08 Chlorine Industry Review

2008-2009

Tackling issues in a transparent manner

Euro Chlor
representing the chlor-alkali industry

Tackling issues in a transparent manner

08

Chlorine Industry Review

2008-2009

Cover: The main illustrations in this report represent currents, flows, streams.
Electric current is the power used in chlor-alkali electrolysis.
It cannot be substituted and represents up to 50% of the cash cost of production.
That fact makes chlor-alkali an energy-intensive industry.

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01 Introduction

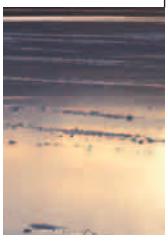
Tackling issues in a transparent manner

In the 20 years since Euro Chlor's creation – yes, 2009 is our 20th birthday – has our industry changed and, if so, has it been for the better? In many positive ways the answer is a resounding yes to both questions.
In 1989 we were under scathing attack from the green movement for our use of mercury but more so from the deluded notion that chlorine was the 'devil's element'. This may well have been the beginning of the use of junk science to prove an emotional point.

Since then concerted efforts to explain to regulators how chlorine is used safely and effectively to benefit society have brought us to the point where we are no longer seen in such a poor light. Euro Chlor's reputation has grown steadily throughout this time with the ultimate accolade that we are the first to have a voluntary agreement formally recognised by the Commission (see page 20).

We have achieved this by our unwavering commitment to tackle issues in an open, honest and transparent manner preserving dignity and respect in all our dealings with our stakeholders. (In this regard we have not changed!) Such values are exemplified in our Director of Regulatory Affairs, Arseen Seys, who retires at year end after 24 years of dedicated service to Euro Chlor and its preceding organisation BITC. The gratitude of all current and past colleagues from the industry goes to Arseen for the remarkable achievements which he has orchestrated throughout his distinguished career.

The natural raw material salt constitutes the basis for chlor-alkali production



Over the last year, Energy – or more specifically the Emissions Trading Scheme (ETS) – has continued to dominate our work and thinking though the economic crisis and related recession have been more prominent in the news of late.

Are these two headline subjects related? Well not exactly. But the latter has certainly emphasised the fragility of our European industrial competitiveness. As the Far East economies begin to recover at a faster rate than the European ones we need to press strongly for measures to minimise the impact of climate change policies without compromising the environmental objectives.

So far Euro Chlor has succeeded in gaining recognition for electro intensive industries and provisions for state aid to maintain European competitivity are written into the legal text. We have every reason to be optimistic that these provisions will eventually lead to many millions of Euros to offset to a significant extent the cost of CO_2 in electricity prices paid by members.

It is too early for jubilation but we take encouragement from the progress made as we move forward in thrashing out a framework for state aid with DG Competition.

This second stage of our work is equally as challenging as the first as we try to find a scheme which prevents carbon leakage without distorting competition in the Single Market which at the same time also delivers the overall objectives of climate change measures.

We remain optimistic of an acceptable outcome.

A year ago I reported that chlorine production in 2007 had hit an all time high.
Apart from some remarks like 'enjoy the good times while they last – they won't last for ever', I don't think anyone foresaw the global economic crisis and recession which hit during the second half of 2008.

Our industry has been hit as hard as any with many members imposing austerity measures on their operating units. I hope the 10% reduction in membership fees for 2009 agreed by your Management Committee helps a little!

As I write, forecasters in the financial press refer to 'green shoots of recovery' though for most, this gives little comfort for the immediate future. But let us not succumb to melancholy! Over the 20 years of our short history we have learnt to cope with change, the cyclical nature of our business and the associated stress.

Together, we will continue to work for a stronger, ever more sustainable industry able to withstand these storms emerging with our pride intact.

Alistair J. Steel
Executive Director

02 Sustainability

Continuous efforts for improvement

"It is logical that progress towards our 2010 sustainability goals has diminished. In some areas achieving further improvement becomes much more difficult as we approach the targets. Still, those companies in the upper quartile of performers have been able to maintain their position. As a professional organisation we must ask ourselves what needs to be done in order to realise the improvement we aim at. If we don't, we waste an opportunity to create value."

Alistair J. Steel

The cost of electricity represents about 50% of the manufacturing cash costs for chlorine and caustic soda

Unified strategic approach

All of the Western European chlorine manufacturing members of Euro Chlor agreed in 2001 on an industry-wide strategy that focused on six voluntary commitments. These were first developed to ensure a united industry approach and commitment to address key sustainability concerns:

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

In parallel, data was collected for 2001-02 and with this information, 14 performance indicators and improvement goals were agreed among producers and announced by Euro Chlor in January 2003. Then the following year, a 15th indicator was added that required members to gain EMAS and/or ISO 14001 Environmental Accreditation for their plants.

The original 14 indicators come under the following main areas: economic aspects of production, environmental protection, safety and social progress. Each year, producers are required to report their progress to Euro Chlor, which combines feedback to report to the association's Management Committee prior to annual publication of the industry's performance.

In this section, we report on performance indicators and progress in 2008 towards goals in 2010. Whilst the programme continues to be a powerful force for change, not all the indicators show the same degree of progress. See each individual parameter for more details.

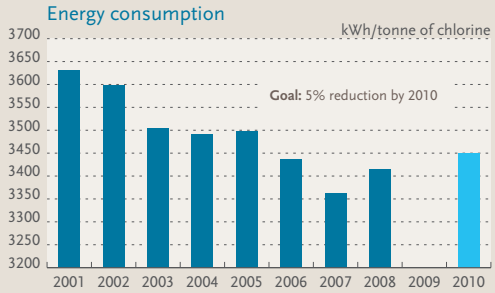
Economic contribution

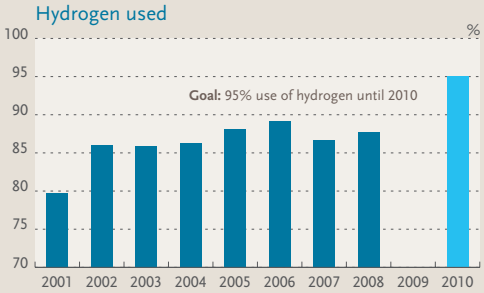
Energy use

Target: By 2010, reduce industry-wide energy consumption by 5% in terms of kWh/tonne of chlorine produced compared with the 2001 base year.

Update: As in 2005, there was again an increase in 2008, but the average energy consumption is still below the target fixed for 2010, with a value of 3,415 kWh/t of chlorine produced. The global trend is related to the progressive conversion from mercury to membrane technology.

Background: Since electricity is an indispensable raw material of the chlorine production process, the basic consumption – corresponding to the electrochemical reaction – cannot be significantly reduced. However, converting one technology into a more efficient one may save a certain amount of energy and, to a lesser degree, reduce ancillary energy use.
The energy indicator is weight-averaged across all producers and based on steam and electricity. Energy is mainly used for electrolysis (transformers, rectifiers and cells) and also for illumination and motor power (pumps, compressors, centrifuges, etc.). Steam is used mainly for caustic soda concentration to 50% and for minor utility purposes.





Energy consumption
Real
Objective

Hydrogen utilisation
Real
Objective

Hydrogen use

Target: Increase recycling and re-use of hydrogen gas from 80% (2001) to 95% by 2010.

Update: In 2008, the percentage of hydrogen use increased slightly to 87.7%, but *has remained* roughly constant for several years, with a value quite low compared to the target of 95%. About one third of the companies are below 80%, with three not even reaching 50%.

Comment: The 2010 goal will be difficult to achieve!

Background: High-quality hydrogen is co-produced with chlorine and caustic soda during the electrolysis of brine. This can be used as a raw material or fuel to produce steam; technologies are today in industrial development to allow for local electricity recovery via fuel cells.

Manufacturing technology

Target: The percentage of chlorine produced by mercury cells, diaphragm cells, membrane cells and other technologies will be communicated on a yearly basis.

Update: Membrane technology represents now almost the half (49%) of the installed production capacity in Europe. The mercury process accounts for 34% at the beginning of 2009, continuing the progressive phase out of this technology in line with the Chlor Alkali sector's voluntary agreement. The diaphragm process still accounts for about 14% of the total capacity.

Economic development

Target: Euro Chlor has decided to report monthly, quarterly and annually data on European production of chlorine and caustic soda. This includes utilization rates, caustic stocks, capacity and technology by plants and applications.

Update: In 2008, Euro Chlor continued to publish on its website and distribute to the media figures for monthly chlorine production and caustic soda stocks.
The Industry Review includes every year a map of Europe showing the location of all plants and a table indicating the location, ownership, technologies and capacity of each plant (see p.37 for 2008).

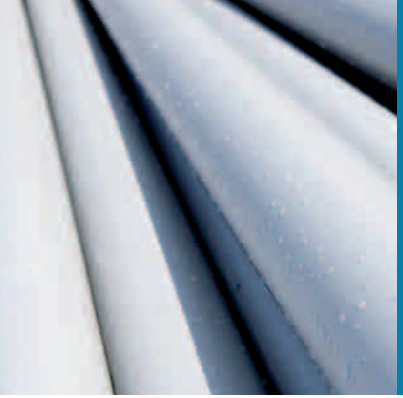
Safety & social progress

Lost-time injuries

Target: To reduce lost-time injuries (LTI) to 1.3 per million working hours for all workers - both company employees and contractors working in production units.

Update: The 2008 figures for employees decrease significantly to the lowest level since 2001, with a LTI rate per million working hours of about 7.2, but this is still too high compared with the ambitious target of 1.3. For contractors, the rate also decreased to a LTI rate per million working hours of 7.9.

