THE EUROPEAN CHLOR-ALKALI INDUSTRY

Steps towards sustainable development

Progress Report

August 2007

Euro Chlor
representing the chlor-alkali industry

Foreword

The results of a half-way review of Euro Chlor's groundbreaking 2010 Sustainability Programme described in this publication show that several goals have already almost been achieved, such as those for energy consumption or process incidents and losses. However, in other areas, such as the number of lost-time injuries among contractors, companies will need to work harder to meet expectations.

Pioneering initiative

Euro Chlor's pioneering, long-term sustainability programme was the first such initiative to be launched within the European chemical industry in 2001. It represented an important step for the chlor-alkali sector in its strategy to improve performance and earn public trust by addressing the "triple bottom line" of environmental, social and economic issues.

The seeds of this strategy were in fact sown in 1995 when the industry undertook four voluntary initiatives. Over the following years, this resulted in the completion of a programme of 25 marine risk assessments for chlorinated substances; a 59% (1995-2006) reduction in manufacturing mercury emissions; development of recycling technologies by the PVC industry, which consumes about a third of chlorine manufactured in Europe, and improved technology transfer to East European producers.

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

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

From these commitments, 15 performance indicators were established and endorsed by the membership. These goals together with the industry's progress during the period 2001-06 are described in this document.

Brussels
August 30,

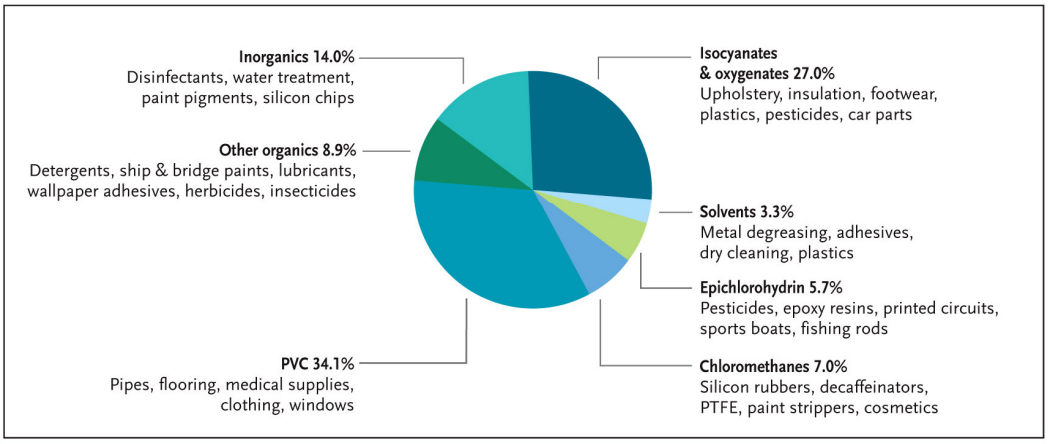
CONTRIBUTORS TO SUSTAINABILITY

Economic development

The chlor-alkali sector underpins more than €300,000 million of annual European chemical industry turnover. Chlorine and its co-product, caustic soda (sodium hydroxide), are essential to the production of a vast number of chemical products that are vital to society, underpinning more than half of all commercial chemistry applications. These products are used to create plastics, pharmaceuticals and thousands of other products.

The single biggest application for chlorine is the manufacture of polyvinyl chloride (PVC or vinyl plastic). More than half of the caustic soda manufactured is used in the chemical industry. The rest goes into products such as soap and textiles, or is used in water treatment, aluminium production and oil refining.

