed 3,000 brochures to delegates and members of the public on the industry's commitment towards a sustainable future.

During the conference, the International Council of Chemical Associations (ICCA) organised an event on building partnerships for the safe management of chemicals. The recent WCC workshops in Brazil and India, aimed at improving environmental performance and promoting best practice in chlorine manufacture, were presented in a speech by Dr Udo Oels, Member of the Board of Bayer, as a good example of capacity building.

The world summit identified a number of challenges – eradicating poverty, changing unsustainable patterns of production and consumption, protecting and managing natural resources and social and economic development. Given that 1.2 billion people lack safe water while 40% do not have adequate sanitation, one of the main commitments of the conference was to reduce these figures by half by 2015.

Relief projects

As part of its commitment to the Johannesburg objectives, the chlorine industry is active in seeking practical ways to help lesser-developed countries improve access to safe water and sanitation.

For example, under the WCC umbrella it has joined the West Africa Water Initiative (WAWI), a public-private partnership involved in water supply, sanitation and the management of water resources in villages in Ghana, Mali and Niger.

Euro Chlor and the European Council of Vinyl Manufacturers (ECVM) funded drinking water and sanitation projects in 2002 for people in two villages, Sacoyou and Cha Ki Rocja Sanaña, in Guatemala. Aid was provided via the Water Relief Network (WRN), a collaboration between the PVC/chlor-alkali industries and the Red Cross.

In 2003, Euro Chlor and ECVM initiated a third project for Guatemala in collaboration with six other European chemical and plastics industry organizations. This will provide similar safe water distribution and sanitation facilities for people living in the village of Buena Vista.

Third World Water Forum

Meeting every three years, the World Water Forum brings together governments, international organisations, UN agencies, scientists, water experts and NGOs. March 2003 saw the third meeting in the series in Kyoto, Japan. Attracting 10,000 delegates, the conference focused on water and sanitation goals agreed in Johannesburg. Chlorine and PVC industries, through the WCC, contributed to three sessions and the poster event demonstrating the contribution of chlorine and PVC to safe and economical water supplies.

HPV Initiative

Globally, the chemical industry volunteered to provide harmonised, internationally-agreed data and initial assessment reports for about 1,000 high production-volume chemicals by the end of 2004 (the ICCA HPV programme). The goal is to provide a sound, scientific basis for future risk assessments and to demonstrate the industry's commitment to communicating openly with its stakeholders.

About 80 chlorinated substances have been identified under the programme. Euro Chlor member companies are directly leading 31 consortia to provide the necessary data. Another 12 are led by other European associations. The remainder are being managed in Japan or North America. Eighteen chlorinated chemicals have so far been assessed by OECD, including 13 by Euro Chlor consortia.

The industry's Internet initiative to enhance transparency and boost public confidence in the HPV process continues to arouse interest. Background information on all 45 chlorinated substances examined by Euro Chlor members under the ICCA HPV and EU Existing Substances Chemicals programmes is being made available on the Euro Chlor website (www.eurochlor.org).

In a 'one-stop shop' concept, data on the chemicals will be accessible through hot links, whether the source is OECD SIDS/SIARs, EU Existing Chemicals risk assessments or industry. This system will ensure optimum public transparency on how the chlorine industry is meeting its HPV commitments.

Assessing potential risks

Developing statistical analysis system
In partnership with the University of Louvain-La-Neuve in Belgium, Euro Chlor is developing a statistical analysis system to more accurately estimate concentration levels of PBTs in waterways.

Starting with actual data from sampling stations, the aim of the system is to support risk assessments of organochlorines. By developing a practical methodology to estimate their distribution and concentration across the waterways of a given area, it will help achieve a more accurate assessment of potential risks.

The methodology was presented and discussed in March 2003 at a conference in Brussels entitled, *Availability, interpretation and use of environmental monitoring data*. In due course, it may contribute to the monitoring processes of the Water Framework Directive and risk assessments under the new EU Chemicals Policy.

A number of scientific bodies and environmental organisations have raised concerns that children may be more susceptible to chemicals than adults and that traces of certain compounds in the environment may affect their development. Acknowledging that this issue needs particular attention, Euro Chlor is working with other sectors of the chemical industry to evaluate data in this area. The findings are expected to be presented by the European Chemical Industry Council (Cefic) at a special workshop early in 2004.

Information and education

Science for non-scientists
Part of Euro Chlor's role is to be a source of sound, scientific information for legislators, politicians and the general public. To this end, it continued to add to its series of key science information sheets (short, easy-to-understand explanations for non-specialist readers) as well as comprehensive, technically-detailed science dossiers.

New information sheets published in the past year have dealt with water chlorination, dioxins, POPs (persistent organic pollutants) and PBTs (persistent, bioaccumulative and toxic substances). New science dossiers examined trichloroacetic acid, chloroform, dioxins and furans and chlorine substituents. All are available on *Chlorine Online* at www.eurochlor.org.

The website continued its upward trend last year with 142,000 visits, an increase of almost 20% on the previous year. Enquiries via the website for information about chlorine chemistry also continued to rise – a 24% increase over the previous year to 550. These came from 48 countries with Germany (95) the highest followed by the United States (71), United Kingdom (64) Belgium (38) and India (37).

Whilst routine communications activities at the country level are the responsibility of national chlorine groups, Euro Chlor strives to support local activities. For example, an English-language Chlorine Tree poster developed by WCC for the Johannesburg Sustainability Summit was reproduced in French, German and Spanish for local use.