Comment: Even if the long- term trends show some reduction (mostly for contractors), the figure remains much too high compared with



PVC sustainable development on track despite the global recession

As reported by Vinyl 2010 in its 2009 annual progress report, the European PVC industry recycled 194,950 tonnes of this chorine-based plastic in 2008, continuing an exponential increase in the recycling of post-consumer PVC since 2004. Vinyl 2010 is a voluntary commitment from industry groups representing the complete PVC value-chain: the European Council of Vinyl Manufacturers (ECVM), the European Plastics Converters (EuPC), the European Stabiliser Producers Association (ESPA) and the European Council for Plasticisers and Intermediates (ECPI). Vinyl 2010 says that progress towards targets set in 2000 show that this particular approach to self-regulation is working and that the PVC industry's sustainable development initiative is definitely on track to achieve its Voluntary Commitment 10-year targets despite the difficulties that the whole of industry has faced resulting from the global recession.

the target. For employees, the values have roughly stayed level for more than 5 years. There is a marked need for additional efforts by a number of companies in order to achieve significant improvement for both indicators.

Background: A lost time injury (LTI) results in at least one day of absence from work. It is reported as the number of LTI per million working hours. The figures from companies reporting on a three day period of absence are converted to an equivalent of one day using a Cefic correlation.

Process incidents and losses

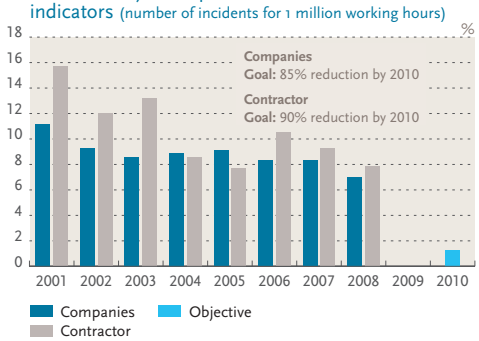
Target: A 75% reduction in the number of process incidents from 67 (2001) to 15.

Update: After 3 years at the level of the 2010 target, the number of incidents increased to 20 in 2008.

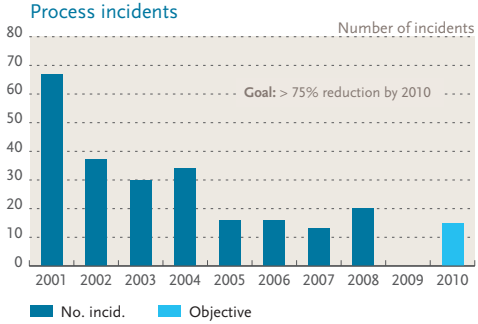
Comment: The 2010 target can still be achieved, but efforts are needed.

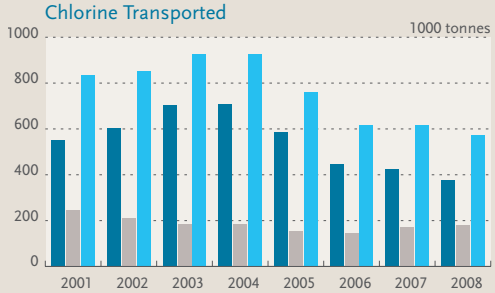
Background: Incidents are classified as events involving a fire, explosion or the release of chlorine, hydrochloric acid, sulphuric acid, sodium hypochlorite (bleach) or caustic soda, which cause a fatality, serious injury or property damage exceeding € 100,000. Losses include any of the above chemical spills in air, water or land, which impact human health or the environment, property or result in evacuation.

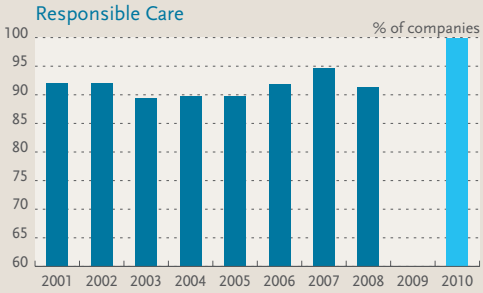
Lost Time Injuries - production units and contractors indicators (number of incidents for 1 million working hours)



Process incidents







Chlorine Transported
Bulk rail
Bulk road
Total without pipeline

Responsible Care
Actual
Objective

Transportation

Targets: Zero 'transport incidents' involving the bulk movement of chlorine by 2010.
The tonnage of chlorine transported as a percentage of the total chlorine produced will be reported annually as well as the mode of transport involved.

Update: One transportation incident was reported in 2008, while two occurred in 2007.
A slightly lower quantity of chlorine was transported in 2008, compared to 2007 and 2006: chlorine producers in Europe transported 574,000 tonnes of chlorine, with about two third being shipped by rail and the remainder by road.
The transport of chlorine (excluding pipelines) represented a bit less than 6% of the 2008 production. The average distance chlorine was transported by rail remained about 460 km and 190 km by road.

Background: A "chlorine transport incident" is one which either involves death or injury, a spill/leak of more than 5 kg, substantial property damage, public disruption of more than one hour or the intervention of emergency services or media coverage.
The amount of chlorine transported in Europe by rail and road has halved during the past decade. Chlorine movement has been decoupled from production through supplier/customer relocations and more use of local pipelines.
Rail transport dominates; road transport for bulk supply is used only in the United Kingdom and, to a limited extent, in Spain, France and Portugal.

Responsible Care

Target: All chlorine-producing members of Euro Chlor to sign up to the 'Responsible Care' initiatives by 2010.

Update: Some companies are not convinced of the desirability of a formal commitment and have still not signed for the programme.
As of 31 December 2008, 32 out of the 35 reporting full members had joined national Responsible Care initiatives.

Background: Responsible Care is the chemical industry's global voluntary initiative by which companies, through national associations, work together to continuously improve their health, safety and environmental performance and to communicate with stakeholders about their products and processes.
Responsible Care was conceived in Canada and launched in 1985 to address public concerns about chemical manufacture, distribution and use.
The number of national chemical industry associations embracing the Responsible Care ethic has grown considerably from 6 to 52 countries since 1992.

Responsible Care®
OUR COMMITMENT TO SUSTAINABILITY

Responsible Care® is the global chemical industry initiative to continuously improve health, safety and environmental performance

Phosphorouspent achloride has been a crucial reactant in the first industrial synthesis of acrylic glass. The pool water is kept healthy by chlorination

Reproduced with the kind permission of PlasticsEurope

Chlorinated solvents: Risk management and educational efforts

Value chain engagement

The European Chlorinated Solvent Association (ECSA) has developed a sustainability strategy which aims to help secure the long-term viability of chlorinated solvents.

ECSA has intensified the dialogue on the safe use of chlorinated solvents in partnership with trade associations representing end-users and recyclers. An awareness survey in the value chain gave the following results:

90% of all participants in the awareness survey receive their up-to-date information on safe handling, use and disposal of chlorinated solvents via the MSDS technical data sheet. 65% of all participants inform their employees not only via the MSDS about the safe handling, use and disposal of chlorinated solvents but also via verbal instructions. Half of the participants also introduced specific training for their employees. None of the participants still use open systems for the use of chlorinated solvents. The participants applied suitable technology, either strictly closed loop systems or closed systems with open (un)loading. Both closed systems are used nearly equally by the participants to store and handle chlorinated solvents safely.

About 20 % of the participants in the awareness survey do not measure emissions of chlorinated solvents, or monitor the exposure of workers to chlorinated solvents and do not check for obvious misuse or unsafe use. Further dialogue is required towards the value chain about these measures as ECSA recommends strongly to take these measures into account.

Most users believe that for their application chlorinated solvents are the best products – provided that they are correctly and safely used.

Two year EU Project on dry cleaning

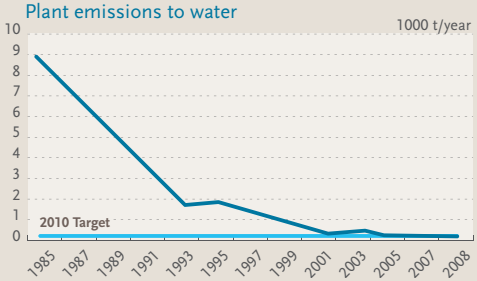
The European Chlorinated Solvent Association (ECSA) is a partner in one of the projects of the Leonardo da Vinci lifelong education programme initiated by the European Commission. The project aims at developing competencies and skills within companies, SMEs and at sectoral level.

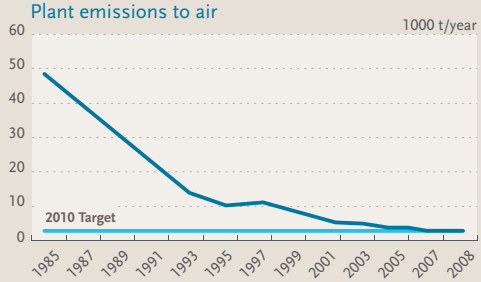
The initiative was launched end of 2008 under the dry cleaners' organisation CINET, in cooperation with more than a dozen research institutes, machine manufacturers and professional organisations in Europe, including ECSA. ECSA is going to promote sustainable practices in dry cleaning activities using perchloroethylene (PER) which - with a European market share of between 70 and 80% - is the most common solvent used worldwide in dry cleaning.

ECSA took the lead in the module on perchloroethylene as a dry cleaning agent. The module includes the development of a learning programme on the Internet. At the end of the course, an examination on an Internet-based questionnaire will test the capacities of the participants and lead to a special recognition in the form of a diploma documenting the sustainable operating practices applied in the dry cleaning shop which go far beyond existing regulations on the matter.

The chlor-alkali industry produces basic building blocks enabling downstream sectors to manufacture products substantially reducing our carbon footprint, like insulation materials

Chlorinated organic compounds





Environmental protection

COC emissions

Target: Emissions of 22 chlorinated organic compounds (COCs) to be reduced in 2010 by 75% to water and by 50% to air against the 2001 base year.

Update: At end 2008, COC emissions from manufacturing plants confirmed globally the results of 2007; for the water compartment, the value stayed at the level of 69% reduction, and remained slightly below 50% for the air performance.