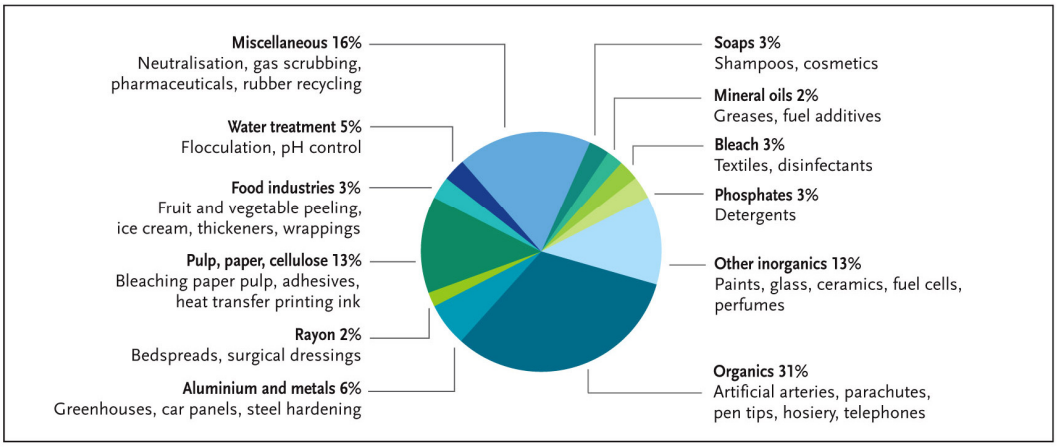
European chlorine applications in 2006 (10.14 million tonnes)



Emissive uses of elemental chlorine, such as for pulp and paper bleaching, have been replaced in Europe by use to make products that frequently do not contain chlorine in the final product, such as polycarbonates and polyurethanes.

Euro Chlor has met its commitment to report data on European production of chlorine and caustic soda monthly, quarterly or annually, including utilisation rates, caustic soda stocks, capacity and technology by plant and applications. In 2006, Euro Chlor published regularly on the internet figures for monthly chlorine production and caustic stocks (www.eurochlor.org) and distributed these to chemical industry media.

European caustic soda applications 2006 (9.89 million tonnes)

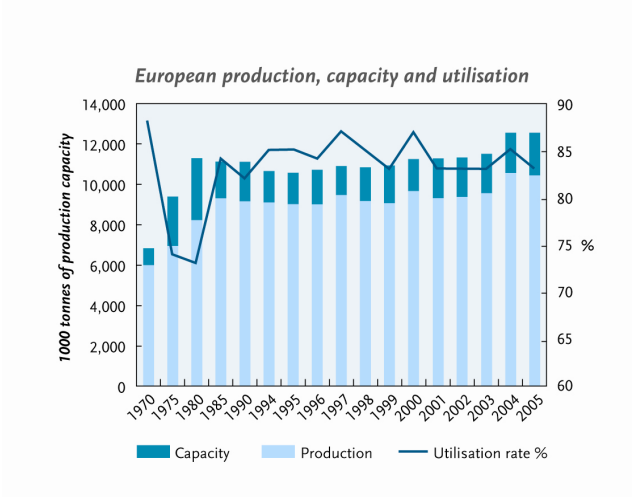


Chlorine production totalled 10.39 million tonnes in 2006, compared with 10.45 million in 2005 and the 10-year-high of 10.54 million in 2004. Capacity utilisation rates last year averaged 83% compared with 85% in 2005.

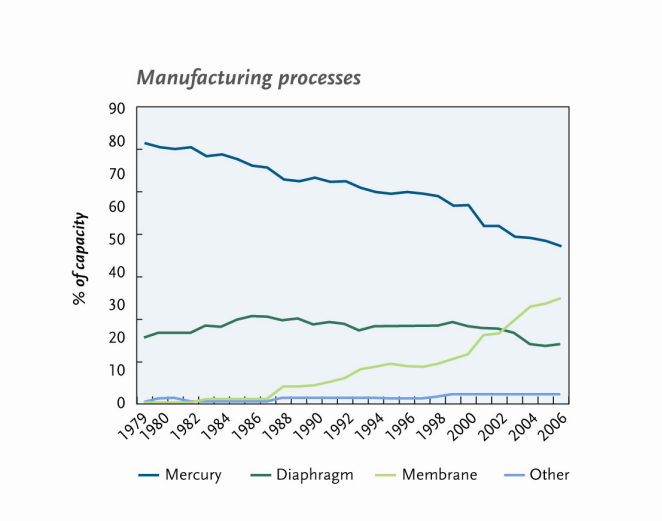
There were significant fluctuations in demand for caustic soda, but demand was strong overall for the second year running. This led to caustic stocks held by producers dropping below 300,000 tonnes in March 2006 and reaching an all-time low of 215,000 tonnes in November. It was not until March 2007 that stock levels returned above 300,000 tonnes.