In Spain, Asociación Nacional de Electroquímica (ANE), published a pamphlet on swimming pool hygiene, which was distributed to schools and institutes, swimming clubs, local consumer information offices, media and ANE members. ANE's website (www.cloro.info) was updated and provided with new sections on Publications, Frequently Asked Questions and Links to other information sources.

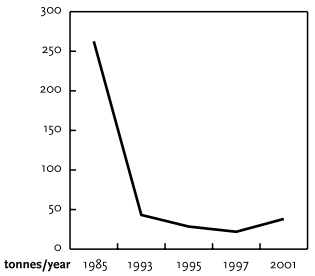
Italian chlorine sector group Federchimica Assobase sponsored teaching materials at the Acqua Picture Exhibition in Milan to mark the UN International Year of Freshwater (2003). Students and teachers visiting the exhibition received a chlorine information kit, including a CD-Rom and video. Federchimica Assobase also organised the chlorine section of the Federchimica Giovani competition for primary and secondary students. More info: www.cloro.org

In France, the Syndicat des Halogènes et Dérivés (SHD) strengthened its collaboration with French consumer associations by organising two 1-day events: one on "Security and Sustainable Development" and the other "Chlorine and Water Disinfection".

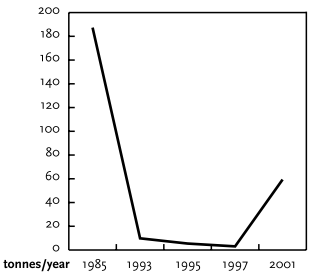
BelgoChlor, a sector group of Fédération des Industries Chimiques de Belgique (Fedichem) updated its website (www.belgochlor.be) and more than 50% of 100,000 visitors in 2002 downloaded the third edition of the Belgian White Book on Chlorine, which is now available on CD-Rom.