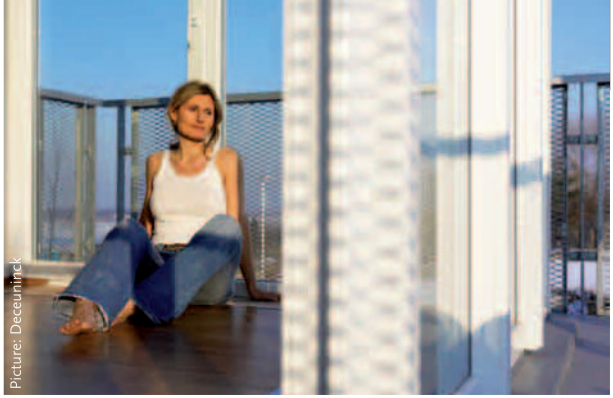
Background: The COCs were selected from various international regulatory priority lists for emissions reductions and comprise the following substances: 1,1,1-trichloroethane; 1,1,2-trichloroethane;1 ,2-dichlorobenzene; 1,2-dichloroethane;1 ,4-dichlorobenzene; 2-chlorophenol; 3-chlorophenol; 4-chlorophenol; carbon tetrachloride; chlorine; chlorobenzene; chloroform; dichloromethane; dioxins & furans (as TEQ); hexachlorobenzene; hexachlorobutadiene;h exachlorocyclohexane; pentachlorophenol; tetrachloroethylene; trichlorobenzene; trichloroethylene and vinyl chloride.
In 2005, pentachlorobenzene was added to the list of the substances to be monitored, in line with the requirements of the EU Water Framework Directive.
To provide a longer-term perspective of the sector's commitment to reducing emissions, the data shown spans the period 1985-2008.

Mercury emissions

Target: Although all other programme deadlines are for 2010, the industry decided to maintain an earlier 1998 commitment to achieve an emission target of 1 g Hg/t chlorine capacity on a national basis by end 2007, with no plant being above 1.5 g Hg/t chlorine capacity.
The industry elected to keep the earlier date, since from October 2007 all EU chlor-alkali plants whether membrane, mercury or diaphragms require an operating permit under the Integrated Pollution Prevention and Control (IPPC) Directive.

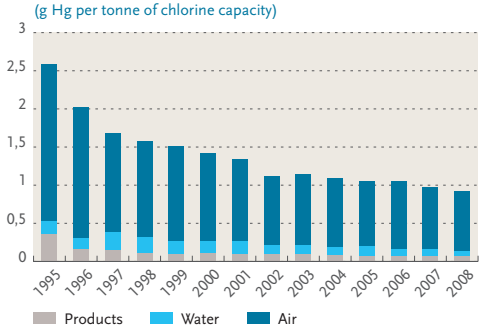
Update: Overall European emissions in 2008 amounted to 0.92 g Hg/tonne chlorine capacity compared with 0.97 g Hg/t in 2007.
The average mercury emissions for Western European countries decreased also to 0.91 g/t capacity.

Comment: The decreasing trend continues, even if a few plants still need to improve their performance. Unfortunately 2 plants are still above the 2007 target of 1.5 g Hg/tonne chlorine capacity for the total emissions. Due to a large amount of mercury recovered from waste in one plant, the Euro Chlor 5 year running average difference to balance became negative for the first time.



PVC constitutes a very sustainable construction material combining longevity and powerful thermal insulation with great freedom of design

European mercury emissions 1995-2008
(g Hg per tonne of chlorine capacity)



Product knowledge

Target: There is no specific goal for 2010. This is because the industry agreed to provide full eco-toxicological and environmental data on 29 chlorinated substances under the International Council of Chemical Associations/ OECD initiative on high production volume (HPV) chemicals.

Update: The remaining four HPV chemicals on the list are either handled under the REACH programme (so to be registered before December 1st 2010) or no longer commercially available and supported.

Environmental accreditation

Target: All full members to gain EMAS and/ or ISO 14001 Environmental Accreditation for their plants by 2010.

Update: During 2008, three production sites gained EMAS accreditation and another gained ISO 14001, while a company did not renew temporarily its ISO 14001 accreditation.
In total, 54 sites have an ISO 14001 Environmental Accreditation, of which 14 are also EMAS accredited.

Background: EMAS (The Eco-Management and Audit Scheme) is the EU voluntary instrument which acknowledges organisations that improve their environmental performance on a continuous basis. EMAS registered organisations are legally compliant, run an environmental management system and report on their environmental performance through publication of an independently verified environmental statement.
ISO 14001 is an international quality assurance standard to evaluate an organisation's environmental management systems and encourage continuous improvement. It helps organisations minimise negative environmental impacts (to air, water or land), comply with applicable laws/regulations and other environmentally-oriented requirements.
It is often the case that ISO 14001 is used as a part of the EMAS registration process.

WORLD chlorine council

World Chlorine Council

The World Chlorine Council® (WCC) is an ICCA committee representing the chlorine and chlorinated products industries. The WCC membership includes associations and companies in Africa, Asia, Europe, Latin America and North America, representing over 90 percent of global chlorine and caustic soda production.

Overall, WCC is focused on engaging producers worldwide to achieve its 2007-2010 goals which focus on:

- Engaging the global chlorine and vinyl industries;
- Participating proactively in key international fora and coordinating advocacy on priority issues;
- Promoting continuous improvement in safety, environment and health performance;
- Demonstrating progress towards sustainability for chlorine chemistry; and
- Communicating the benefits of chlorine chemistry to society.

Outreach to the global chlor-alkali sector

In 2008 and 2009, WCC continued to strengthen relationships with the chlor-alkali associations of Russia (RusChlor), China (China Chlor-Alkali Industry Association), India (Alkali Manufacturers Association of India) and producers in the Asia-Pacific region. Outreach was also initiated in the Middle-East.

Energy and Climate Change

The WCC Governing Council and Management Committee have been addressing issues around energy and climate change which are very much on the political agenda in various countries/regions and by international bodies such as the UN and G-8. The WCC members associations have been exchanging information on the policy developments in EU, Japan, US, Brazil, India and China and have also been assessing critical issues for the chlor-alkali industry and raised specific proposals within our membership. WCC is also contributing to the ICCA Energy and Climate Change activities.

A WCC ad hoc Energy & Climate Change Group has been set-up reporting to the Management Committee with the following tasks:

- Monitor the international policy development on climate change. Assess potential impact on the chlor-alkali sector.
- Work on the concept and methodology to benchmark energy consumption/CO_2 emission in the chlor-alkali sector.
- Work with international bodies (UN FCCC, G8, IEA) that are preparing international standards/sectoral agreement on energy for the chlor-alkali sector.
- Contribute to the ICCA LCA (Life Cycle Analysis) program on energy savings of key chlorine derivatives.

WCC has contributed to the IEA (International Energy Agency) report that has been officially submitted to the G-8 Summit in July. In particular our contribution on power and steam consumption in the membrane technology for chlor-alkali manufacturing which is considered by IEA as "best proven technology" has been well received and taken on board in the final IEA report.

Advocacy for Promoting Sound Implementation of International Conventions & Policies

WCC is currently engaged in more than 10 international treaties or inter-governmental programs that could impact chlorine-based processes or products. Advocacy efforts cover outreach to governments and industry contacts on issues relating to chlorine and its derivatives. WCC advocacy efforts are focused on the following priority issues:

Picture: Dirk Prenting

Children suffering from a life-threatening ultra-violet sensitivity ("Moonchildren") can live an almost normal life thanks to protective UV-resistant PVC-film

- Stockholm POPs Convention – The World Chlorine Council (WCC) has continued outreach to governments regarding the process and criteria for reviewing candidate chemicals.
  This process has important implications for chemical regulation at both the domestic level and international venues. Industry's efforts have resulted in improvements in the assessment of candidate POPs and the use of such information for risk management.
- UNEP Global Mercury Programme – WCC has been an active contributor to the UNEP Global Mercury Programme and has made a sustained effort to help mercury-based chlorine producers around the world to reduce mercury uses and emissions. This includes provision of technical support and information sharing through stewardship workshops. WCC has adopted commitments for the responsible handling of equipment and mercury after a plant shuts down or converts to mercury-free processes. WCC submitted its annual report to UNEP summarizing mercury use, consumption and emissions by mercury cell facilities and continues to participate in the UNEP Partnership for Mercury Reductions in the chlor-alkali sector. Finally, WCC will participate in the recently announced decision by governments to proceed with the negotiation of a legally binding treaty on mercury.

Improving Chlorine Safety, Environment & Health Performance

Through the WCC safety program, our industry sector is working to achieve continuous improvements in safety performance at facilities worldwide as well as during transportation and use of chlorine-based products. The WCC continues to organize stewardship workshops around the globe to promote best practices in environment, health, and safety.

Key developments in 2008-2009 include:

- The WCC Safety Newsletter was issued quarterly to share best practices and to learn from past incidents. The newsletter was also translated from English into Japanese, Portuguese, Spanish and Chinese.
- New safety tools on specific topics were made available to producers and packagers, including the WCC Safety Poster.
- Experts from WCC companies and associations gave presentations on chlorine safety matters at the 2nd International Conference on China Chlor-Alkali and PVC Industry Sustainability. This event was hosted jointly by CCAIA, and WCC and the Global Vinyl Council.
  Additional seminars are planned for 2009-2010.
- The chlor-alkali associations in China, India and Russia have stepped up their programmes to improve the safety, environment and health performance in their countries.

As ICCA works to implement the industry's Global Product Strategy (GPS), sector groups like WCC may have an important role to play in the implementation for specific products and outreach to key downstream users.

Demonstrating Sustainability of the Chlor-Alkali Industry

In 2008 WCC initiated a review of its sustainability program. This included feedback from key stakeholders on challenges and opportunities facing the industry. In 2009, WCC is moving forward with development of an enhanced sustainability framework that focuses on the products, processes, safety, energy and benefits of chlorine chemistry. Part of WCC's Sustainability Program includes support for partnerships and initiatives that uphold the Millennium Development Goals and demonstrate how chlorine chemistry is essential to sustainable development.

