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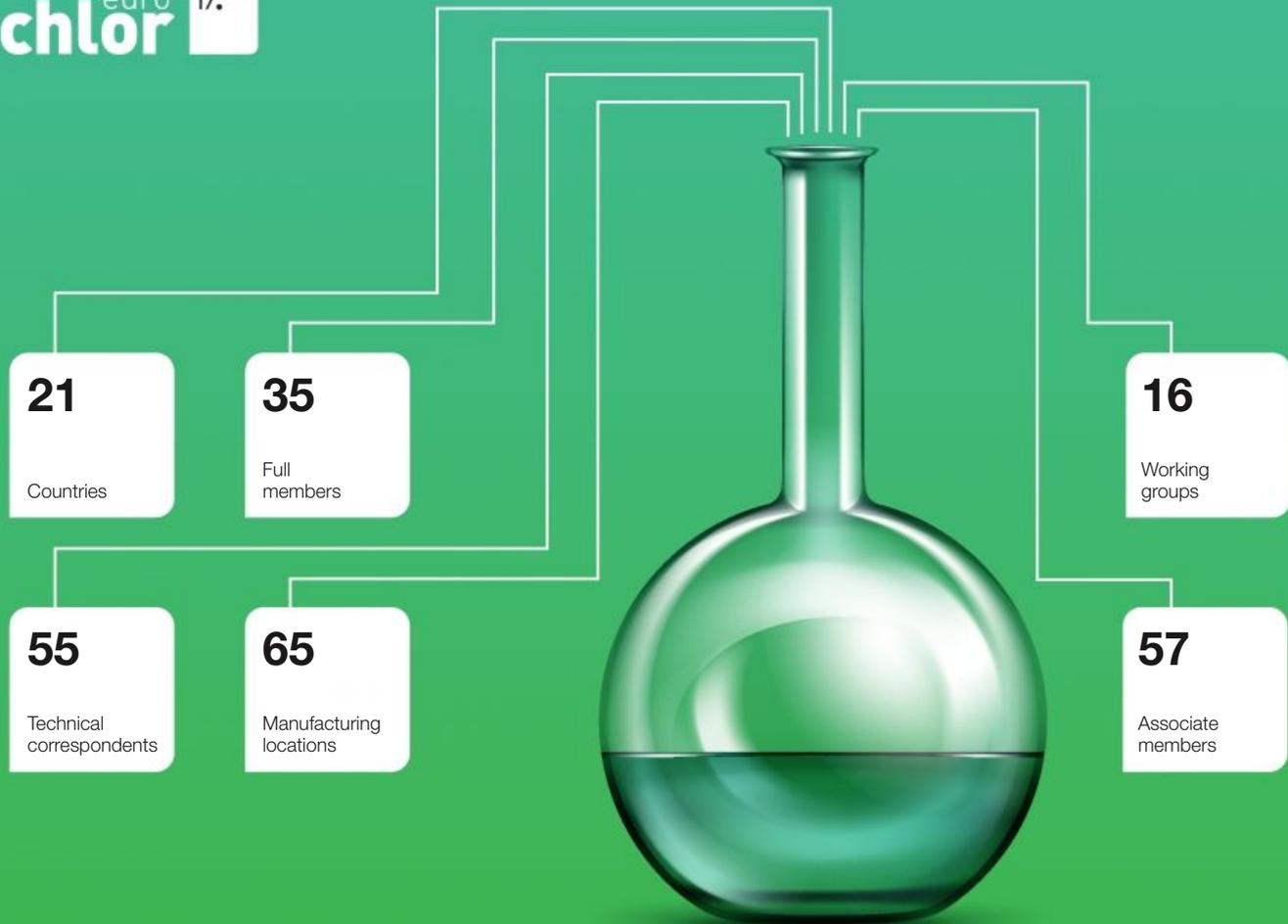
# Industry Review 2016-2017

2017 - the year of 17 successes

Many daily lives rely on chlor-alkali chemistry and products to keep them healthy but also to enable them to work safely and efficiently.

This year we highlight those jobs which rely on materials that would not exist without chlorine and caustic soda. Euro Chlor, the European chlor-alkali industry association will expand this list of jobs, focusing on the real-world benefits of chlor-alkali to the European workforce.

**eurol**  
**chlor** 17.



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# 2017, the chlorine year

## 2017 is remarkable for several reasons

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**“The regulatory and economic environment in Europe continues to challenge our global competitiveness.”**

First of all, it is *our* year, commemorating number 17 on the Periodic Table, as featured in our logo and benefits campaign on the many everyday essential ‘chlorine things’. 2017 is also the year in which our tenth Technology Conference took place, this time in May in Berlin. The attendance of over 360 people and 46 booths demonstrates the vitality of our industry and its attractiveness to its many and diverse stakeholders.

2017 also comes with challenges as it is the year in which, by 11<sup>th</sup> December, mercury cell technology to produce chlor-alkali will no longer be considered a ‘Best Available Technique under any circumstances’. With this deadline approaching we have seen good, recent progress, but challenges still remain. Conversion and decommissioning represent significant financial challenges, but they are also complex in terms of safety and reducing environmental and occupational exposure. Euro Chlor facilitates the sharing of accumulated experience amongst its members and will continue to support the safe, permanent disposal of excess mercury.

2017 also saw the launch of an important project within the ‘Safety Initiative’. Improving incident sharing continues to prove challenging, but everyone agrees work is vital here to make it a success.

Meeting members with different responsibilities within the companies and openly discussing with them on removing hurdles to incident sharing has already yielded positive results. We also use these meetings to communicate on the various Euro Chlor activities and documents, as well as identifying future member needs. These open interactions are highly appreciated by all involved and have already led to new projects that have triggered company experts to join Euro Chlor task forces. We intend to continue this programme, aiming to re-establish positive interactions with all our members.

As an active contributor to global activities via the World Chlorine Council, we are sharing these learnings with our colleagues around the globe, in order to promote safety as the key element of our universal goal to ensure our license to operate.