Emissions to water

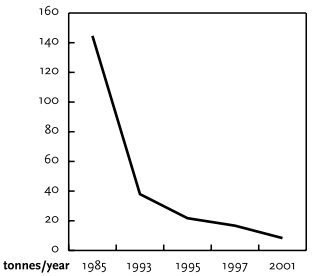
1,2-Dichloroethane



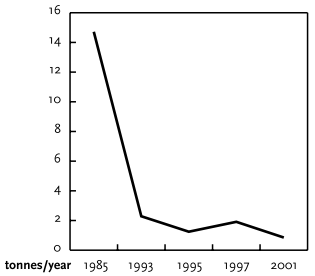
Trichloroethylene



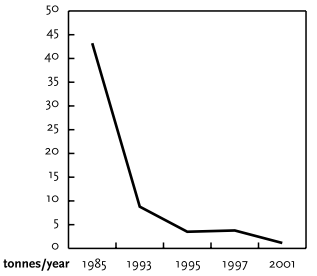
Chloroform



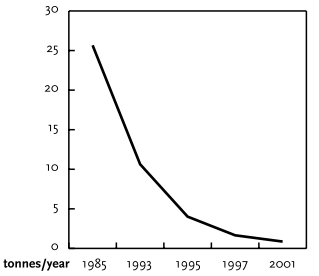
1,4-Dichlorobenzene



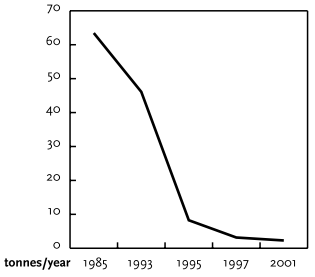
Carbon tetrachloride



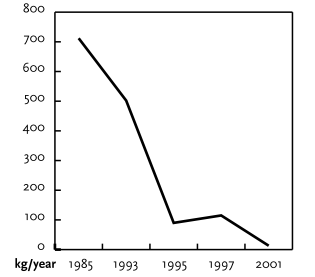
Tetrachloroethylene



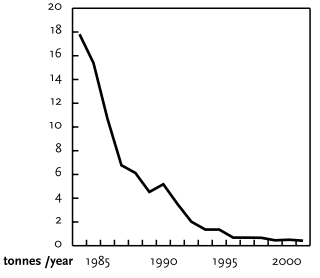
Dichloromethane



Hexachlorobenzene

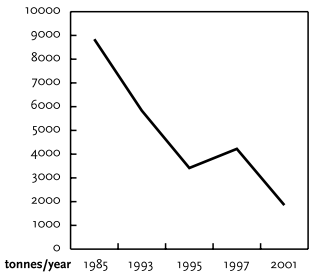


Mercury

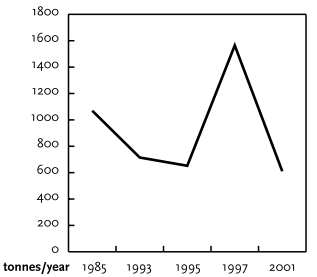


Emissions to air

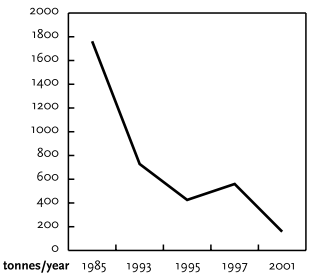
1,2-Dichloroethane



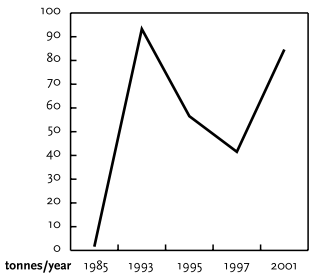
Trichloroethylene



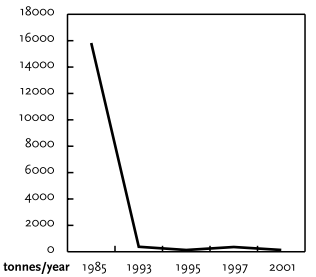
Chloroform



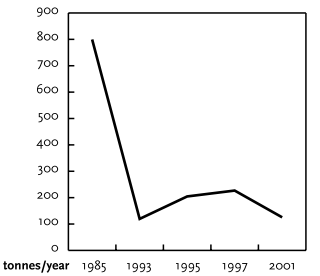
1,4-Dichlorobenzene



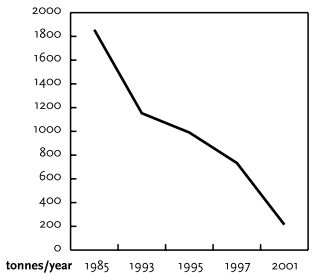
Carbon tetrachloride



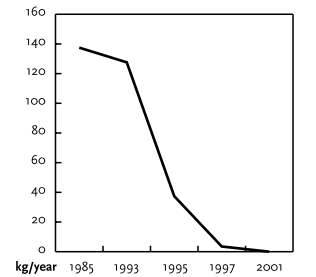
Tetrachloroethylene



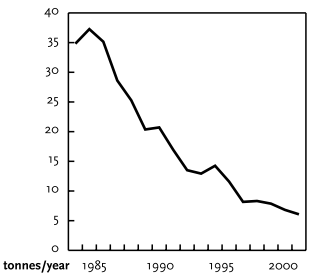
Dichloromethane



Hexachlorobenzene



Mercury



COC emissions significantly lower

The European chlor-alkali industry began a manufacturing emissions monitoring programme for about 20 chlorinated organic compounds (COCs) in 1985. Further data was collected from members in 1993, 1995, 1997 and 2001, by which time producers had reduced overall emissions to air by 90% from the 1985 baseline and those to water by 98%.

Under the 14 sustainability indicators announced in 2003 (pages 8-9), the industry continues to be committed to further reduce emissions and communicate progress to stakeholders. For the first time, Euro Chlor is reporting in this section (see inside, fold out pages 23-24), industry-wide emissions to air and water for eight chlorinated organic compounds and mercury.

LEGISLATIVE DEVELOPMENTS
Chemicals Policy Review

REACH process unworkable
While Cefic is primarily responsible for leading the industry's efforts to clarify and refine the concepts in the White Paper, Euro Chlor support has included evaluating the proposed REACH (Registration, Evaluation and Authorisation of Chemicals) approach as it affects intermediates, CMRs (carcinogenic, mutagenic and repro-toxic substances), PBTs (persistent, bioaccumulative and toxic chemicals) and vPvBs (very persistent and very bio-accumulative chemicals).

Society demands more knowledge of the risks and benefits of chemicals and requires the industry to be more transparent. These are goals which Euro Chlor understands and supports. However, we do not believe that the REACH process will do this. We believe it is unduly bureaucratic and fails to address true priorities. The Authorisation step in particular is a bar to innovation and ignores the basic EU principle of a free market. Overall, the proposal fails to take account of the excessive costs on the industry's international competitiveness and, ultimately, will place a burden on authorities, agencies, users and producers making the process unworkable.

Euro Chlor and several member companies have made formal inputs to the Internet consultation process using these and other arguments. We have made constructive proposals on the simplification of the scope to exclude polymers and intermediates and to limit authorisation to categories 1 and 2 CMRs.

We advocate the centralisation of the process through a fully staffed European Agency with executive powers, as well as a reduction in the requirements of the bureaucratic Chemicals Safety Reports (particularly for use down the supply chain). For balance and fairness, there must be a legal right of appeal on all decisions arising from application and interpretation of the legislation.

Positive Energy Tax outcome
Energy used as a raw material for electrolysis has been formally excluded from the new EU Energy Tax Directive, due to come into force in January 2004. Advocacy efforts by Euro Chlor and member companies during 2002 resulted in a decision by the EU not to include a threshold for electricity usage as a raw material whereby it would be taxed if it was more than 50% of total product cost (N.B. electricity comprises 40-60% of chlorine production costs). Euro Chlor argued that imposing such a threshold would harm the industry's global competitiveness and provide no incentive to save energy.

Existing Substances Regulation

Pioneer on risk assessments

Under the EU Existing Substances Regulation (now being integrated into the new EU Chemicals Policy), Euro Chlor continued its assessment of priority chlorine-related chemicals. Limited risk assessments were completed for caustic soda (2002) and chlorine (2003) as part of the OECD voluntary HPV (high production volume) initiative in order to gather more information before progressing to the EU regulatory programme. Work continues on sodium hypochlorite in partnership with the International Association for Soap, Detergents and Maintenance Products (AISE).

The chlor-alkali sector was an early chemical industry leader seven years ago when it began a voluntary programme to assess the risk of 25 chlorine-related substances to the marine environment – particularly the North Sea. Two substances no longer produced in Western Europe were subsequently excluded from the programme and risk assessments have now been completed through Euro Chlor on the remaining 23. The findings are assessed by independent scientists before publication in the scientific literature.