03 Legislative developments

Towards balanced and workable legislation

The most important and critical role of Euro Chlor is to provide advocacy leadership on efforts to positively influence proposed regulations in the areas of energy, environment, climate change, health and competitiveness. We are working together with the EU and international authorities on the common objective of achieving efficient, balanced and workable legislation. Industry also strives to minimise potential threats to its competitiveness in global markets e.g. shortcomings in the EU's energy policy.

Emission Trading Scheme Directive – Revision

Euro Chlor has taken a very deep interest in the development of the revised Emission Trading Scheme (ETS) Directive which was adopted in December 2008 and is now focusing on the implementation rules. The aim of this work is to ensure that the European chlor-alkali industry will have a future in Europe and that the industry remains competitive on a global scale.

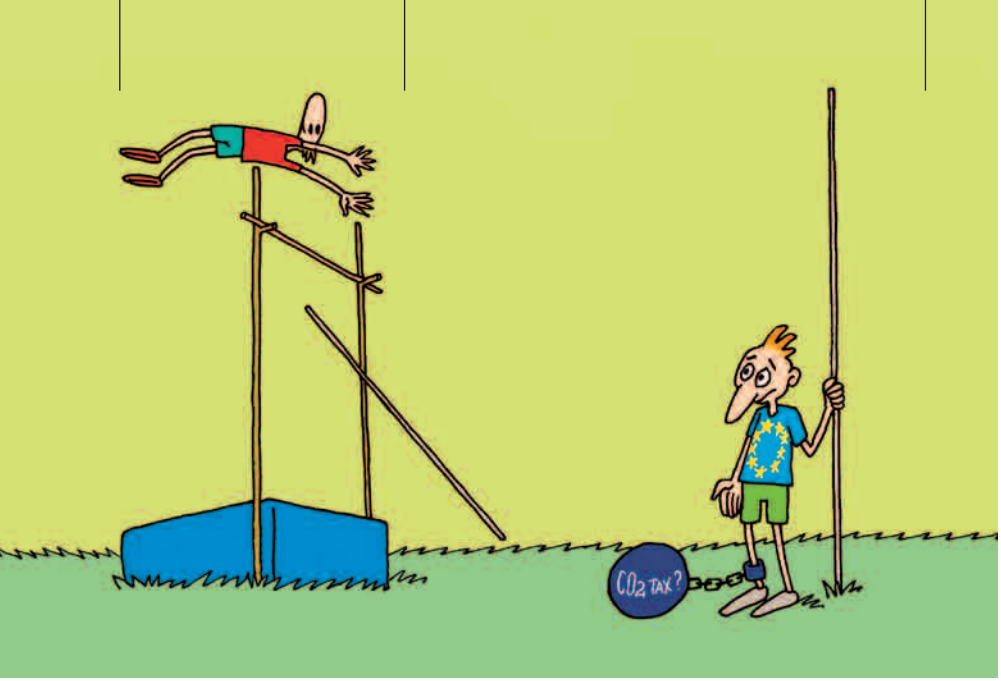
Euro Chlor advocated that electro-intensive industries which are indirectly impacted by the cost-pass through of CO_2 in the price of electricity should get access to appropriate mitigating measures in order to protect them from the risk of carbon leakage. This was taken on board in the final negotiations between the Council and European Parliament.

For the chlor-alkali industry, the most important aspect of the adopted legislation is the provision allowing Member States to provide financial compensation for additional costs of CO_2 passed through in electricity prices. The financial compensation will be based on ex-ante benchmarks of the indirect emissions of CO_2 per unit of production. Euro Chlor has commissioned a consultant to quantify the direct and indirect CO_2 emissions of the electrolysis process related to the consumption of electricity and steam. For the chlor-alkali industry the benchmark for electricity consumption will be determined for membrane technology which is recognised as the most efficient available technology. The setting up of the measures will fall under the competences of the Commission who will decide on the rules by latest 31 December 2010. Euro Chlor has expressed its willingness to the Commission to contribute to this work.

Euro Chlor also takes part in the discussions on identification of sectors exposed to significant risk of carbon leakage. This is one of the issues that have to be resolved by the Commission by latest 31 December 2009, through the so-called comitology procedure. The directive identifies an exposed sector according to the criteria: 5% CO_2 cost/GVA (gross value added) + 10% non EU trade intensity or 30% CO_2 cost/GVA or 30% trade intensity. Euro Chlor has given input to the Commission to demonstrate that the chlor-alkali sector should be recognised as an exposed sector. At the Stakeholder meetings organised by the Commission, the results of the work to identify these sectors show that the sector to which the chlor-alkali industry belongs (basic inorganic chemicals NACE 2413) does qualify as a sector exposed to carbon leakage. It is, however, not yet confirmed that the above mentioned exposed sector criteria for direct emitters will also apply to the identification of sectors exposed to carbon leakage due CO_2 cost pass through in the electricity price (indirect emitters).

In addition to the Commission's assessment, Euro Chlor has commissioned a qualitative study to demonstrate the exposure of the chlor-alkali sector on its own. This study confirms that the chlor-alkali industry is a sector significantly exposed to carbon leakage resulting from CO_2 costs passed through in the electricity price and trade intensity.

Working together on achieving efficient, balanced and workable legislation



Euro Chlor advocated that electro-intensive industries which are indirectly impacted by the cost passed through of CO_2 in the price of electricity should get access to appropriate mitigating measures

Update of the BAT document

As planned, the European Commission has started the review process of the document on Best Available Techniques (BAT) for the Chlor-Alkali Manufacturing Industry – the so-called BREF. The BREF provides guidance to national governments, industry and stakeholders on the best technologies and practices for the manufacturing of chlor-alkalis including the setting of associated emission and energy consumption levels that can be achieved by applying BAT. The BREF guidance has to be taken into account in the plant permitting process under the IPPC directive.

The original BREF document was adopted in 2000 to which Euro Chlor had successfully contributed. Euro Chlor has for the current update been accepted as member of the Technical Working Group (TWG) in charge of the revision and a small group of members of the General Technical Committee and Regulatory Affairs Committee have been officially accepted as members of the TWG. At the request of the European Commission, national governments and other stakeholders were also invited to send in their views ("wishes") on the items that should be subject to review and inclusion in the new BREF.

Euro Chlor has established an Ad Hoc Task Force in order to prepare viewpoints and positions and to provide assistance to the team that will effectively take part in the update process. Euro Chlor submitted 8 items covering decommissioning of idle chlor-alkali plants, conversion costs, best techniques for mercury and asbestos diaphragm plants, KOH units, energy consumption and emissions data. In total, 134 wishes were submitted from all parties interested. The first official meeting of the TWG with governments, other stakeholders and industry will likely take place in October 2009. The whole revision process will take about two years.

"We congratulate Euro Chlor for this proactive initiative which will ensure that several thousand tonnes of mercury will be taken out of circulation and safely stored away. This voluntary agreement is an excellent example of how industry can take an active role in helping implement important environmental legislation that will protect the health of European citizens and the environment."

European Commissioner Stavros Dimas

EU mercury regulation on export ban and storage obligation

On September 25, 2008, the European Council adopted the legislation banning all exports of mercury from the European Union and providing for safe underground storage of mercury from the chlor-alkali sector. Once the export ban takes effect on 15 March 2011, surplus liquid mercury from decommissioned chlorine plants will be transported to its final destination in approved sealed steel containers and stored in deep underground salt mines. Such mines typically have no humidity, an environment which excludes corrosion and assures a sound, final disposal. Euro Chlor considers this an environmentally sound option which can be accomplished at an acceptable cost.

However, before such storage can be done the Commission will develop the specific technical criteria to be met by storage companies, along with safety measures to be observed at the sites. This work will have to be finalised by 1 January 2010. For this purpose the Commission has appointed a consultant who will prepare a study which will be presented at a stakeholders meeting during autumn 2009. Euro Chlor will be consulted to share its experience in handling and storage of mercury.

Voluntary agreement on safe mercury storage acknowledged

Euro Chlor welcomed the official recognition by the European Commission on 22 December 2008 of the voluntary agreement of the chlorine producers to ensure the safe disposal of mercury no longer used in the industry. This voluntary agreement is complementary to the EU Mercury Storage Regulation and enters into force on the same date - 15 March 2011. The agreement stipulates that the signatories will use utmost care in selecting storage facilities, sets safe handling and storage requirements and describes the annual information that should be provided to the European Commission.

A powerful painkiller may be developed based on highly toxic chlorinated substances found on some tropical frog's skins

Environment Commissioner Stavros Dimas said: "We congratulate Euro Chlor for this proactive initiative which will ensure that several thousand tonnes of mercury will be taken out of circulation and safely stored away. This voluntary agreement is an excellent example of how industry can take an active role in helping implement important environmental legislation that will protect the health of European citizens and the environment." This is the first voluntary industry agreement to be formally recognised by a Commission Recommendation since the adoption of a Communication on environmental agreements in 2002.

POPs/PBT substances

At the May 2009 COP-4 (Conference of the Parties) meeting in Geneva, nine substances were agreed for addition to Annexes A, B and/or C of the Stockholm Convention. Alpha-HCH, Beta-HCH, Hexabromobiphenyl, Chlodecone, Pentachlorobenzene (PeCB), Perfluorooctanyl Sulfonate (PFOS), commercial Pentabromodiphenyl ether (PentaBDE), commercial Octabromodiphenyl ether (OctaBDE) and Lindane. The negotiations were extremely difficult and many developing country parties sent a strong signal to donors to increase the amount of funding available to POPs. The need for resources and implementation activities is also linked to the topic of non-compliance. This aspect was debated at lenght but not concluded. It was postponed for further discussion at COP-5.