Looking to the outside world, the regulatory and economic environment in Europe continues to challenge our global competitiveness. According to Cefic statistics, regulatory

costs have doubled over the past decade with energy policies continuing to increase power prices due to rising taxes and levies, reducing our global competitiveness. Fortunately, despite these continuing political uncertainties, the economy is slowly picking up. Nevertheless, Europe urgently needs to improve its policy support for the manufacturing sector to foster innovation, provision of new jobs, generate growth and supply the needs of future generations.

At its June 2017 meeting, the Council called for a future industrial policy strategy, underlining the essential role of industry as a major driver for growth, employment and innovation in Europe. In line with its own earlier conclusions, it called for concrete action to ensure a strong and competitive industrial basis for the Single Market. It is vital that these policy intentions are realised so that both citizens and industry in Europe benefit. On a global, level playing field the European chlor-alkali industry will be successful. We stand ready to deliver the needs for the future, but let's begin now in **2017!** ■

**Dolf van Wijk**  
*Executive Director*

# Sustainability

## To help all of Europe live and work safely and sustainably

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Please allow me to start with a number. 7500. This is the number of workers who are employed in the European chlor-alkali Industry. From these chemical professionals comes nearly 9.7 million tonnes of chlorine every year, and their health and safety is of prime importance to Euro Chlor. From the guidance documents to this year's successful and well attended Technology Conference and mercury workshop, we are always thinking of ways to further improve our industry's safety. Nowhere is this more evident than in recent Euro Chlor outreach programmes to engage the membership and help them identify areas for further improvements in safety and sustainability.

Another core area for Euro Chlor is highlighting the socio-economic benefits of our industry. Here, the numbers speak for themselves. Over half of all chemicals produced in Europe rely on chlor-alkali products, with the vast majority of chlorine

helping to form essential modern plastics (such as PVC). 85% of all medicines made in Europe are based on chlorine, over 90% of European drinking water is made safe for consumption using chlorine and 25% of medical devices involve chlorine chemistry in their production.

We must also not forget the number of jobs which are made safer and more efficient thanks to our products. 2.7 million European firefighters use chlorine-based protective equipment, 3.5 million nurses use PVC-based medical devices to treat our ill and 11 million European construction workers build safe and environmentally friendly structures using chlor-alkali based building materials. These and many more are reliant on the valuable chemicals our industry provides.

This 2017 review is dedicated to these people, highlighting that our modern lifestyles are thanks, in no small part, to chlor-alkali. This theme will return in a new Euro Chlor initiative

('17 successes') which I hope you will join me in supporting. It is up to all of us to promote the virtues of our industry, working tirelessly to help all of Europe live and work safely and sustainably. ■



**Dieter Schnepel**  
*Chairman of the Management  
Committee*

**3.1%**

decrease in **energy consumption**

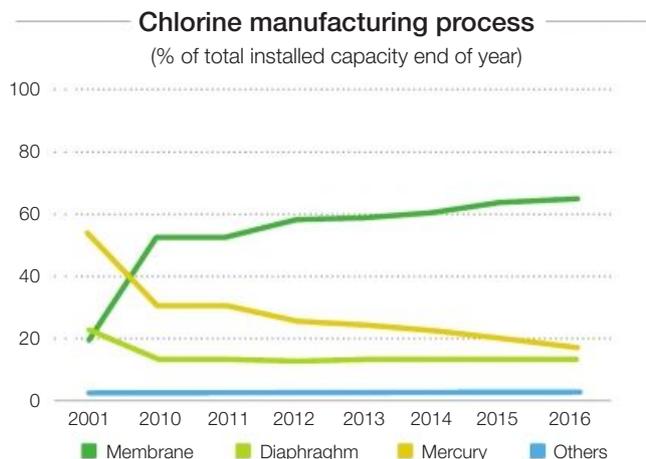
**1.4%**

decrease in **hydrogen utilisation**

## Manufacturing Technology

Two mercury based units were shut down and/or converted to membrane technology during 2016. As of the end of 2016, membrane technology represented about 66% of European chlorine production capacity. In contrast, the mercury process now accounts for approximately 17% of production capacity.

In 2017, conversions to the membrane process (or closures of the mercury plants) will further increase due to the implementation of the chlor-alkali BAT conclusions under the Industrial Emissions Directive. The Directive requires exclusion of mercury technology, with implementation of the chlor-alkali BAT by member states by the end of 2017. ■



## Economic Development

Within the Sustainability Programme, Euro Chlor is publishing on a monthly, quarterly and annual basis, European production data for chlorine and caustic. This includes utilisation rates and caustic stocks.

In addition, every year, chlorine and caustic applications, plant capacities and employed production technologies are published in this annual review.

The aim of these efforts is to increase transparency on the activities of the European chlor-alkali sector. ■

**“We must not forget the number of jobs which are made safer and more efficient thanks to our products.”**

## Mercury Emissions

The phase out of the mercury process for chlor-alkali production continued in 2016 as it must be finalised by the end of 2017. Despite this, Euro Chlor considers it to be vital to continue monitoring and reducing mercury emissions at those production sites which still employ mercury-based technology.

The absolute level of mercury emissions declined to around 1.4 tonnes in 2016, a reduction of approximately 0.3 tonnes/ year compared to 2015. This is mainly due to the closure of several mercury installations in 2016.

Specific mercury emissions remained at 0.68 g Hg/ tonne Cl<sub>2</sub> capacity in 2016. ■

**80 Hg** Mercury emissions declined to **1.4 Tonnes**

## Energy Consumption

Energy consumption in 2016 was at 93.2% compared to the 2011 reference level. Compared to 2015, there was a decrease of 3.1% (from 96.3% to 93.2%). This decrease is due to several factors: the conversion of mercury to membrane plants (or closure of the mercury plants), the lower number of companies participating in the Sustainability Programme this year, and the reduced production level in 2016 (when compared to 2015).