Knowledge gained through the Euro Chlor programme is being shared with the authorities [e.g. the Commission for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and the European Commission] to assist in the development of regulatory initiatives such as the development of Environmental Quality Standards (EQS) under the Water Framework Directive (N.B. summaries are available on *Chlorine Online* at www.eurochlor.org).

Water Framework Directive

Active participation in standards setting
The list of priority chemicals in the field of water policy under the Water Framework Directive includes mercury and some chlorinated compounds, which are of high importance to the chlorine industry. For a defined sub-set of these, known as Priority Hazardous Substances, there is a requirement for emissions and discharges to cease by 2020.

Euro Chlor has actively contributed to the process through participation in the development of Environmental Quality Standards (EQSs) and Emission Limit Values (ELVs) for the substances of interest to the chlorine industry.

EQSs for nine chlorinated priority substances were recently discussed with an EU Commission-led expert group.

Earlier voluntary marine risk assessments produced by Euro Chlor proved extremely valuable in reaching agreement. The debate on mercury was much more difficult, not compatible with chlorine industry views and, at this stage, inconclusive. There will be further negotiations before a final proposal targeted for November 2003 during which time Euro Chlor, national associations and companies will continue to press the Commission and Member States to deliver a practical and workable EQS for mercury.

Because it sets a precedent, Euro Chlor strongly disagrees with the classification of 1,2,4-trichlorobenzene as a Persistent Bioaccumulative and Toxic (PBT) substance and thus a Priority Hazardous Substance under the Directive. The federation has requested the Commission to review this classification.


Egl tours
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韓國
日本

Stockholm Convention on POPs
Biocidal Products Directive

UNEP to develop guidance on BAT and BEP
The implementation of the Stockholm Convention on POPs has the potential to significantly impact chlorine-related industries – in particular with regard to the generation and release of the so-called by-product POPs such as dioxins and hexachlorobenzene.

UNEP will develop guidance documents for BAT (Best Available Techniques) and BEP (Best Environmental Practices) for those industrial processes that have the potential of being a major source of dioxin and hexachlorobenzene emissions into the environment. Euro Chlor – under the umbrella of the World Chlorine Council – has been nominated to be a member of the UNEP Expert Group, composed of government and industry experts and environmental NGOs. The extent to which industrial chlorine processes will be covered by the UNEP work is still under discussion. The chlorine industry position is that chlorine processes are generally recognised as a minor source of dioxin emissions and, therefore, there is no need for an international guidance document.

Biocides notified
The EU Biocidal Products Directive introduced a process for authorising the marketing of biocides. Producers who wished to keep their products on the market had to submit a notification dossier for each substance by March 2002 and a full dossier by 2007. In collaboration with its members, Euro Chlor submitted notification dossiers for chlorine, sodium and calcium hypochlorite. The next step is to provide efficacy data and full risk assessments for each application.


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Occupational health

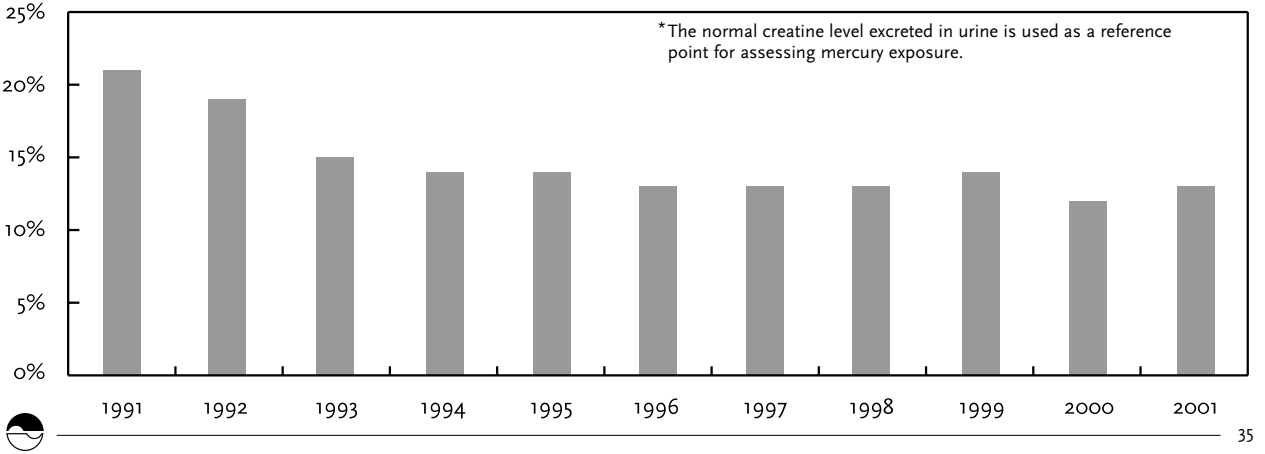
Electromagnetic fields

A draft directive has been published aimed at addressing concerns about the potential health effects of exposure of workers to electromagnetic fields (EMF). As written, chlor-alkali plants will not be able to meet the standards proposed. Of particular concern is that new bipolar membrane cell installations – defined as BAT – are further from compliance than old monopolar mercury cell technology. Action and limit values are theoretically set – yet with more than 100 years experience of chlorine electrolysis, there is no practical evidence of any ill-effects from EMF in our industry. Euro Chlor has submitted a position paper requesting three actions: 1) a Regulatory Impact Assessment before proceeding further, 2) the development of standardised methods for measuring EMF before the Directive enters into force and 3) a suggestion for limiting the application of technical summation formulae to fields in excess of 100kHz (as is done in some national legislations).