Dichloromethane restriction

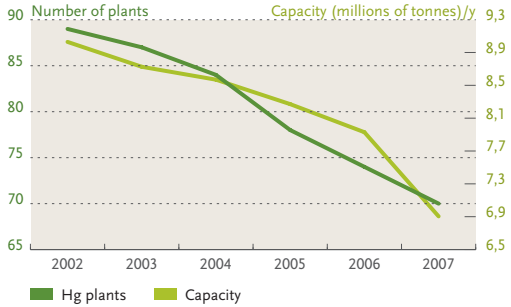
The Council adopted the decision on restricting the marketing and use of dichloromethane as paint stripper in the internal market with a ban on use by consumers and a general ban on use by professionals operating outside industrial premises. However, Member States can opt to allow further use for certain activities by specifically trained professionals under certain strict conditions (derogations).

ECSA is preparing for derogations in certain member states and seeking partnership with the relevant stakeholders before the proposed restrictions apply. For industrial use of paint strippers, an increase in protection of workers is required.

The timeline as such started after publication in the Official Journal on June 6, 2009: paint-strippers containing dichloromethane (DCM) in a concentration equal to or greater than 0.1% by mass shall not be placed on the market for the first time after 18 months after the entry into force for supply to the general public or to professionals. Furthermore, they shall not be supplied to them after 30 months after the entry into force and shall not be used by professionals 36 month after entry into force. Member states will be able to allow further use of DCM by approved professionals.

The World chlorine Council reported to the United Nations Global Mercury Programme on the progress made by the chlor-alkali sector in reducing the use and the emissions of mercury

WCC-chlor-alkali Industry / Number of plants and capacity of mercury electrolysis units (in USA/Canada, Europe, Russia, India and Brazil/Argentina/Uruguay)



WCC-chlor-alkali Industry / Total mercury emissions (air + water + products) (for USA/Canada, Europe, India and Brazil/ Argentina plus 1 Uruguayan and 3 Russian plants from 2005 onwards)

UNEP decides on Global Convention on Mercury

At the UNEP Governing Council/Ministerial Forum convened on February 16-20, 2009 a decision was reached to establish an international convention to deal with mercury pollution which should include both binding and voluntary measures. The details of the new convention will be negotiated over the next 3 years and will be completed by 2013.

The UNEP meeting also decided on the provisions for the future mercury convention. The requirements that will be applicable to the chlor-alkali industry and VCM production are on reduction of emissions, measures on use and trade of mercury and addressing mercury-containing waste.

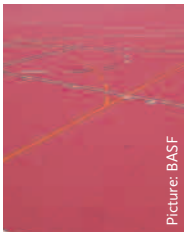
The UNEP Partnership for the chlor-alkali industry continues under the US government lead. WCC is an active partner in this program. The following positive results were reported to UNEP by WCC:

- The number of plants and the mercury cell-based production capacity show a worldwide decrease: the number of plants went down from 89 to 70 over the period 2002-2007 (-18 %) and the mercury cell-based capacity from 8.6 million tonnes to 6.9 million tonnes (-20 %).
- Global mercury emissions have been further substantially reduced in the period 2002-2007. As a matter of fact, they went down from 23.3 tonnes/year to about 8.4 tonnes, a 64 % decrease over the six years of reporting by WCC. The emissions, expressed in g/tonne annual capacity show the same trend.

04 Communication & education

Transparency enhances credibility

The Chlor-Alkali sector has based its reputation management on providing timely and reliable information. No slogans, but correct and credible facts.
Euro Chlor endeavours to continue this open and transparent communication with stakeholders at European and international levels to contribute to balanced and workable legislation. All stakeholders, such as academia and the public at large are systematically informed of the newest scientific findings in areas connected to our activities.



Picture: BASF

Polyurethane is an outstanding material for the coating of multifunctional sports courts

Listen, look and respond

The European chlor-alkali sector's approach is coupled with a willingness to listen, and take voluntary measures to address concerns. It is inevitable that chlorine will be associated with emerging and future issues, precisely because it is such a major building block of the broader chemical industry. Accordingly, the provision of sound scientific information continues to be an essential element of Euro Chlor activities.

Within this strategy, a fresh impetus has been given to press relations and communication to the public at large. Euro Chlor has systematically expressed its views and comments on important issues. The website has been updated continuously and a fully renewed version is currently being prepared.

New Corporate Identity for Euro Chlor

In co-operation with a graphic designer, a new corporate identity for Euro Chlor has been developed. The purpose of this action was not just to modernise the way Euro Chlor presents itself to its public audiences. Its sobriety and coherency should strengthen the positioning of the federation as a solid, reliable partner in the issues and dossiers it is handling with stakeholders.

The simple but contemporary style details comprise the use of two basic colours, green (chlorine!) and blue (symbolising clean water and air) and modern style elements are integrated in the design. The well-known Euro Chlor logo, however, will remain unchanged.

A perfect harmony between green (chlorine) and blue (air, water) characterises the new Euro Chlor Corporate Design

The general communications strategy is also characterised by a more efficient use of resources, by minimising print communication and maximising electronic tools as well as an enhanced subsidiarity between Euro Chlor and its member companies. Several communication instruments will be put at their disposal in English, but can easily be translated making use of the templates which will be available to them.

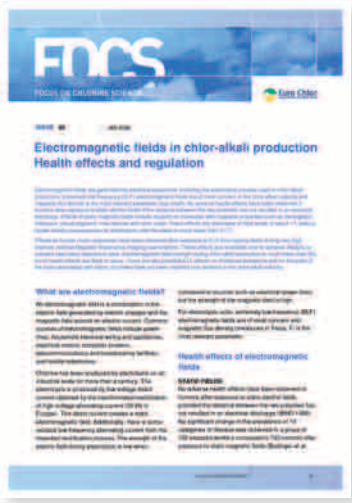
Science Dossiers

Euro Chlor continues to expand its library of Science Dossiers, developped by reputable university departments and scientists. These Dossiers aim to provide the scientific community and other stakeholders with reliable information on a broad range of chlorine related issues. The scope is wide, ranging from dioxins in the environment to the biodegradability of chlorinated compounds. Recent Science Dossiers have been published on CD-ROM and can be consulted on the Euro Chlor website.

The Swedish Environmental Institute IVL has prepared *The origin and fate of mercury species in the environment*. Another Science Dossier by the Norwegian Jon Efskind, MD, dealt with *Metallic Mercury (Hg^0) – The biological effects of long-time, low to moderate exposures.*

Euro Chlor Science Dossiers provide reliable scientific information on a broad range of chlorine related issues

Theleafl ets "Focus on Chlorine Science" facilitate the knowledge gathering of scientists, regulators and decision makers



Focus on Chlorine Science

The series of Focus on Chlorine Science (FOCS) leaflets aims to clarify and consolidate scientific research in chlorine chemistry, facilitating the knowledge gathering of scientists, regulators and key decision makers. It has been expanded by a publication on *Chlorinated swimming pools and respiratory health*, summarising the conclusions of the scientific workshop which Euro Chlor and the American Chemistry Council organised in 2007. Euro Chlor also published a new FOCS dedicated to EMF: *Electromagnetic fields in chlor-alkali production – Health effects and regulation.* It summarises the currently available scientific information on exposure to EMF studies, selecting particularly those related to the type of fields present in electrolysis units.

The Euro Chlor Annual Science Newsletter, published in May 2009, summarises the scientific communications and publications produced over the past year. It is distributed to a very large audience, including regulators.

Chlorine Online

During 2008, Euro Chlor received nearly 230 chlorine information requests from 37 countries through the federation's Internet website, Chlorine Online. The Top 5 "visiting" countries were UK (56), Germany (38), Italy (17), France (16) and Switzerland (15). The requests primarily concern health, safety and the environmental aspects of chlorine production and use.

Risk assessment of POPs

Researchers under the leadership of Dr. Pim Leonards of the Free University of Amsterdam (Institute of Environmental Studies) were sponsored by Euro Chlor to review the scientific literature to collate and critically evaluate published methodologies to assess the risks of POPs. The resulting paper, *'Assessing the Risks of Persistent Organic Pollutants to Top Predators: A Review of Approaches'* was published in the peer-reviewed Journal *Integrated Environmental Assessment and Management* (Vol. 4, 4, pp. 386–398, 2008). This review constructively demonstrates how to carry out risk assessments of POPs with acceptable uncertainty. This supports a risk-based evaluation of such substances, which has been consistently advocated by Euro Chlor and the World Chlorine Council.

SETAC - Transparency and factual information from industry

Euro Chlor is a sustaining member of SETAC Europe, the European branch of the Society of Ecotoxicology and Applied Chemistry, to engage in the environmental health debate, to monitor emerging issues related to chemicals and to distribute our science material to the audience of scientists from government, academia and industry. SETAC Europe held its Annual Congress from May 31 until June 4, 2009 in Göteborg, Sweden. Many of the 1600 attendees called into the Euro Chlor booth or picked up science material. This puts into practice Euro Chlor's vision of building credibility and transparency of the chlor-alkali sector through providing factual and reliable information to support science-based decision-making.

05 Science

Effective advocacy with a sound scientific basis

Euro Chlor continues to use its scientific expertise to advocate sound, science-based regulatory decision-making. Key activities in 2008-2009 have been built on the major issues of recent years, including the launch of the REACH consortia for all concerned chemicals, improving risk assessment methodology for POPs, compiling EU registration dossiers for chlorine-based biocides, investigating possible health effects of chlorinated swimming pools and updating recommendations on minimizing workplace exposure to mercury and chlorine.

Many medical applications rely on chlorine-based materials, such as PVC

ReachLink

REACH: consortia organised

Within the general framework of the REACH legislation on the environmental safety and health effects of expectedly some 30,000 chemicals, Euro Chlor has been working intensively on the establishment of Consortia, grouping companies that manufacture and/or import the same substance. All consortia that Euro Chlor Members intended to organise have been formed. Substances covered are: caustic soda, chlorine, ethylene dichloride, hydrogen chloride, perchloroethylene, potassium carbonate, potassium hydroxide, sodium hypochlorite. The chlorinated solvents consortium covers the five substances tetrachloroethylene, trichloroethylene, chloroform, carbon tetrachloride and dichloromethane. All consortia are managed by Euro Chlor working under the umbrella of ReachCentrum.