Manufacturing: Mercury capacity decreases

Chlorine is produced by three main technologies (mercury, diaphragm and membrane) and, in small quantities, by two others (electrolysis of hydrochloric acid and fused salt).



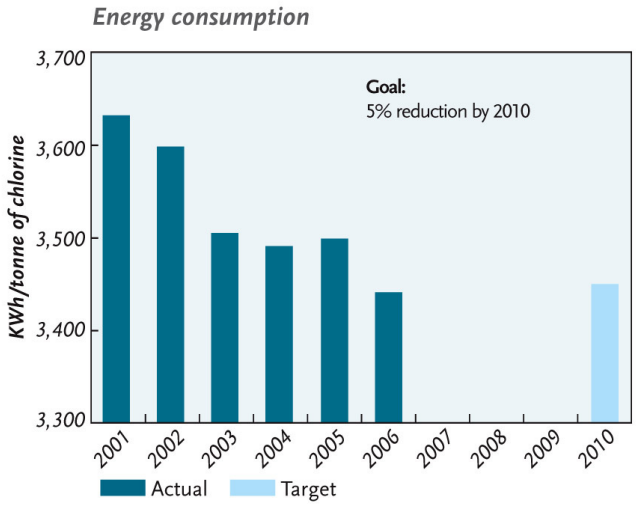
In 2006, the mercury process accounted for 43% of European capacity and by end 2007 is expected to be overtaken as the principal technology by the more energy-efficient membrane process.



Membrane technology accounted for 39% of production, and diaphragm for 15% in 2006. By 2010, mercury cells are expected to represent less than 35% of capacity and European chlor-alkali manufacturers have made a voluntary commitment that all mercury plants will beconverted to alternative technology by 2020. Diaphragm technology has historically used chrysotile asbestos, a use that is allowed to continue in the EU until the four remaining plants that use the substance reach the end of their economic lives.

Energy usage: Target achieved

Electricity is essential to make chlorine. It cannot be substituted and represents 20% of sales value. As electricity is a raw material in chlor-alkali production, basic consumption – corresponding to the electrochemical reaction – cannot be reduced. Energy savings arise primarily through using more efficient technologies and reducing ancillary energy use.



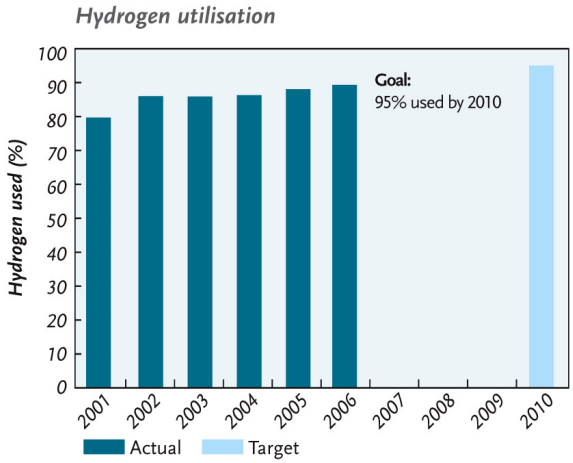
The energy usage indicator is based on both electricity and steam. The electrical energy consists of power used for electrolysis (transformers, rectifiers and cells) and motor power (pumps, compressors, centrifuges and utilities). Steam is used principally for caustic soda evaporation but also for minor utility purposes.