Mercury hygiene

For over 30 years Euro Chlor has implemented its own mercury hygiene standards based on urine analysis (Figure 3). At end 2002, the Commission issued a draft indicative occupational exposure limit (IOEL) based on air concentrations. The correlation between the two is weak and the suggested air value is not practical. Industry proposed a more pragmatic and realistic air figure, but continued to emphasise that urinary levels are more relevant. Currently, mercury has been removed from chemicals listed in the Directive until the Scientific Committee on OEL makes definitive recommendations.

Urine analysis for mercury exposure (Figure 3)
% of workers with more than 35 ug Hg/g creatinine*



Regulatory pressures increase

In 2001, the metal-cleaning and spot-cleaning solvent, trichloroethylene (TRI), was reclassified under the Dangerous Substances Directive from a Category 3 to a Category 2 carcinogen. This would normally lead to a prohibition on consumer sales, but the move has been delayed as the necessary directive has not yet been adopted. The ban will not take effect until towards the middle of 2004, depending on individual Member States. Suppliers are now required to add a hazard-warning label to their products.

Based on current data, the European Chlorinated Solvent Association (ECSA), which is part of Euro Chlor, believes the reclassification is scientifically unsound. ECSA has gained approval from the French government to begin an epidemiological study among the metalworking communities of the Arve Valley. The study, conducted by the University Claude Bernard in Lyon, began in September 2002 and will last for three years. If results show that normal exposure to trichloroethylene does not increase the risk of cancer, ECSA will ask for the 2001 reclassification to be reversed.

In the meantime, ECSA has recommended that TRI is not used in consumer products and has proposed statements of best practice for its manufacture, its use as an intermediate and use by the metal cleaning industry (where TRI can continue to be used in closed systems).

Chlorinated solvents and paraffins

A second chlorinated solvent, perchloroethylene (PER), is used by more than 80% of European dry cleaners. Its toxicity classification is under review and ECSA expects a decision from the European Commission within a year.

Some 5% of the PER that escapes into the atmosphere degrades into trichloroacetic acid (TCA). For a number of years, ECSA has periodically monitored TCA levels across Europe and has found no significant concentrations other than in Germany's Black Forest. The Commission has asked ECSA to carry out a further study into the Black Forest phenomenon to see whether the TCA in this case is naturally occurring or caused by degrading PER.

There is pressure from some EU governments, particularly Denmark and Germany, to ban the use of methylene chloride in paint strippers. ECSA argues that with the continuing adoption in stripper formulations of vapour retardants – additives that reduce the evaporation rate – methylene chloride should not face further restrictions. While agreeing with ECSA that a ban is unnecessary, the Commission has proposed a study on the effectiveness of vapour retardants. No further moves are expected until the study is completed.

The seventh amendment to the Cosmetics Directive will prohibit Category 3 carcinogens in cosmetics, unless found by a scientific committee to be risk-free. As a Category 3 substance, methylene chloride falls under the ban. Given that the principal alternative is highly-inflammable, there will be no benefit for consumers. Although cosmetics account for less than 1% of methylene chloride production, the chlorinated solvents producers view this move as an unjustifiable precedent. Category 3 carcinogens have never before faced an outright ban and similar moves in other sectors could have more serious consequences.

Following a risk assessment in 1999, short chain chlorinated paraffins (SCCPs) were banned for their two main applications – metal and leather working. By the time the ban takes effect on January 6, 2004, their use will have completely ceased. The remaining applications – which together account for only 50kg of emissions a year – will be the subject of a Commission report in 2003.

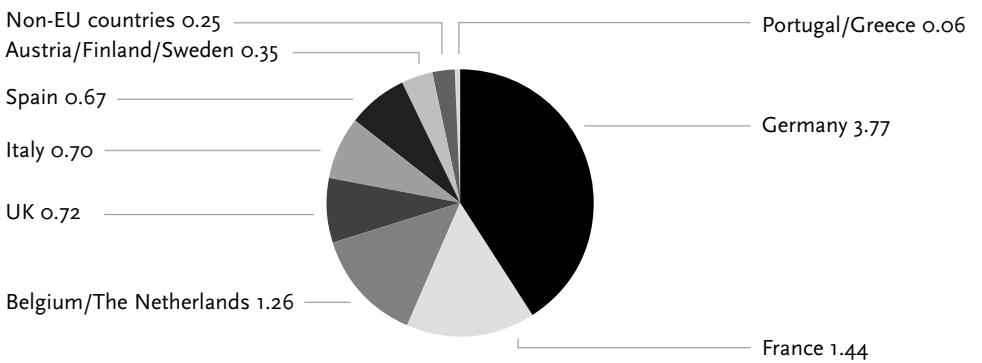
Chlorinated paraffins are currently being risk-assessed by Member States under the Existing Substances Regulation. The current proposal from the United Kingdom rapporteur is to drop the carcinogenicity classification for SCCPs and not to propose such a classification for mid-chain chlorinated paraffins (MCCPs). If this happens, it will be the first case of a classification becoming less severe. Along with its US counterpart, ECSA is also co-operating with the UK in assessing the environmental risks of long-chain chlorinated paraffins.