A lead company for every substance has been identified which will also be the SIEF facilitator (Substance Information Exchange Forum) and lead registrant for a joint submission of the dossier. Contacts with the SIEF participants are ongoing.

The chlorinated paraffins (medium-chain chlorinated paraffins, long-chain chlorinated paraffins and sulpho-chlorinated paraffins) are managed separately by a consultant.

For all consortia external consultants have been contracted to support the preparation of the dossier. In addition to a full dossier covering all uses, subgroups within some consortia will also prepare a limited dossier for intermediate use only. Several dossiers will strongly rely on "waiving", i.e. demonstrating on a scientific basis that certain tests are not needed. In some cases, chemicals can be compared to similarly structured chemicals for which a proper study exists or exposure information can be used to justify no testing.

ReachLink

The preparatory work included contacting all SIEF participants using SIEFreach®, the robust IT platform developed by the company ReachLink to facilitate SIEF management. Major companies in the chemical industry participated in the development of this SIEFreach® platform, developed by industry for industry.

The first platform under SIEFreach® allows to share information with SIEF participants, including an automatic evaluation whether the SIEF participants are willing to register. For that purpose the SIEF participants fill in a questionnaire which is evaluated by SIEFreach®. Companies are sorted in the categories "dormant", "passive", "active" or "leading". The "active" and "leading" companies are working together in consortia. "Dormant" companies will probably not need to introduce a dossier, but can become "passive" and buy access to the dossier if appropriate. The SIEFreach® platform has been used by Euro Chlor consortia.

Mercury and REACH

For the use of mercury in the chlor-alkali industry REACH constitutes a special case.
As a sector, we are neither a producer nor an importer of mercury which means that there is no legal obligation to register the substance. But being a user we should ensure that "someone" registers mercury. This is why Euro Chlor is discussing the matter with a recycling company that is willing to take the leadership on the preparation of a dossier. Euro Chlor intends to actively participate because we have gathered considerable knowledge on risk assessments for mercury use in the chlor-alkali production. This knowledge comprises the environmental impact in the plant's neighbourhood and workers' health. We expect that the registration dossier will be ready on time by December 2010.

Sodium chloride is a special and still pending case in this debate. This natural chemical can also be man-made which makes registration necessary. Euro Chlor is helping in finding a leading company.

Classification and labelling

For sodium hypochlorite, classification and labelling is under revision. In the new EU Regulation on Classification, Labelling and Packaging of Substances and Mixtures (EC 1272/2008) (CLP) that came into force in January 2009, it had to be classified and labelled as "Dangerous to the Environment". It was decided that further testing was required to realistically assess the toxicity of sodium hypochlorite solutions to aquatic species and a new acute toxicity study on water flea (Daphnia magna) was commissioned. The new data is considered to be more reliable than previous data from toxicity studies. This new result, combined with other available data, shows that invertebrates and fish are equally sensitive to sodium hypochlorite. It allows one to conclude, based on the weight of evidence, that the acute toxicity of sodium hypochlorite to freshwater species lies in the range: $10 < L(E)C50 \leq 100$ ◂g/l. If classification is based on the calculation method, solutions of ≥ 2.5% active chlorine will need to be classified as "Dangerous to the Environment".

Substances of very high concern

Substances of very high concern should be the subject of authorisation and be substituted when a suitable alternative is available.
The first list of proposed substances of very high concern was issued in 2008 and contains 15 chemicals, including short chain chlorinated paraffins.

The Member State Committee of the European Chemicals Agency (ECHA) adopted an opinion sharing the ECHA Secretariat's view that seven substances of very high concern should be included in the so-called Authorisation List. The substances are: musk xylene, MDA (4,4-diaminodiphenylmethane),h exabromocyclododecane (HBCDD), bis(2-ethylhexyl) phthalate (DEHP), dibutylphthalate (DBP), benzylbutylphthalate (BBP) and short chain chlorinated paraffins.

Euro Chlor will follow this matter closely, because it will be the "guinea pig" case for the authorisation of chemicals.

Short Chain Chlorinated Paraffins

Evaluation of short chain chlorinated paraffins (SCCPs) by UNECE (United Nations Economic Commission for Europe) and by the UNEP Stockholm Convention made little progress. The Persistent Organic Pollutants Review Committee decided to revisit the risk profile of SCCP again in October 2009. In particular China and India had major comments on the risk profile. The UNECE Working Group on Strategies and Review is still considering three management options for SCCPs, which are a total ban, a ban with exceptions for application in conveyor belts for mines and dam sealants (as proposed by Parcom Decision 95/1), or a limited ban for metalworking fluids and leather fat liquors. The latter option would be consistent with the Directive resulting from the EU Risk Assessment. This option would be supported by Euro Chlor, although it is not likely to be accepted by the UNECE Working Group.

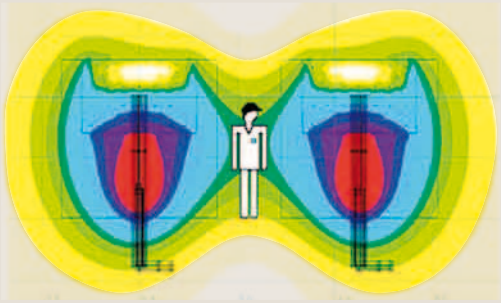
Although earlier tests indicated a low bioaccumulation potential for MCCPs, Euro Chlor has agreed to carry out additional testing with a C14 substance for which the UK rapporteur expressed some doubt. The test is expected to be finalised before the end of 2009. The study will be important to assess if MCCPs fulfill the PBT criteria or not.

Biocides

An ongoing issue within Euro Chlor is the registration of sodium hypochlorite, calcium hypochlorite and chlorine under the Biocidal Products Directive (BPD) 98/8/EC. The original dossiers for the three active substances were submitted in July 2007. The completeness check was received from the Rapporteur Member State and with some modifications the dossiers were accepted as complete and entered the evaluation process. It is hoped that the first evaluation will be done by mid 2009.

In October 2008 a second set of dossiers for the three substances were submitted, to take into account specific uses identified, in particular as preservatives for liquid cooling systems and slimicides. The completeness check is currently underway, and it is likely that these dossiers will enter the evaluation phase for these uses by mid 2009.

An ad hoc Euro Chlor working group finalised the update of its code of practice for occupational Electromagnetic Fields in line with the EU Directive on the matter



Occupational health high on the agenda

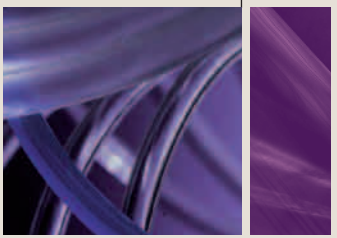
The occupational health issue is still high on the members' agendas. Together with the Occupational Health working group, Euro Chlor finalised revised Codes of Good Practice on chlorine and mercury and aligned them with the proposed self-audit questionnaires. Illustrated training sets are being developed in order to support these codes of good practice. Euro Chlor is committed to continue the collection of urinary mercury data and to propose recommendations to reduce workers exposure to mercury. After several years without noticeable improvement, the year 2008 showed a decrease in the Euro Chlor average figures. With a view to further improve the mercury levels in urine a questionnaire has again been sent to the membership.

Workers' exposure to electromagnetic fields (EMF)

After strong pressure from industry and some national authorities, the application of the European directive to protect workers against the effects of electromagnetic fields was postponed for 4 years (till April 2012), giving time for a complete impact assessment of the Directive and for a possible update of the proposed limits, using the latest information available.

The guideline for the application of the Directive was temporarily put on hold, waiting for the finalisation of the current work to update the directive. The working party assisting the Commission, in which Euro Chlor is actively participating, was then charged to continue its work in the frame of the directive impact assessment and to propose practical ways to update the directive. In parallel an industry task force within BusinessEurope has been created, with Euro Chlor participation, to make constructive proposals for the Directive improvement.

In spite of these delays, the ad hoc Euro Chlor working group finalised the update of its code of practice for occupational EMF in line with the EU Occupational Electromagnetic Fields Directive (2004). In this document we propose to use, for the measurements, the method described in the draft Cenelec (European Committee for Electrotechnical Standardisation) standard that is still in development, based on proposals from our working group.



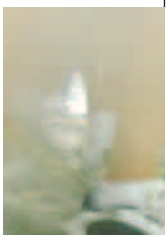
Belgian Astronaut Frank De Winne (ESA), launched to the ISS in June 2009, wears a space suit and helmet produced from materials based on chlorine chemistry

Picture: ESA - STAR CITY

06 Industry overview

Chlorine production remained high

European chlorine production in 2008 was just below the record high of 2007, although the fourth quarter showed a considerable decrease as a result of the economic and financial crisis. Demand for chlorine's essential co-product, caustic soda, remained robust. The situation was less favourable for chlorinated solvents.



European chlorine production (10.4 million tonnes in 2008) was 2.4% down on the 10.7 million tonnes produced in 2007. Capacity utilisation rates in 2008 averaged 79.8% compared with 84.5% in 2007.

Germany remained Europe's largest chlorine producer in 2008, accounting for 42.6% of European production, followed by Belgium/The Netherlands with 13.9%. The UK/Austria/Switzerland/Finland/Norway/Sweden group with 12.0% was the third highest, with France at 11.7% a close fourth. These top four regions accounted together for 80.2% of total 2008 European chlorine production.

Demand for caustic soda remained strong for the third consecutive year, resulting in overall average monthly stock levels below the 300,000 tonne mark.

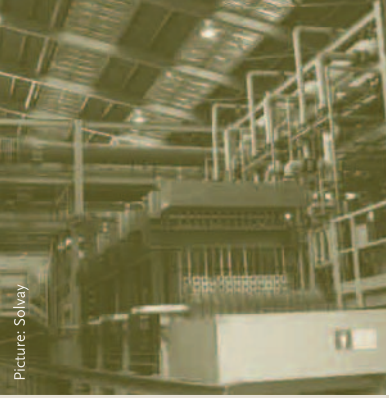
The chlor-alkali sector's strong performance further confirms that chlorine and its co-product caustic soda are key building chemical blocks for a wide range of products and processes.