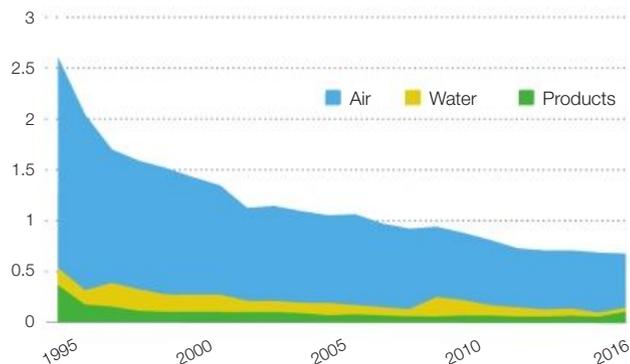
In 2016, 92% of Euro Chlor members from 50 sites were surveyed under the sustainability programme whilst in 2015 this was 97% at 54 sites. ■



Energy consumption decreased by **3.1%**

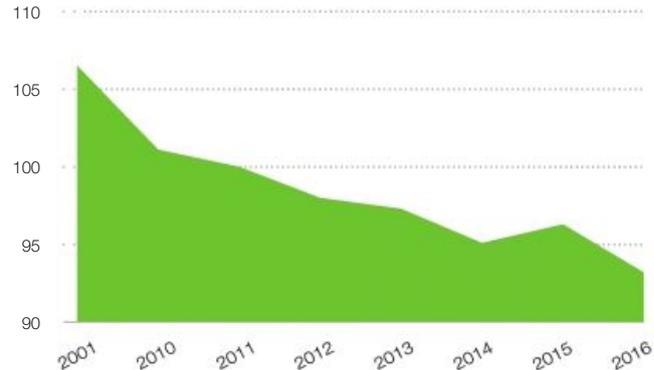
Trend of mercury emissions

(g Hg/ tonnes Cl<sub>2</sub> capacity)



Primary fuel energy consumption

(% with respect to 2011)



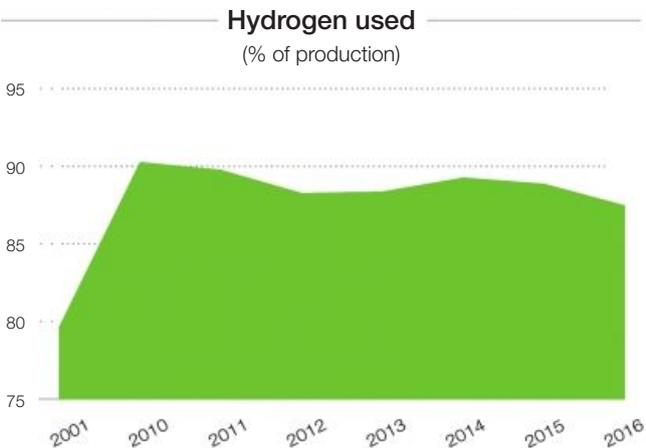
## Hydrogen Use

The use of hydrogen has slowly decreased since 2014. In 2016, the utilisation rate of hydrogen was 87.5%, a decline of 1.4% compared to 2015.

Hydrogen can be used for several applications such as a chemical reagent, as fuel for steam generation, generating electricity in fuel cells and as fuel for transport devices. Its production can also be avoided by the installation of depolarised cathodes. To further increase hydrogen use, different options are available. However, in practice this is often complicated due to economic constraints. ■



**Utilisation rate of hydrogen**  
decreased by **1.4%**



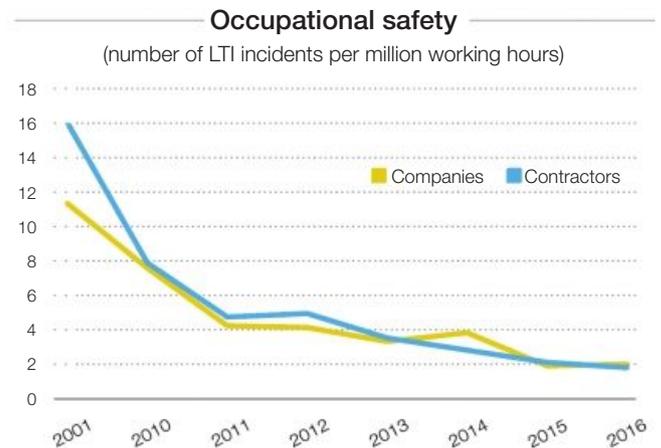
## Occupational Safety

In 2016, Lost Time Injuries (LTIs) for member company personnel increased slightly (from 1.9 to 2.0) compared to 2015 whilst the LTI figure for contractor staff improved (from 2.1 to 1.8). This stagnating performance, in addition to the absolute value, is the reason for the Safety Initiative. Here, Euro Chlor and its members are looking into options to improve the culture of incident sharing and learning from each other to prevent and reduce the number of incidents in our industry branches.

It should be noted that, since 2011, this LTI rate per million working hours only includes incidents *directly* related to chlorine industry specific items. ■



**Contractor incidents** decreased to  
**1.8** per **1,000,000** working hours



## Process Incidents

The process incidents and losses slightly declined compared to 2015, from 2.58 to 2.28 incidents per million tonnes of chlorine produced. This looks promising but we have to keep in mind that in 2016, fewer sites participated compared to 2015.

The Safety Initiative continues to work on improvement of incident sharing and sharing best practices to improve the safety performance of our industry sector. ■



Process incidents declined to  
**2.28** per 1,000,000 tonnes/chlorine

## Time dedicated to HSE training

This indicator, introduced during the second phase of the Sustainability Programme, monitors the proportion of working time spent on formal training of member company operators in the fields of health, safety and environmental protection (HSE).