THE INDUSTRY IN BRIEF

Production and use
The chlor-alkali industry in Europe is very diversified with producers ranging in size from 6000 t/yr to 1.5 million t/yr chlorine capacity. Twenty percent of the producers manufacture 70% of the chlorine. The largest producer is Dow in Germany; the most geographically spread is Solvay/Solvin with production in seven European countries.

Germany outstrips all other European countries in chlorine capacity. Whilst there has been some growth in capacity in Germany, the United Kingdom has seen a substantial drop. Four plants (two membrane, one diaphragm and one mixed membrane/ diaphragm) in the UK out of a total of seven have closed in the last three years. Capacity in the other countries has remained more or less static.

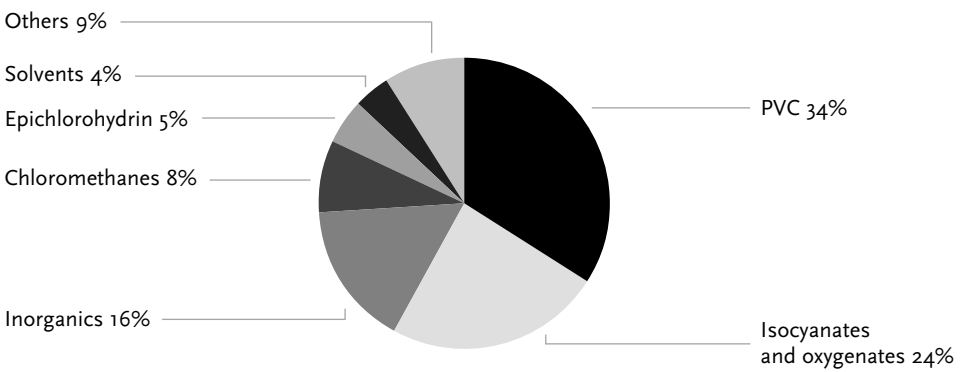
Chlorine production in 2002
Total production: 9.22 million tonnes



The majority of the chlorine is co-produced with sodium hydroxide, more commonly known as caustic soda (in general, production of one tonne of chlorine is accompanied by production of 1.1 tonnes of caustic soda). About 5% is co-produced with potassium hydroxide or alcoholates. There is only one plant now producing metallic sodium and chlorine.

In 2002, chlorine production in Western Europe totalled 9.22 million tonnes, a 0.5 % decrease compared with the 2001 figure of 9.26 million tonnes. Capacity utilisation rates in 2002 averaged 85.2% compared with 85.7% the previous year. A further 541,000 tonnes was produced in Euro Chlor member companies in the Accession Countries, representing an estimated 70% of the production in these areas.

Chlorine applications in 2002
(9.22 million tonnes)

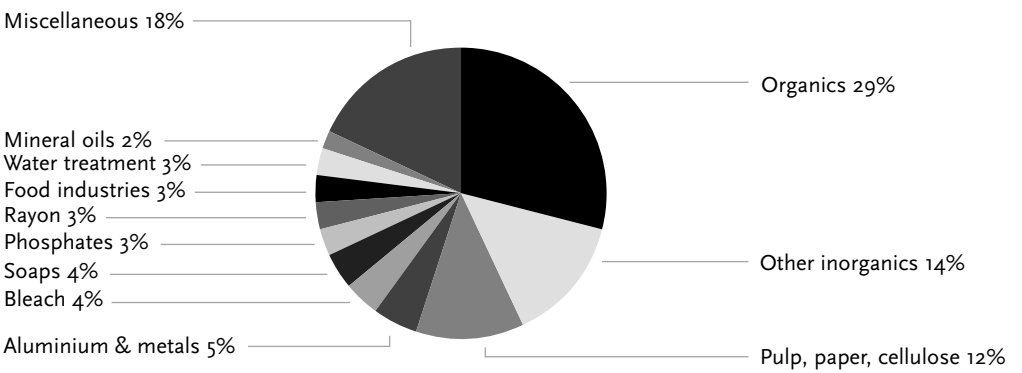


Chlorine is widely used across the chemical industry with PVC remaining the largest single application in Western Europe, accounting for 34% of production. Many of the highest value chlorine chain products – such as polycarbonates, polyurethanes and epoxy resins – do not contain chlorine, but depend on it for their synthesis. About 30% of chlorine is used to make chlorine-free end products. There was very little change in the uses of chlorine between 2001 and 2002, with a small increase in propylene oxide being offset by drops in chlorinated solvents and inorganic uses.

Sales of the chlorinated solvents trichloroethylene (TRI), perchloroethylene (PER) and methylene chloride declined overall for the seventh successive year. TRI sales in 2002 dropped 17% to 52,000 tonnes, PER decreased 6% to 61,000 tonnes while methylene chloride remained stable at 144,000 tonnes (2002: 143,000 tonnes).

Caustic soda production is directly related to chlorine manufacture. The use pattern, based on consumption of 9.84 million tonnes, was similar to previous years.