In 2006, the industry achieved the 2010 target of a 5% reduction in energy consumption in terms of KWh per tonne of chlorine produced compared with the 2001 base year. Average energy consumption last year was 3,440 kWh/t.

Hydrogen usage

High-quality hydrogen – suitable for use as fuel or as a raw material - is co-produced with chlorine and caustic soda during the electrolysis of brine. The goal for 2010 is for 95% utilisation of this hydrogen, compared with a figure of 80% in 2001.

Last year, 89.1% of hydrogen was utilised, an improvement on the 2005 figure of 88.1%; with further efforts, the 2010 goal should be achievable.



SAFETY AND SOCIAL PROGRESS

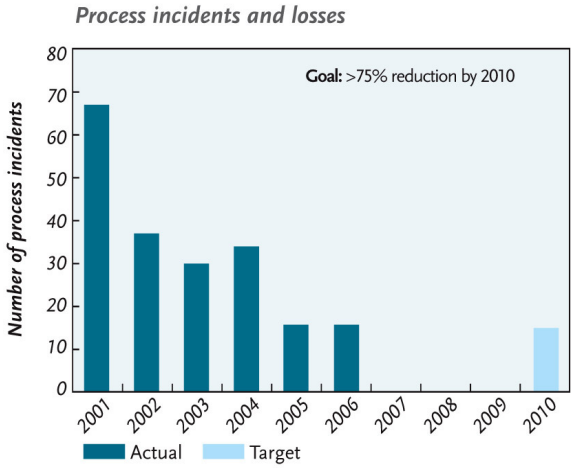
Lost Time Injuries

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

In 2006, there was an improvement in employee figures, with an LTI rate per million working hours of 8.32, compared with 9.09 in the previous year. However, the rate for contractors showed a disappointing increase, to 10.5 (2005: 7.72). There is a marked need for additional efforts here.

Process incidents and losses

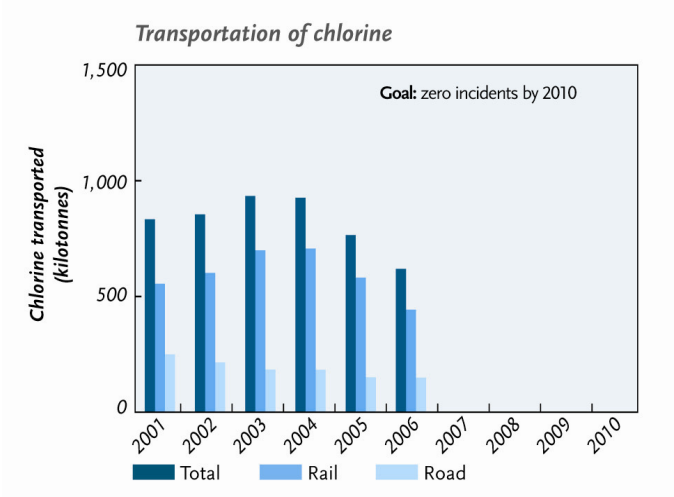
Incidents are defined as serious events involving a fire or explosion or release of certain chemicals, which cause a fatality, serious injury or property damage of more than €100,000. Losses include any spill of chemicals to air, water or land meeting pre-defined criteria such as human and environmental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



The target for 2010 is a 75% reduction in process incidents from 67 (2001) to 15. This remains achievable: there were 16 process incidents in 2006 (2005: 16). For 2005 and 2006, this was less than half the annual average for 2001-2004. The 2010 target is considered achievable.

Transport incidents

The amount of chlorine transported by rail and road has been sharply reduced during the past decade, with 6% of 2006 production being transported (excluding pipelines), compared with 7% in 2005. Chlorine movement has been decoupled from production through supplier/customer relocations and increased use of local pipelines. Rail transport dominates; road transport for bulk supply is used only in the UK and, to a limited extent, in Spain. In 2006, the average distance chlorine was transported by rail was 480 km and by road, 200 km.