Over the last few years, this figure was rather stable at 1.5%, but this year we have seen an increase to 1.7%. ■



Time spent on HSE Training  
increased to **1.7%**

### Process incidents and losses

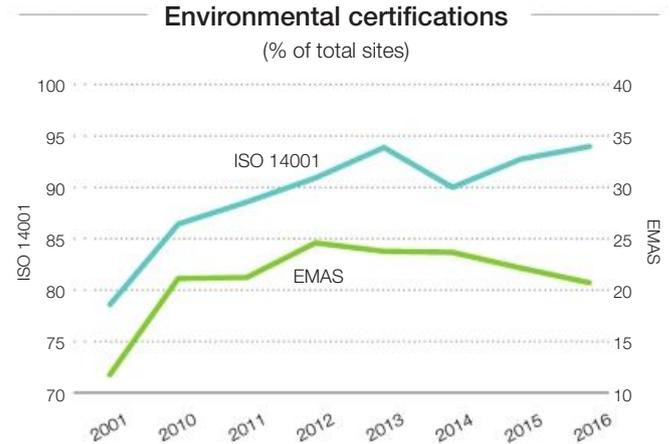
(number per million tonnes chlorine produced)



**“Safety Initiative continues work to improve sharing of best practices.”**

## Environmental Accreditation

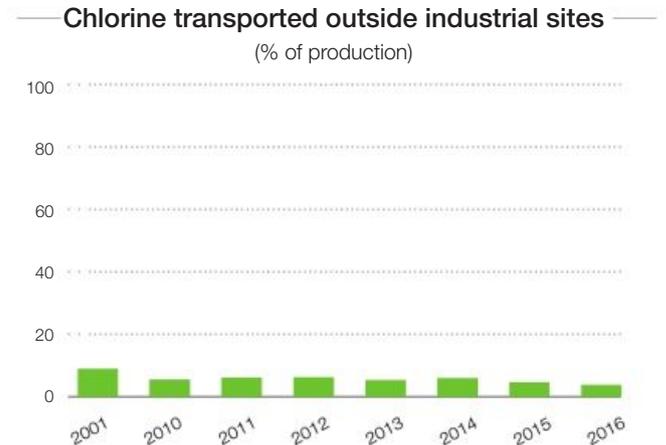
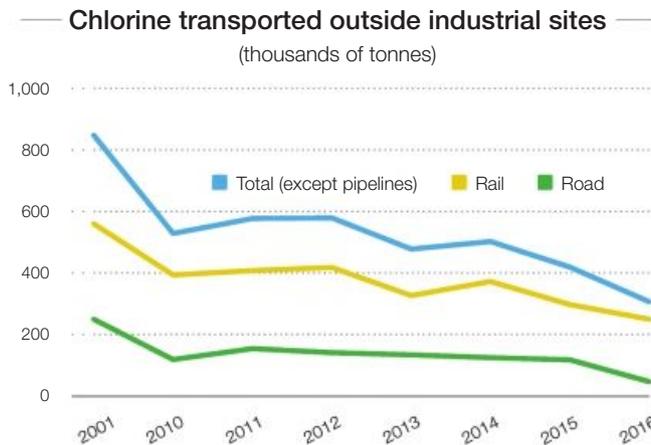
Overall, the percentage of sites with ISO 14001 (environmental) accreditation increased compared with 2015, returning to the 2013 level. The percentage of sites also having the more demanding EMAS (Eco-Management & Audit Scheme) has slowly decreased in recent years. ■



## Transportation

The amount of chlorine that is transported from production sites decreased further in 2016. Only 3.6% of produced chlorine was transported, mainly by rail (81%).

It should be noted that this year's review includes reports from fewer production sites as compared to last year. ■



## VinylPlus continues its progress towards PVC sustainability

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Since its June 2011 launch, **VinylPlus** continues to build on the accomplishments of its predecessor Vinyl 1010, to make PVC truly sustainable. Now that the half-way point of its 10-year journey has passed, progress is continuing on all five Sustainability Challenges, derived from The Natural Step System Conditions for a Sustainable Society.

VinylPlus brings a significant contribution to circular economy activities; a key objective of current EU policy. Circular economy is more than waste management though, it entails efforts to do more, with less!

In 2016, VinylPlus increased the volume of recycled PVC to 557,000 tonnes. This enables a saving of more than 1.1 million tonnes of CO<sub>2</sub>. A cumulative total of over 3.5 million tonnes of PVC has been recycled since 2000, thanks to VinylPlus efforts. Legacy additives remain an open issue, having a negative impact on demand for recycled PVC. VinylPlus is confident though that the ever-increasing number of studies it undertakes in support of PVC recycling/ recycled product safety will lead to balanced solutions that combine maximum safety with increased recycling potential.

VinylPlus also confirmed the commitment taken to the sustainable use of additives, documenting the cessation of sales of lead stabilisers in the EU-28 and continuing to develop a science-based methodology (the Additives Sustainability Footprint, ASF), for assessing the sustainable use of PVC products additives. All of this has been carried out in constant dialogue with all stakeholders as demonstrated by the increasing credibility of the annual Vinyl Sustainability Forum.

The VinylPlus commitment is also recognised by external stakeholders at international levels. VinylPlus was “Highly Commended” by The Circularity 2017, a prestigious circular economy award programme run by the World Economic Forum and the Forum of Young Global Leaders. This programme offers recognition to those businesses, organisations and individuals who distinguish themselves by driving innovation and growth in the circular economy. ■

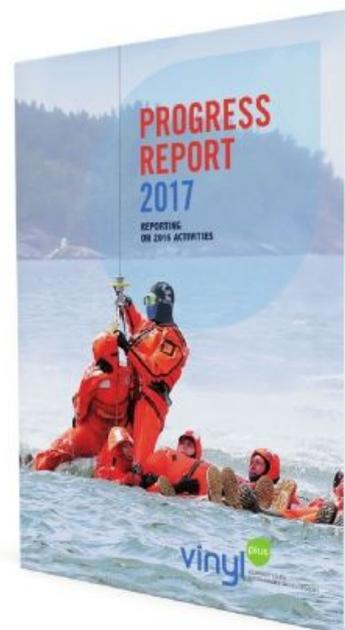
The Progress Report 2017 summarizes VinylPlus achievements in 2016:  
[www.vinylplus.eu/documents/44/59/New-Progress-Report-2017](http://www.vinylplus.eu/documents/44/59/New-Progress-Report-2017)

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🌐 [www.vinylplus.eu](http://www.vinylplus.eu)

🐦 [@VinylPlus\\_EU](https://twitter.com/VinylPlus_EU)

**“VinylPlus brings a significant contribution to circular economy activities; a key objective of current EU policy.”**



## Technology Conference 2017: sustainable chlorine production in the spotlight

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The tenth Euro Chlor Technology Conference & Exhibition, held in Berlin from May 16 to May 18, again shared best practices and new technological developments in the areas of health, safety and environmental protection.