The market demand for chlorinated solvents went down in the second half of 2008 under the influence of the economic crisis. Sales of dichloromethane and perchloroethylene dropped equally by 15% compared with 2007. Trichloroethylene sales continued to decline as a result of the more stringent carcinogenicity classification introduced since 2002.

Chlorine and caustic soda are produced by electrolysis using three main technologies – mercury, diaphragm and membrane. Ten years ago, the mercury technology accounted for more than 60% of European capacity. In 2008, it represented about 34% while the more energy-efficient membrane process has reached almost half of the European installed capacity. This continues the gradual shift away from mercury cells as committed by European industry to close or convert such plants to non-mercury technology by 2020 (except for production of a few speciality chemicals).

In the second half of 2008 and at the beginning of 2009 six mercury units shut down or reduced their activity in several countries. In Italy, Caffaro stopped a mercury plant (68,000 tonnes/year) in Torviscosa, Eredi Zarelli did likewise with the small plant of Piscinisco (6,000 tonnes/year) and Solvay shut down the Bussi mercury unit (87,000 tonnes/year) to convert it partially to the membrane technology. In UK, INEOS also shut down a mercury cell room (150,000 tonnes/year) in Runcorn, like Tarnow did in Poland with its only site (43,000 tonnes/year). In Germany, Vinnolit reduced its mercury capacity (minus 60,000 tonnes/year in Knapsack) and started a new membrane unit in Gendorf.

Today there are about 8,300 tonnes of mercury remaining in 37 mercury-based plants in 14 European countries.

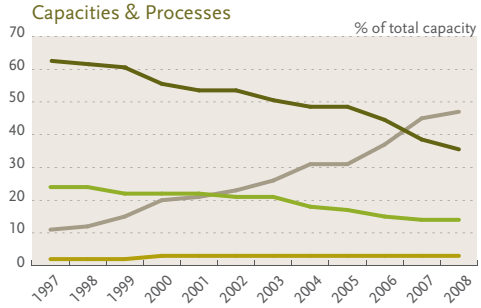


Picture: Solvay

Mercury
Membrane
Diaphragm
Other

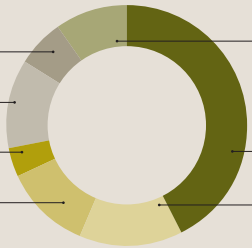
Visually and chemically a chlor-alkali electrolysis plant differs considerably from a "traditional" chemical installation

Capacities & Processes



European Chlorine production in 2008

10,440 kilotonnes



Poland+Hungary+Czech Republic+ Slovak Republic+Romania 1,003 kt (9.6%)

UK+Finland+Sweden+Austria+Norway+Switzerland 1,252 kt (12.0%)

Italy 392 kt (3.8%)

France 1,221 kt (11.7%)

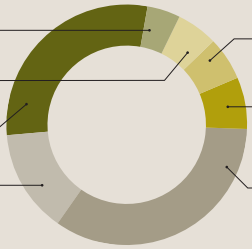
Spain+Portugal+Greece 672 kt (6.4%)

Germany 4,447 kt (42.6%)

Belgium+theN etherlands 1,456 kt (13.9%)

European chlorine applications in 2008

10,460 kilotonnes



Solvents 495 kt (4.7%)
Metal degreasing, adhesives, dry cleaning, plastics

Epichlorohydrin 561 kt (5.4%)
Pesticides, epoxy resins, printed circuits, sports boats, fishing rods

Isocyanates & Oxygenates 3,048 kt (29.1%)
Uphlostery, insulation, footwear, plastics, pesticides, car paints

Inorganics 1,429 kt (13.7%)
Disinfectants, water treatment, paint pigments

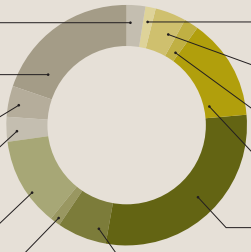
Chloromethanes 616 kt (5.9%)
Silicon rubbers, decaffeinators, Teflon®, paint strippers, cosmetics

Other Organics 730 kt (7.0%)
Detergents, ship & bridge paints, lubricants, wallpaper adhesives, herbicides, insecticides

PVC 3,579 kt (34.2%)
Doors and window frames, pipes, flooring, medical supplies, clothing

European caustic soda applications 2008

9,920 kilotonnes



Soaps 272 kt (2.7%)
Shampoos, cosmetics, cleaning agents

Miscellaneous 1,953 kt (19.7%)
Neutralisation of acids, gas scrubbing, pharmaceuticals, rubber recycling

Bleach 413 kt (4.2%)
Textiles, disinfectants

Food industries 322 kt (3.2%)
Fruit and vegetable peelings, ice cream, thickeners, wrappings

Pulp, paper, cellulose 1,197 kt (12.1%)
Adhesives, heat transfer printing, newspapers, books

Mineral oils 121 kt (1.2%)
Greases, fuel additives

Rayon 120 kt (1.2%)
Bedspreads, surgical dressings

Water treatment 402 kt (4.1%)
Flocculation of waste, acidity control

Phosphates 201 kt (2.0%)
Detergents

Other inorganics 1,351 kt (13.6%)
Paints, glass, ceramics, fuel cells, perfumes

Organics 2,910 kt (29.3%)
Artificial arteries, parachutes, pen tips, telephones

Aluminium and metals 659 kt (6.6%)
Greenhouses, car and airplane panels, steel hardening

High tech sports shoes provide remarkable mechanical properties thanks to the use of polyurethane

Chlorinated solvents market not exempted from the current economic climate

Sales of the chlorinated solvents Perchloroethylene and Dichloromethane totalled 154,000 tonnes last year, an average drop of 15% compared with the previous year (182,000 tonnes). The chlorinated solvents market went down primarily in the second half of 2008 under the grip of the economic crisis.

European sales of **Perchloroethylene** (PER) by ECSA member companies last year dropped to 44,000 tonnes (2007: 52,000 tonnes). Despite the influence of the current economic situation, PER remains the solvent of choice for dry-cleaning and continues to gain market share as a substitute for TRI in metal degreasing.

Dichloromethane (DCM) sales dropped in 2008 to 110,000 tonnes compared to 130,000 tonnes in 2007. DCM is the most widely-used of the chlorinated solvents, especially in the pharmaceutical industry. The percentage of the decrease in DCM sales (15% compared to the previous year) is equal to PER and reflects the economic situation in the second half of 2008.

The absolute sales of **Trichloroethylene** (TRI) can no longer be reported according to Cefic statistics rules requiring that at least 3 companies are participating. Two producers were left in Western Europe in 2008: Dow Europe and INEOS Chlor. INEOS Chlor already announced it was stopping production of TRI and PER beginning of 2009. The decline of trichloroethylene (TRI) sales continued after the more stringent carcinogenicity classification for TRI introduced in 2002. The ECSA Members and the Romanian producer Chimcomplex Borzesti have taken further steps to ensure safe use in metal degreasing by stopping supplies of TRI to companies that are not equipped with closed systems after 2010.

07 Chlorine production plants

January 2009

Providing safe and healthy drinking and swimming water is the best-known application of chlorine chemistry

COUNTRY	*	COMPANY	SITE	PROCESS	CAPACITY (000 tonnes)
Austria	1	Donau Chemie	Brückl	M	70
Belgium	3	SolVin	Antwerp	Hg, M	474
	4	SolVin	Jemeppe	M	174
	5	Tessenderlo Chemie	Tessenderlo	Hg, M	400
Bulgaria	*90*	*Polimeri*	*Devnya*	*D*	*124*
Czech Rep.	6	Spolana	Neratovice	Hg	135
	7	Spolchemie	Usti	Hg	61
Finland	8	AkzoNobel	Oulu	Hg	43
	9	Finnish Chemicals	Joutseno	M	75
France	10	PPChemicals	Thann	Hg	72
	11	Perstorp	Pont de Claix	D	170
	12	Arkema	Fos	D, M	310
	13	Arkema	Jarrie	Hg	170
	14	Arkema	Lavera	Hg, D	350
	15	Arkema	Saint Auban	M	20
	16	MSSA	Pomblières	Na	42
	17	Prod. Chim. d'Harbonnières	Harbonnières	Hg	23
	18	Solvay	Tavaux	Hg, M	375
	19	Tessenderlo Chemie	Loos	Hg	18
Germany	20	BASF	Ludwigshafen	Hg, M	385
	21	Bayer	Dormagen	M, HCl	480
	22	Bayer	Leverkusen	M, HCl	360
	23	Bayer	Uerdingen	Hg, M	240
	24	Bayer	Brunsbuttel	HCl	210
	25	Dow	Schkopau	M	250
	26	Vinnolit	Knapsack	Hg, M	250
	27	CABB	Gersthofen	M	40
	28	Dow	Stade	D, M	1585
	29	AkzoNobel	Ibbenbüren	Hg	125
	30	AkzoNobel	Bitterfeld	M	88
	31	Evonik Degussa	Lülsdorf	Hg	136
	32	Ineos ChlorVinyls	Wilhelmshaven	Hg	149
	33	AkzoNobel	Frankfurt	Hg	167
	34	Solvay	Rheinberg	D, M	200
	35	Vestolit	Marl	M	260
	36	Vinnolit	Gendorf	Hg	172
	37	*Wacker Chemie*	*Burghausen*	*M*	*50*
Greece	38	Hellenic Petroleum	Thessaloniki	Hg	40
Hungary	39	BorsodChem	Kazincbarcika	Hg, M	299
Ireland	*40*	*MicroBio*	*Fermoy*	*M*	*6*
Italy	41	Altair Chimica	Volterra	M	27
	42	Solvay	Bussi	M	25
	44	Syndial	Assemini/Cagliari	M	153
	45	Syndial	Porto Maghera	Hg	200
	49	Solvay	Rosignano	M	150
	50	Tessenderlo Chemie	Pieve Vergonte	Hg	42
Netherlands	51	AkzoNobel	Botlek	M	633
	52	AkzoNobel	Delfzijl	M	109
	54	*SABIC GE Plastics*	*Bergen-op-Zoom*	*M*	*89*
Norway	55	Borregaard	Sarpsborg	M	45
	56	Elkem	Bremanger	M	10
	57	Ineos ChlorVinyls	Rafnes	M	260
Poland	58	Rokita	Brzeg Dolny	Hg	125
	59	Zachem	Bydgoszcz	D	60
	60	Anwil	Wloclawek	M	214
Portugal	61	Solvay	Povoa	M	29
	62	CUF Quimicos Industriais	Estarreja	M	68
Romania	91	Oltchim	Ramnicu Valcea	Hg, M	260
	92	*ChimComplex*	*Borzesti*	*M*	*107*
Slovak Rep.	63	Novácke Chemické Závody	Nováky	Hg	76
Slovenia	*88*	*TKI Hrastnik*	*Hrastnik*	*M*	*15*
Spain	64	Ercros	Huelva	Hg	101
	65	Ercros	Sabinanigo	Hg	25
	66	Ercros	Vilaseca	Hg, M	190
	67	Electroquímica de Hernani	Hernani	M	15
	68	ELNOSA	Lourizan	Hg	34
	69	Ercros	Flix	Hg	150
	70	Química del Cinca	Monzon	Hg	31
	71	SolVin	Martorell	Hg	218
	72	Solvay	Torrelavega	Hg	63
Sweden	74	AkzoNobel	Skoghall	M	95
	75	Ineos ChlorVinyls	Stenungsund	Hg	120
Switzerland	77	SF-Chem	Pratteln	Hg	27
	89	Borregaard	Atisholtz	M	10
UK	82	Ineos ChlorVinyls	Runcorn	Hg, M	746
	85	Albion Chemicals**	Thetford	M	7
TOTAL					13127
			Non members		302
			Members		12825