Caustic soda applications in 2002
(9.84 million tonnes)



EURO CHLOR

Founded in its current form in 1990, Euro Chlor helps chlorine producers improve safety standards whilst conducting science, advocacy and communications programmes. An integral part of Euro Chlor are the European Chlorinated Solvent Association (ECSA) and the Chlorinated Paraffins Sector Group. Euro Chlor has 105 members, comprising 39 chlorine producers, 35 associate members and 31 technical correspondents. During 2002, eight new associates and three new technical correspondents joined the federation. Euro Chlor speaks on behalf of 97% of the chlorine production capacity in the EU and EFTA regions and about 70% of capacity in the Accession countries.

Committees & working groups

Overall strategic direction and guidance is provided to the Secretariat by the Management Committee. There are 35 committees and working groups providing specialist advice and assistance in such areas as advocacy, science, manufacturing, transportation, safety, health and the environment.

Management

Management Committee
- Mercury ad hoc Task Force
- Sustainability ad hoc Task Force

Statistics Committee

Advocacy & communications

Regulatory Affairs Committee
- EU Advisory Group
- National Chlorine Associations WG

Chlorine Communicators' Network (CCN)

Management Committee

Co-chairmen: Pernot, Ph - Atofina (left); Scheffers, H C J - Akzo Nobel (right)

Bergmann, U - BASF; Ohm, Ch - Bayer; Guinet, J-F - ChlorAlp; Schollemann, F - Dow Deutschland; Paini, G - EniChem; Fearn, P - Finnish Chemicals; Tane, C - Ineos Chlor; Heber, J - Norsk Hydro; Zak, J - Rokita; Gielen, F - Solvay; Aparicio Díez, M - Solvay Química; Dubinski, M - Tessenderlo Chemie; Berwe, H - Vinnolit.

Technical & safety

General Technical Committee (GTC)
- Environmental Protection WG
- GEST (Safety) WG
  - Equipment WG
  - Transport WG
- Health WG
  - Electromagnetic Fields WG

Science

Steering Committee
- Monitoring & Environmental Chemistry WG
- Toxicology WG
- Risk Assessment ad hoc WGs
  - Caustic Soda
  - Chlorine
  - Marine
  - Mercury
  - Sodium Hypochlorite

European Chlorinated Solvent Association

Management Committee
- Communication & Outreach WG
- General Technical WG
- Occupational & Environmental Health WG
- Product WG
- Chlorinated Solvents Risk Assessment WG
- Chloroform RA WG

Product groups

Biocides Strategy Group
Chlorinated Paraffins Sector Group
Chloroisocyanurates Group
Potassium WG

Secretariat employees


Barrie Gilliatt


Françoise Minne


André Orban


Véronique Garny


Dolf van Wijk


Raf Bruyndonckx


Valentina Bertato


Viviane Norré


Arseen Seys


Caroline Andersson


Riet Buyssens


Peter Whippy


Griet Provoost


Guy Mesrobian


Maria Prieto

Membership

Full members
- Akzo Nobel Base Chemicals
- Albemarle
- Albion Chemicals Ltd
- Anwil
- Aragonesas Industrias y Energia
- Atofina
- BASF
- Bayer
- Borregaard Industries
- BorsodChem
- Caffaro
- ChlorAlp
- Degussa
- Dow Europe
- Electroquímica de Hernani
- Electroquímica del Noroeste
- Ercros
- Finnish Chemicals
- Hellenic Petroleum
- Ineos Chlor
- LII Europe
- Métaux Spéciaux
- Norsk Hydro
- Novácke Chemické Závody
- Produits Chimiques d'Harbonnières
- Química del Cinca
- Quimigal
- Rhodia Eco Services
- Rokita
- SF-Chem
- Solvay
- Solvin
- Spolana
- Spolchemie
- Syndial SpA
- Tessenderlo Chemie
- Vestolit
- Vinnolit
- Zachem

Associate members
- Arch Chemicals
- Asociación Nacional de Electroquímica (ANE)
- Association of Chemical Industry of the Czech Republic (SCHP)
- Aziende Chimiche Riunite Angelini Francesco (ACRAF)
- Chemical Industries Association (CIA)
- Chlorine Engineers
- Cotelle (Colgate-Palmolive)
- De Nora Impianti
- Du Pont de Nemours
- Electrochemical Industries
- Erco Worldwide
- Exxon Chemical Europe
- Fédération des Industries Chimiques de Belgique (Fedichem)
- Federazione Nazionale dell'Industria Chimica (Federchimica Assobase)
- Leuna Tenside
- Lonza
- Nankai Chemical Industry Co.
- National Petrochemical Company of Iran
- NCP
- Nichimen Europe
- Nippon Soda
- Pentachlorophenol Task Force
- Plast- & Kemiföretagen – The Swedish Plastics and Chemicals Federation
- Polish Chamber of Chemical Industry (PIPC)
- PPG Industries
- Procter & Gamble Eurocor
- Schweizerische Gesellschaft für Chemische Industrie
- Shikoku Chemicals
- Syndicat des Halogènes et Dérivés/ Chimie Minérale
- Teijin Twaron
- Tosoh Corporation
- Unilever Hellas
- Verband der Chemischen Industrie (VCI)
- Vereniging van de Nederlandse Chemische Industrie (VNCI)
- Waterchem AIE