Chairman Dieter Schnepel welcomed 360 participants from 34 countries and highlighted that our industry will continue to develop in the years ahead of us. Our high energy demand means we need to find increasingly efficient ways of using energy. "This again is a driving force for even more environmental and economically effective measures to reduce our energy consumption", Schnepel underlined.

46 Exhibitors presented their equipment and services. Representatives of member companies and other institutions also contributed with highly appreciated presentations. Apart from the mercury challenge, issues like the effects of the EMF Directive on our industry, the protection of our worker's physical and mental health and the continuation of Euro Chlor's sustainability programme were some of the many discussed subjects.

Thomas Bareiß, a member of the German Bundestag who specialises in energy matters, underlined the need for our industry to stay in Germany and Europe but recognised that this strongly depends on competitive energy availability.

Many challenges are achievable thanks to our collaborative approach, on which Euro Chlor Executive Director, Dolf van Wijk closed the conference, stating that "transparency and working together are key shared values for success". ■

## Health Working Group broadens its horizons beyond chemical hazards...

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At the recent Technology Conference, it became clear that the Euro Chlor occupational physicians were ready to tackle three new interesting topics:

- **Electromagnetic fields:** Jean-Claude Besson presented the latest information to enable health professionals to reassure concerned workers. A training presentation will follow;
- **Shift work:** Marc Boeckx showed which working schedules presented the highest risks of accident and gave useful advice on how to keep workers alert and healthy;
- **Burn-out:** Aline Hugé covered this cross-industry emerging issue, providing practical advice on prevention, identification of early symptoms and the reintegration of people upon recovery.

Already working for years on health management issues related to mercury, chlorine and/ or caustic soda, the group is prepared to take up new challenges! ■

# Regulation

## Emission Trading System reform post-2020: the political debate continues

The European Commission, Parliament and Member States have yet to reach consensus on the revision of the EU Emissions Trading System (EU ETS) for the post-2020 period.

For Euro Chlor, it is crucial to ensure that indirect emitters producing up to the benchmark of energy efficiency do not face any carbon costs. Currently the Council proposal foresees (limited) compensation through State Aid, whereas the EU Parliament proposes a centralised system at Union level that can be supplemented by State Aid if needed.

Together with Cefic Public Affairs, Euro Chlor advocates for an effective compensation scheme that guarantees a level playing field across the EU. Subsequently, it will be crucial to follow up on the 2018 review of the State Aid rules, ensuring that our sector remains an indirect emitter eligible for State Aid. ■



## Chlorate Emissions

The Euro Chlor Environmental Working Group (EWG) has completed a project to model chlorate emissions from chlor-alkali plants.

During the 2014 chlor-alkali BREF process, chlorate emissions to water were extensively discussed. However, due to a lack of suitable data, no sensible BAT-AEL could be set. Therefore, a monitoring requirement was added so that data could be obtained by producers, to eventually set such a limit.

Building on this obligation, and to prepare for future discussion on a sensible emission limit for chlorate, in consultation with ARCHE Environmental consultants, the EWG collected and analysed membrane plant chlorate emission data from Euro Chlor members. These data have underlined the need for members to continue with their environmental chlorate monitoring activities. ■

mercury emissions  
decreased to

**0.68 g/tonne Cl<sub>2</sub>**

mercury technology  
phased-out by the end of

**2017**

## Clean energy for all Europeans

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The November 2016 'Clean energy for all Europeans' legislative proposals cover energy efficiency, renewable energy, the design of the electricity market, security of electricity supply and governance rules for the Energy Union. The Commission's ambitious plan also includes actions to accelerate clean energy innovation and to renovate Europe's buildings.

Expressed in numbers, the whole package targets a 40% greenhouse gas emission cut in 2030 compared to 1990, an increase in share of renewables in power generation of up to 27% and an EU-wide 30% improvement in energy efficiency. Starting with the topic of energy efficiency, the EU Parliament and Member States are now scrutinising all texts and proposing amendments.

For industry it will be challenging to safeguard global competitiveness in a renewable-friendly regulatory framework that risks rendering European energy supply less reliable and very expensive. ■

## Major milestone for biocides process

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After nearly a decade of effort by Euro Chlor members, on 14 December 2016, the European Chemicals Agency (ECHA) Biocidal Product Committee decided to approve the disinfectant uses of chlorine, calcium hypochlorite and sodium hypochlorite! This means that the product application phase can now begin for these active substances. Taking place over the next two years, the active approval and product application date is expected in January 2019.

However, Euro Chlor biocidal registration groups will still be involved with works on cooling waters and slimicide applications over the next 5 years for the hypochlorite active substances.

Work will also continue in the product arena; with cooperation between members to share the workload on product applications and disinfection by-product assessment. ■

## Challenges facing chloro alkanes in Europe

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In collaboration with the MCCP REACH consortium, the Chloro Alkane Sector Group held an international workshop in Brussels in January 2017.

After discussing the additional REACH CoRAP PBT testing requirements (due for completion by September 2018), the event covered the regulatory position of chloro alkanes in North America as well as their situation in the Water Framework and RoHS directives. There was also a keen drive to better understand downstream uses, leading to successful outreach programmes with lubricant, PVC and paint manufacturers.

From this workshop, a new presentation was released to help authorities to understand why SCCP (a phased-out substance) cannot be an impurity in MCCP. This video is available via the Euro Chlor website.