* Number on map
** Changed name to Brenntag U.K. & Ireland on 1 March 2009

Process: Hg: Mercury M: Membrane D: Diaphragm HCl: Electrolysis of HCl to Cl_2 Na: molten salt electrolysis / Company names in italics are not Euro Chlor members

08 Euro Chlor

Regulatory and HSE focal point

Euro Chlor represents the interests of 98% of chlor-alkali producers in the EU-27 and the EFTA regions with the EU institutions and international authorities. It also provides a focal point for members to share best practices on health, safety and environment (HSE) matters as well as co-ordinate scientific and communications activities to improve understanding of chlorine chemistry.

Modern car headlights can be beautifully styled thanks to the plastic polycarbonate

In Europe, 37 producers members of Euro Chlor directly employ about 39,000 people at 69 manufacturing locations in 22 countries. However, almost 2,000,000 jobs are directly or indirectly related to chlorine and its co-product caustic soda when downstream activities are taken into consideration.

Apart from producers, Euro Chlor also has 40 Associate members and 45 Technical Correspondents. These include national chlorine associations and working groups, suppliers of equipment, materials and services as well as downstream users and producers outside Europe.

From offices in Brussels, Euro Chlor has also provided the Secretariat for the World Chlorine Council, a global network of national or regional organisations in more than 27 countries. WCC represents producers accounting for more than 80% of worldwide chlor-alkali production.

Euro Chlor was founded more than 50 years ago as a production-oriented technical organisation (called B.I.T.C.) but was restructured in 1989 in order to provide the sector with strengthened scientific, advocacy and communications capabilities. Since then, a strong focus has been placed on sound science coupled with continuous health, safety and environmental improvements complemented by open and transparent communication with key stakeholders.

Organisation

The 14 Secretariat staff employed at offices in Brussels represents seven nationalities (Belgian, British, Dutch, German, New Zealander, Italian and Swedish) and between them speak 9 languages.

Guidance and overall strategic direction is provided by the Management Committee and a few dozen committees and working groups provide specialist knowledge and support.

CHLORINE AND CAUSTIC SODA – KEY CHEMICAL BUILDING BLOCKS			
Adhesives	Ceramics	Fiber-glass	Lubricants
Advanced composites	Computers	Flame-proofing	Paints
Air bags	Cosmetics	Footballs	Paper
Antibiotics	Credit cards	Fungicides	Perfumes
Antifreeze	Detergents	Gaskets	Pharmaceuticals
Bleach	Disinfectants	Golf bags	Plastics
Blood bags	Drilling fluids	Greenhouses	Refrigerants
Brake fluids	Drinking water	Hairdryers	Roller blades
Bullet-resistant glass	Dry cleaning	Herbicides	Roofing
Bumpers	Dyestuffs	Inks	Safety belts
Car seats	Electronics	Insulation	Vitamins
Carpets	Explosives	Intravenous drips	Window frames ...
CDs and DVDs	Fertilizers	Lighting	... and much more.

Management Committee (22 June 2009)

Chairman: Fuhrmann, W	Akzo Nobel Industrial Chemicals
Amling, A	Bayer MaterialScience
Berges, J	Evonik Degussa
Constant, F	Solvay
García Brú, F	Ercros
Garrigue, F	Perstorp
Heroes, Y	Tessenderlo Chemie
Märkl, R	BASF
Pelzer, A	PCC Rokita
Procházka, M	Spolchemie
Roghmann, R	Dow
Russo, G	Syndial
Tane, C	INEOS ChlorVinyls
Träger, M	VESTOLIT
Tual, D	Arkema
Winhold, M	Vinnolit

Secretariat staff

Steel Alistair	Executive Director
Minne Françoise	Senior Assistant
Seys Arseen	Deputy Executive Director Environment & Regulatory Affairs Director WCC Managing Director
Andersson Caroline	Senior Counsellor Regulatory Affairs
Coppens Isabelle	Assistant
Garny Véronique	Science Director
van Wijk Dolf	Science Manager Chlorinated Paraffins Manager
Bertato Valentina	Science Manager
Presow Shaun	Science Counsellor
Paturiaux Virginie	Assistant
Debelle Jean-Pol	Technical & Safety Director
Peeters Chantal	Assistant
Marquardt Wolfgang	ECSA Manager
Clotman Dirk	Communications Manager

Committees and working groups

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

Advocacy & communications
- Regulatory Affairs Committee
- EU Advisory Group
- National Chlorine Associations WG
- Chlorine Communicators' Network

Product groups
- Chlorinated Paraffins Sector Group
- Potassium Group

European Chlorinated Solvent Association
- Management Committee
- Communication & Outreach WG
- General Technical WG
- Occupational & Environmental Health WG
- Product WG
- Sustainability WGs

Science
- Steering Committee
- Environmental WG
- Toxicology WG
- Risk Assessment ad hoc WGs
- Biocides Strategy Group
- Biocides Registration Groups
- REACH Project Team

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

Full Members

Akzo Nobel Industrial Chemicals
Altair Chimica
Anwil
Arkema
BASF
Bayer MaterialScience
Borregaard Industries
BorsodChem
CABB (Germany)
CABB (Switzerland)
CUF-Químicos Industriais
Donau Chemie
Dow Deutschland
Electroquímica de Hernani
Electroquímica del Noroeste (ELNOSA)
Ercros
Evonik Degussa
Finnish Chemicals
Hellenic Petroleum
INEOS ChlorVinyls Limited
MSSA
Novácke chemické závody
OLTCHIM
PCC Rokita
Perstorp
PPC
Produits Chimiques d'Harbonnières
Química del Cinca
Solvay
SolVin
SPOLANA
Spolchemie
Syndial
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Vinnolit
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Al Kout Industrial Projects Co.
Asociación Nacional de Electroquímica (ANE)
Angelini A.C.R.A.F.
AQUAGROUP
Arch Chemicals
Asahi Kasei Chemicals Corporation
Bochemie
Brenntag U.K. & Ireland
Chemieanlagenbau Chemnitz
Chemoform GmbH & Co.
Chlorine Engineers Corp.,
Chemicals Industries Association (CIA)
Colgate-Palmolive Europe
De Nora Tecnologie Elettrochimiche
ELAIS - Unilever Hellas
essenscia
Federchimica Assobase
GHC Gerling, Holz & Co. Handels
K + S
Leuna Tenside
LOMBARDA H
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Hungarian Chemical Industry Association (MAVESZ)
Nankai Chemical Industry Co.
NCP Chlorchem (PTY)
Nippon Soda
NOVACID
Polish Chamber of the Chemical Industry (PIPC)
The Swedish Plastics and Chemicals Federation (Plast- & Kemiföretagen)
Procter & Gamble Eurocor
Association of Chemical Industry of the Czech Republic (SCHP)
SGCI Chemie Pharma Schweiz
Sojitz Europe
Syndicat Halogènes & Dérivés (SHD)
Syngenta
Teijin Aramid
Tosoh Corporation
Uhde
Verband der Chemischen Industrie (VCI)
Vereniging van de Nederlandse Chemische Industrie (VNCI)
Waterchem

Technical Correspondents

AFC Energy
AGC Chemicals Europe
Aker Solutions
Alcan PMGE Pechiney Nederland
Applitek
Asahi Organic Chemicals Industry Co.
CAN-TECH
Chemtec
Conve & AVS
Coogee Chlor Alkali Pty
Crane Resistoflex
Cristal Global
Descote
Eramet
Eynard Robin
Garlock
GEA Messo
Georg Fischer RLS
H2Scan Corporation
Health and Safety Executive
ISGEC
Koruma Klor Alkali
Kronos Europe
Lubrizol Advanced Materials Europe
NedStack Fuel Cell Technology
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Occidental Chemical Belgium
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OUR COMMITMENT TO SUSTAINABILITY

Euro Chlor provides a focal point for the chlor-alkali industry's drive to achieve a sustainable future through economically and environmentally sound manufacture and use of its products. Based in Brussels, at the heart of the European Union, the federation works with national, European and international authorities to ensure that legislation affecting the industry is workable, efficient and effective.

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