A transport incident is defined as any incident in a public area due to the movement of chlorine by road, rail, sea or river resulting in one of the following: death or injury; any spill greater than 5 kg; property damage; public disruption of more than 1 hour or intervention of emergency services; or media coverage.

The 2010 goal is for no transport incidents involving bulk transportation of chlorine. In addition, Euro Chlor members committed to report annually on the percentage of total chlorine production transported, and on the volume transported by each method.

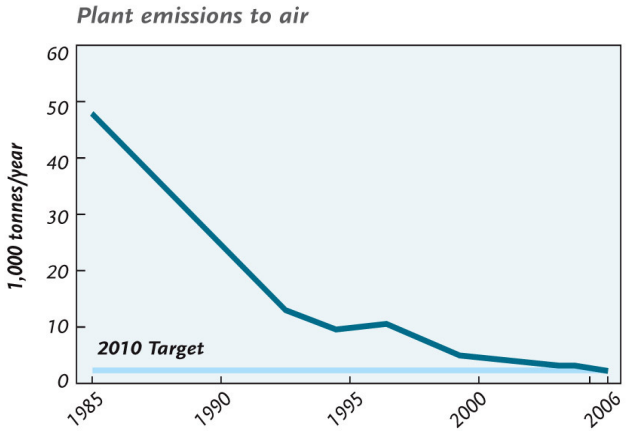
Following zero accidents in 2004, three were reported to Euro Chlor in 2005, with one in 2006. Last year, producers in Europe transported 618,000 tonnes of chlorine (2005: 761,000 tonnes), from which 73% was shipped by rail and the rest by road, representing 5.9% of 2006 production (10,294,000 tonnes).

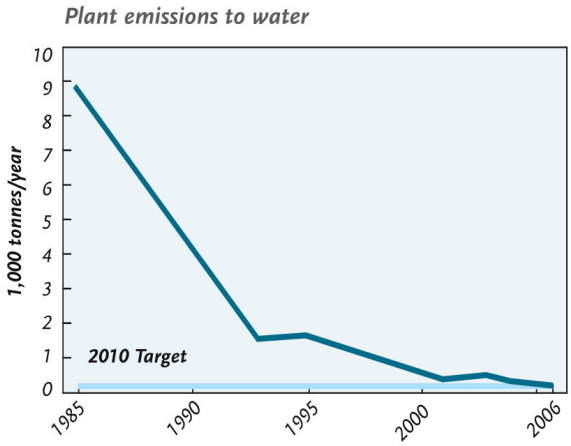
ENVIRONMENTAL PROTECTION

Chlorinated organic chemical emissions

Data on emissions to air and water of 22 chlorinated organic chemicals (COCs)[1] have been collected since 1985. This includes all the chlorinated products covered by the European Pollutant Emission Register (EPER), plus several other compounds. Between 1985 and 2004, emissions were reduced by 94% to air, and by 99% to water. A target of a further 50% reduction to air and 75% to water has been set for 2010 compared to the 2001 baseline.

At end 2006, COC emissions from manufacturing plants had been reduced by 69.8% to water compared with 67% at end 2005 and 50.8% to air compared with 35% a year earlier.

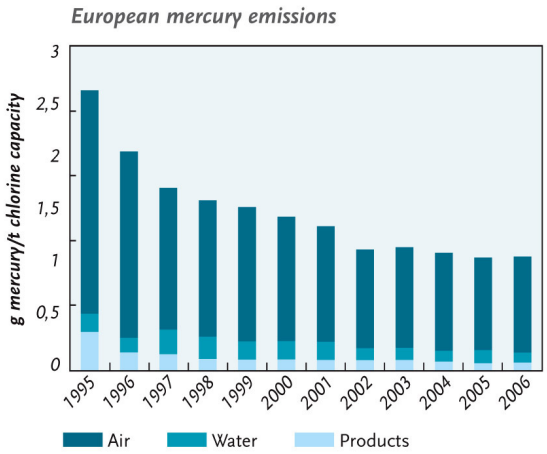




[1] 1,1,1-trichloroethane; 1,1,2-trichloroethane; 1,2-dichlorobenzene; 1,2-dichloroethane; 1,4-dichlorobenzene; 2-chlorophenol; 3-chlorophenol; 4-chlorophenol; carbon tetrachloride; chlorine; chlorobenzene; chloroform; dichloromethane; dioxins and furans (as TEQ); hexachlorobenzene; hexachlorobutadiene;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