Technical correspondents
- 3V Sigma
- Arabian Chlorine Co
- Asahi Glass Europe B.V.
- Avecia Ltd
- Beltech
- Buckbee-Mears Europe
- Carburos Metálicos
- Chemtec
- Claushuis Metaalmaatschappij
- Crane Resistoflex GmbH
- Descote
- Electroquímica de Sagua
- Eltech Systems Corporation
- Eramet
- Garlock Sealing Technologies
- Kerr-McGee Pigments
- Kronos Europe
- KSB-AMRI
- Nufarm Coogee
- Occidental Chemical Europe
- Palm Schumacher GmbH
- Phönix Armaturen-Werke Bregel
- Polifin
- Quicksilver Recovery Services
- Reliance Industries Ltd
- Samson SA
- Senior Flexonics Ermeto
- Severn Trent Water
- Shaw, Son & Greenhalgh Ltd
- Technip LCI
- W.L. Gore & Associates

Salt, or sodium chloride, is a key raw material for the chlorine industry. In electrolytic processes an electric current is passed through saturated brine (a salt solution) to produce chlorine and caustic soda (sodium hydroxide) as well as hydrogen. There is an almost limitless supply of salt on the planet – at least enough for the next 500 million years. *Getty Images*

Renewable and environmentally-sustainable energy technologies, such as wind power, are predicted to double in the EU by 2020 and create about 900,000 jobs. The giant rotor blades of wind turbines are constructed from chlorine-based materials such as epoxy resins and PVC plastics, which helps ensure they are light, stiff and fatigue resistant. *Getty Images*

Pipeline networks bring safety, environmental and cost advantages for moving chemicals – particularly petrochemicals such as ethylene and propylene – often long distances between different manufacturing locations. However, 85% of chlorine in Europe is manufactured and used close to the point of manufacture. Nonetheless, in 2001, nearly half of the chlorine transported was moved short distances via pipelines to nearby facilities. *Getty Images*

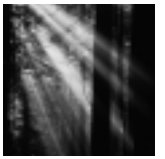
Water is essential for life, yet half the world's diseases are transmitted by water. The UN estimates 1.2 billion people – such as this drought-hit Ethiopian mother and child fleeing to neighbouring Sudan – do not have access to safe drinking water. The UN has set a 2015 goal of halving this figure (p. 17). Chlorine and light-weight, easily laid PVC pipes are helping to meet this challenge.
Photograph: *Michael Goldwater/Network/Grazia Neri.*

Providing information and data openly and transparently to those interested in understanding chlorine chemistry is a fundamental industry goal. Young people are a key audience for specific educational initiatives at the country level (see page 21). These activities are complemented by the Internet information service provided by Euro Chlor's website (www.eurochlor.org), which was visited by 142,000 people in 2002. *Getty Images*

In the 1960-70s, DDT and dioxin-like PCBs were believed to be responsible for significant reductions in fertility of species such as seals, eagles or other predators. With a drastic reduction in environmental levels of DDT and dioxins, many affected species have recovered to pre-1960 levels. Drops in PCBs are not so marked, due primarily to illegal dumping of this banned substance, and low levels have been identified in Arctic polar bears.
Getty Images

Apart from salt, electricity is the only other raw material used to manufacture chlorine. Energy costs play an important role in the competitiveness of European producers on global markets. The mercury process accounts for just under half of European capacity and these producers are currently engaged in a €3,000 million conversion programme to membrane technology. This will reduce their energy consumption by 15%.
Getty Images

Protecting the seas from pollution by discharges of dangerous substances is a long-term goal of governments and international bodies (see p 28-29). Euro Chlor was an early pioneer in conducting marine risk assessments. Since the mid-1990s, 10-12 man-years has been spent assessing 23 high-priority chlorine-related chemicals. Almost all were found to pose no risks for the marine environment. The safe emission levels of three were less clear and research continues to fill data gaps. *Corbis*



The theory that trichloroacetic acid (TCA) – a degradation by-product of dry-cleaning solvent perchloroethylene (PER) – contributes to forest dieback may be wrong. Germany's Black Forest is one of Europe's most affected and preliminary results of research there indicate that the effect on vegetation is caused by naturally-occurring TCA (see page 37). Nature produces nearly 4,000 chlorinated and other halogenated compounds, including many that are also synthesised industrially. *Getty Images*

The SARS (Severe Acute Respiratory Syndrome) virus caused fear throughout China where it emerged in February 2003. The epidemic spread to 32 countries before it was contained. According to the World Health Organisation (WHO), 8,400 people were infected and 800 died. Chlorine bleach solution is recommended as a disinfectant by WHO to kill the virus.
Corbis

European chlor-alkali producers are committed to ensuring that production facilities operate safely and pose no threats to the health of workers nor the communities in which plants are located. Euro Chlor places a strong emphasis on promoting the best health, safety and environmental practices to assist members in achieving continuous improvement (*Responsible Care*).
Image Bank

Sewerage piping is one of a range of applications for PVC, the most widely used polymer in building and construction across Europe. More than half of Western Europe's annual PVC production is used in this sector. Chlorine comprises 71% by weight of PVC, making this the plastic which relies least on non-renewable hydrocarbon-based raw materials (petroleum, natural gas or coal). *Getty Images*

Euro Chlor

The voice of the European chlorine industry. Euro Chlor plays a key communications and representation role on behalf of its members, listening and responding to society's concerns about the sustainability of chlorine chemistry.

Euro Chlor
Avenue E. Van Nieuwenhuyse 4, box 2
B-1160 Brussels, Belgium
Tel: + 32 2 676 72 11
Fax: + 32 2 676 72 41
e-mail: eurochlor@cefic.be
www.eurochlor.org