This workshop highlighted that whilst challenges remain, chloro alkanes are vital in modern society thanks to their versatile chemistry. ■

## Safety Initiative: first promising results

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In 2014, the Euro Chlor Safety Initiative was launched based on stagnating and declining safety performance indicators. This resulted in the introduction of a quarterly Safety Newsletter, discussion of incidents in all technical meetings and the introduction of key safety rules.

Also, at the end of 2016, visits to several member companies began to discuss enhancing incident sharing, exchanging safety learnings, fostering networking between members and obtaining a better understanding on what members expect from Euro Chlor. First results are promising; more incidents have been reported (as reflected in improved Euro Chlor guidelines) and participation in Euro Chlor working groups has increased. These successes will be further discussed at this year's Annual General Assembly. ■

alkanes  
**chloro** versatile  
chemistry

## Goodbye to mercury technology at the end of 2017

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The 2013 Best Available Technique conclusions under the Industrial Emissions Directive implied that mercury cell technology can no longer be used in chlor-alkali units after 11 December 2017. For several years, Euro Chlor has systematically reminded its members of this deadline and has shared announcements of conversions and closures via dedicated Euro Chlor web pages. In addition, the secretariat has been a source of information in relation to dismantling projects, conversion of mercury into mercury sulphide, storage of stabilised mercury, treatment of contaminated sites etc. It should be noted, however, that the mercury story will not end with the shut-down of the last mercury cell. Indeed, issues such as the demolition of buildings and the treatment and follow-up of contaminated sites will continue to keep the chlor-alkali industry busy for several more years. ■

## New mercury regulation reinforces phase out

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On 24 May 2017, the new EU regulation on mercury was published (EU 2017/852). The new regulation reinforces the phase out deadline of the end of 2017 and Euro Chlor will continue to support the membership in identifying conversion and storage options. This regulation allows the temporary storage of liquid mercury for a maximum of 5 years, with a possible maximum extension of 3 additional years. Meanwhile, the liquid mercury must be converted into mercury sulphide before being permanently disposed of. If the mercury from the cells is stored for more than one year, the storage requirements of the Landfill Directive (EU 1999/31) kick in. ■

**“Another significant step taken in mercury phase out in 2017.”**

## Members meet to share experiences on safe mercury phase out

Building on a successful 2016 workshop, Euro Chlor held another session in February 2017 in Brussels to share practical experiences on minimising mercury exposure during the decommissioning process. Given the December 2017 mercury phase out date, decommissioning activities are presenting challenges in ensuring that the environment is protected, and workers remain healthy and safe during this critical work.



Member company representatives share mercury phase out experiences

In addition to a set of presentations on health, safety and technical aspects of the mercury phase out, members were given time to quiz industry experts. Questions clarified included the regulatory situation, mercury stabilisation, equipment disposal, site remediation and minimising exposure.

Euro Chlor is planning to capitalise on this meeting, developing guidance and preparing similar events to help meet future challenges. ■

## UNEP Stockholm Convention lists SCCP but...

The 2017 Conference of the Parties meeting (COP8) of the Stockholm Convention was held jointly with the Basel and Rotterdam Conventions in Geneva. Despite objections from Parties such as China and India, **short chain chlorinated paraffin (SCCP)** was listed on Annex A (elimination) with a list of specific exemptions that covers nearly all current uses (e.g. rubber conveyor belts, waterproof/ fire retardant paints, secondary plasticisers). These exemptions will now be applied for by countries, prior to evaluation by a technical committee in 2020.

Questions were raised by several countries (including Russia) on whether SCCP even meets the Annex E (adverse effects through long range transport) criteria. A 1% limit was also placed in mixtures containing SCCPs, despite the fact that, when one considers the chemistry of these substances, SCCP cannot be present in medium or long chain chlorinated paraffins (M/LCCP).

For Europe, there are no direct consequences as the use of SCCP ended several years ago. However, the Chloro Alkanes Sector Group is concerned about possible unjustified spill-over effects to other chlorinated alkanes.

Additionally, **HCBD** was finally listed on Annex C (in addition to Annex A) of the convention (reduction of unintentional production). ■

## Minamata Convention on mercury enters into force

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With the adoption of the EU Mercury Regulation in May 2017, the EU simultaneously ratified the Minamata Convention. This ratification by the EU Commission prompted other Member States to act, bringing the number of ratifications up to the required 50 for the Convention to enter into force. The first Conference of the Parties (COP1) meeting was then scheduled for 24-29 September 2017 in Geneva. The World Chlorine Council (WCC) will attend to follow up on several open-ended issues including waste handling and storage, import and export of mercury, reporting obligations and finances.

The voluntary Mercury Chlor-Alkali Partnership programme, managed by the UNEP Secretariat jointly with the US EPA (Environmental Protection Agency), was initially set up to facilitate information sharing during Minamata Convention negotiations. With the entry into force of the Convention, the role of this Partnership is likely to be revisited.

From the beginning of the Partnership programme, WCC has been an active contributor to the Chlor-Alkali Partnership which provides a useful information exchange platform. WCC has shared essential information such as best practices and accumulated experience from its regions on mercury handling, storage and waste treatment, costs of conversion and other information. WCC also tracks and reports annually on the progress of mercury phase out, thus contributing to the transparency of the activities of our sector. WCC is committed to continuing these efforts in close cooperation with UNEP. ■

## Chlor-Alkali Partnership mercury reporting

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The World Chlorine Council continues to gather mercury emission data from its members and annually reports them to the UNEP Chlor-Alkali Partnership. The number of plants is decreasing as expected and will further reduce in the coming year due to mercury technology no longer being allowed in Europe as of the end of 2017. At this moment, worldwide there are still 34 mercury plants with a joint production capacity of 3 million tonnes of chlorine per year.