Mercury emissions

Euro Chlor companies have collected data on mercury emissions from their operations since 1977. A voluntary target of 1.0 g of mercury per tonne of mercury cell capacity was set in 1998 to be reached on a national basis by 2007.



The participating countries were initially those in Western Europe. Euro Chlor members from Eastern countries that subsequently joined the federation are progressively committing to the same target. Data for 2006 includes emission levels from plants in Eastern Europe as well as Western Europe.

Although all other programme deadlines are for 2010, the industry decided to maintain an earlier 1998 commitment to achieve an emission target of 1g/t/chlorine capacity on a national basis by 2007. The earlier date was kept due to the fact that from October 2007, all EU chlor-alkali plants (whether mercury, membrane or diaphragm) require an operating permit under the Integrated Pollution Prevention and Control (IPPC) Directive.

Overall European mercury emissions in 2006 amounted to 1.055 g/t chlorine capacity compared with 1.046 g/t in 2005. The average mercury emissions for Western European countries remained at the level of 1 g/t capacity with a slight increase compared with the previous year. This rise was primarily as a result of higher levels of emissions in a few plants, including one that underwent extensive maintenance work, and is considered temporary.

Responsible Care

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

The number of chlor-alkali producing members of Euro Chlor has fluctuated since the programme began, as a result of restructuring and companies merging or withdrawing from the sector. As of 31 December 2006, 35 out of 39 full members had signed up to national *Responsible Care* initiatives.

Product knowledge

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

Environmental accreditation

Euro Chlor aims for all full members to gain Eco-Management and Audit Scheme (EMAS) and/or the International Organization for Standardization (ISO) 14001 environmental accreditation for their plants by 2010.

EMAS 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 the 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, comply with applicable laws, regulations, and other environmentally oriented requirements, and continuously improve.

During 2006, one Euro Chlor member company gained ISO 14001 accreditation and three companies upgraded to the more comprehensive EMAS accreditation.

Conclusion

European chlor-alkali producers can be proud of the substantial progress that has been made under the Euro Chlor Sustainability Programme. However, with the 2010 deadline fast approaching, companies need to beware of complacency. This sector's hard-earned reputation rests on how well it responds to the challenge of stepping up its environmental, health and safety performance during the next three years.

August 30, 2007

Euro Chlor full member companies (August 2007)

Akzo Nobel Base Chemicals
Altair Chimica
Anwil
Arkema
BASF
Bayer MaterialScience
Borregaard Industries
BorsodChem
CABB
Caffaro
CUF - Químicos Industriais
Degussa
Dow
Donau Chemie
Electroquímica de Hernani
Electroquímica del Noroeste
Ercros
Finnish Chemicals
Hellenic Petroleum
Hydro Polymers
INEOS Chlor Limited
LII Europe
MSSA
Novácke Chemické Závody
PCC Rokita
PPC SAS
Produits Chimiques d'Harbonnières
Química del Cinca
Rhodia Services
SF-Chem
Solvay
SolVin
SPOLANA
Spolchemie
Syndial
Tessenderlo Chemie
VESTOLIT
Vinnolit
Zachem

Euro Chlor

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

Euro Chlor helps members improve safety standards whilst conducting science, advocacy and communications programmes. The Brussels-based federation was founded in its current form in 1989 and has 120 members comprising 39 chlorine producers, 44 associates and 37 technical correspondents. Euro Chlor speaks on behalf of 97% of the chlorine production capacity in the EU-27 and EFTA regions.

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