Due to the closure of four plants, the absolute mercury emission declined in 2016 from 5.6 tonnes to 4.4 tonnes. In 2016 the emission per tonne of chlorine capacity decreased to 1.44 g/ tonne Cl<sub>2</sub>. ■

## “Minamata Convention entered into force on 16 August 2017.”

## ECSA REACH

For **methylene chloride**, several comprehensive REACH dossier updates were performed as part of a 2014 ECHA compliance check. Unfortunately, the substance has meanwhile been added to the CoRAP list for substance evaluation. At the end of April 2017, the Italian evaluating MSCA conveyed its decision to request further investigations into the alleged endocrine disrupting (ED) properties. Following discussions with the responsible MSCA toxicologist, a summary document was sent that presented the results from *in silico* testing, explaining that the substance has no ED properties and that further testing is redundant. A final decision is now expected within 12 months.

For **chloroform**, the consortium has decided to conduct a new survey of industrial users to improve the environmental exposure assessment. This will confirm that unavoidable discharges into sewage treatment plants do not pose a risk to the environment.



**“Scientific results  
 counter claims of  
 cancer formation at  
 low exposure levels for  
 methylene chloride.”**

## **ECSA**

### **Product Stewardship Activities**

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Given ECSA's interest in promoting Product Stewardship and providing comprehensive information for safe handling of chemicals, the association has updated existing information and provided additional information via its website [www.chlorinated-solvents.eu](http://www.chlorinated-solvents.eu).

These updates include...

#### **...German guidelines on safe use of PER in dry-cleaning**

ECSA has translated information on safe working conditions for using perchloroethylene (PER) in dry-cleaning in Germany. Originally written by the German Federal Office for Work Safety in cooperation with local authorities, these documents have been published based on recent exposure assessment studies in German dry-cleaning shops. They confirm that, under controlled conditions, exposure can be lower than 20ppm, the exposure limit published by the EU Commission (DIRECTIVE (EU) 2017/164, 31 January 2017).

#### **...Revision of the ECSA Storage & Handling Guidance**

ECSA Guidance on the safe use of chlorinated solvents was updated in late 2016 to provide current information on solvent maintenance, recycling and disposal of spent solvents. Recommendations for textile and metal cleaning machines are also included in the guideline to provide one single reference point. Translations into German, French, Italian, Spanish and Russian are being prepared and will be published on the ECSA website.

#### **...Labels for Chlorinated Solvents**

In order to provide 'hands-on' labelling information for users and distributors of chlorinated solvents (namely methylene chloride and perchloroethylene), generic labels have been published with current hazard classifications of the substances with hazard and precautionary phrases in all European languages. These labels can be downloaded from the ECSA publication webpage and tailored for the particular product with the required languages and product name. A proposal for a generic tank label is also available.

#### **...Genotoxicity study commissioned on methylene chloride**

Together with its US sister organisation (HSIA), ECSA funded a study to clarify the cancer formation mode of action from methylene chloride exposure. From this, a publication in the scientific journal *'Toxicology and Applied Pharmacology'* is being prepared. The outcome of this study shows that, below 100 ppm, there is no methylene chloride related risk of cancer formation. It is shown that there is no genotoxic mode of action for cancer formation by methylene chloride, but that adverse effects only appear as a result of (cytotoxic) high concentration exposure that is far above current occupational exposure limits (EU OEL = 100 ppm/8 h). These results support current threshold setting and provide solid argumentation in case of further regulatory action and counter claims of cancer formation at low exposure levels. ■

# Competitiveness

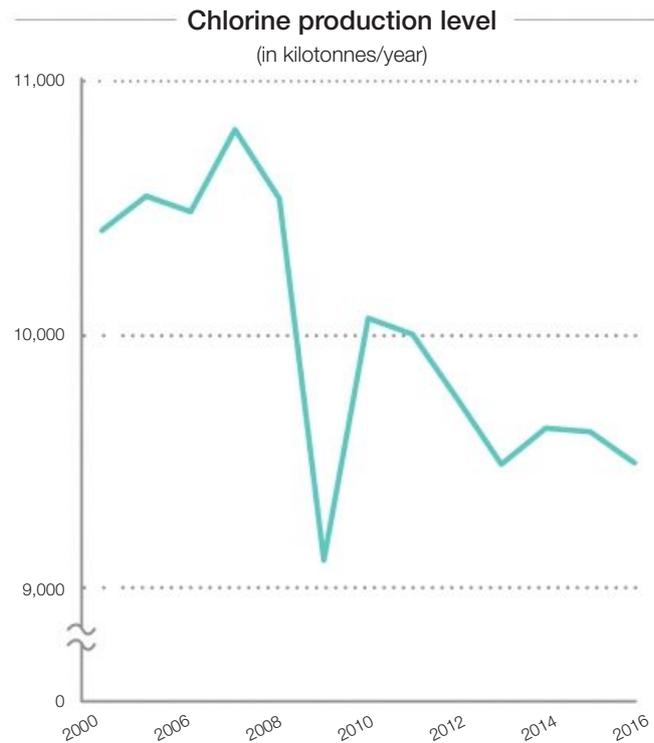
## Chlorine Production 2016

2016 European chlorine production was reported at 9,461 kt, 1.2% below the 2015 level and 11.6% below the 2007 peak level. This means there has been no real recovery. In fact, since 2007, there has been a gradual decrease in the European chlorine production level.

The utilization rate was 79.1%, compared to 80.9% in 2015.

**“There is a continued need for EU policy makers to support the competitiveness of the European chemical manufacturing industry.”**

The overall chemical industry in Europe recorded a growth of 0.4% in 2016 according to European Chemical Industry Council (Cefic) figures. This means that the chlorine industry is not following the general growth of the chemical industry in Europe and the rest of the world. With the developments of the competing regions outside Europe, there is a continued need for EU policymakers to support the competitiveness of the European chemical manufacturing industry. ■



chlorine production  
↓ 1.2%



## Chlorine and caustic soda applications 2016

European Chlorine Applications 2016	kilotonnes	%
Solvents & Epichlorohydrin	788	8.6%
Chloromethanes	414	4.5%
Other Organics	933	10.2%
Inorganics	1,134	12.4%
PVC	2,965	32.5%
Isocyanates & Oxygenates	2,901	31.8%



European Caustic Soda Applications 2016	kilotonnes	%
Phosphates	90	1.0%
Rayon	125	1.3%
Mineral oils	167	1.8%
Soaps	329	3.5%
Bleach	356	3.8%
Water treatment	445	4.7%
Alumina & other metals	408	4.3%
Food Industry	513	5.5%
Other inorganics	1,132	12.1%
Pulp, Paper Cellulose	1,242	13.2%
Miscellaneous	1,567	16.7%
Organics	3,011	32.1%



# Chlorine Production Plants

January 2017



	Country	Company	Site	Nameplate Capacity (000 tonnes chlorine)	Hg	D	M	Others
1	Austria	Donau Chemie	Brückl	74			74	
<b>Austria Total</b>				<b>74</b>	<b>0</b>	<b>0</b>	<b>74</b>	<b>0</b>
3	Belgium	INOVYN	Antwerp	458	90		368	
4	Belgium	INOVYN	Jemeppe	174			174	
5	Belgium	Vynova	Tessenderlo *	400	205		325	
<b>Belgium Total</b>				<b>1,032</b>	<b>295</b>	<b>0</b>	<b>867</b>	<b>0</b>
6	Czech Republic	Spolana	Neratovice	135	135			
7	Czech Republic	Spolchemie	Usti	61	61			
<b>Czech Republic Total</b>				<b>196</b>	<b>196</b>	<b>0</b>	<b>0</b>	<b>0</b>
8	Finland	AkzoNobel	Oulu	40	40			
9	Finland	Kemira	Joutseno	75			75	
<b>Finland Total</b>				<b>115</b>	<b>40</b>	<b>0</b>	<b>75</b>	<b>0</b>
10	France	PPChemicals	Thann	43			43	
11	France	VENCOREX	Pont de Claix	170		170		
12	France	Kem One	Fos	340		179	161	
13	France	Arkema	Jarrie	72			72	
14	France	Kem One	Lavera	363	164	199		
15	France	Arkema	St Auban	20			20	
16	France	MSSA	Pomblière	42				42

	Country	Company	Site	Nameplate Capacity (000 tonnes chlorine)	Hg	D	M	Others
17	France	PC Harbonnières	Harbonnières	23	23			
18	France	NOVYN	Tavaux	360			360	
19	France	PC Loos	Loos	18	18			
<b>France Total</b>				<b>1,451</b>	<b>205</b>	<b>548</b>	<b>656</b>	<b>42</b>
20	Germany	BASF	Ludwigshafen	385	170		215	
21	Germany	Covestro	Dormagen	480			400	80
22	Germany	Covestro	Leverkusen	390			390	
23	Germany	Covestro	Uerdingen	260			260	
24	Germany	Covestro	Brunsbüttel	210				210
25	Germany	Dow	Schkopau	250			250	
26	Germany	Vinnolit	Knapsack	250			250	
27	Germany	CABB GmbH	Gersthofen	52			52	
28	Germany	Dow	Stade	1,585		1,030	555	
29	Germany	AkzoNobel	Ibbenbüren	125	125			
30	Germany	AkzoNobel	Bitterfeld	99			99	
31	Germany	Evonik Industries	Lülsdorf	137	137			
33	Germany	AkzoNobel	Frankfurt	250			250	
34	Germany	NOVYN	Rheinberg	220		110	110	
35	Germany	VESTOLIT	Marl	260			260	
36	Germany	Vinnolit	Gendorf	180			180	
37	Germany	Wacker Chemie	Burghausen	50			50	
96	Germany	LEUNA-TENSIDE	Leuna	15			15	
<b>Germany Total</b>				<b>5,198</b>	<b>432</b>	<b>1,140</b>	<b>3,336</b>	<b>290</b>
94	Greece	Kapachim	Inofita Viotias	10			10	
95	Greece	Unilever Knorr	Marousi	20			20	
<b>Greece Total</b>				<b>30</b>	<b>0</b>	<b>0</b>	<b>30</b>	<b>0</b>
39	Hungary	Borsodchem	Kazincbarcika	323	131		192	
<b>Hungary Total</b>				<b>323</b>	<b>131</b>	<b>0</b>	<b>192</b>	<b>0</b>
40	Ireland	MicroBio	Fermoy	9			9	
<b>Ireland Total</b>				<b>9</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>0</b>
41	Italy	Altair Chimica	Volterra	55			55	
42	Italy	Società Chimica Bussi S.p.A.	Bussi	25			25	
44	Italy	Ing. Luigi Conti Vecchi	Assemini	25			25	
49	Italy	NOVYN	Rosignano	150			150	
50	Italy	HydroChem Italia	Pieve Vergonte	42	42			
93	Italy	Fater	Campochiaro	20			20	
<b>Italy Total</b>				<b>317</b>	<b>42</b>	<b>0</b>	<b>275</b>	<b>0</b>
51	The Netherlands	AkzoNobel	Botlek	637			637	
52	The Netherlands	AkzoNobel	Delfzijl	121			121	
54	The Netherlands	Sabir	Bergen op Zoom	89			89	
<b>The Netherlands Total</b>				<b>847</b>	<b>0</b>	<b>0</b>	<b>847</b>	<b>0</b>

Country	Company	Site	Nameplate Capacity (000 tonnes chlorine)	Hg	D	M	Others
55	Norway	Borregaard	Sarpsborg	46		46	
56	Norway	Elkem	Bremanger	10		10	
57	Norway	NOVYN	Rafnes	280		280	
<b>Norway Total</b>				<b>336</b>	<b>0</b>	<b>0</b>	<b>336</b>
58	Poland	PCC Rokita	Brzeg Dolny	150		150	
60	Poland	Anwil	Wloclawek	214		214	
<b>Poland Total</b>				<b>364</b>	<b>0</b>	<b>0</b>	<b>364</b>
62	Portugal	CUF	Estarreja	122		78	44
<b>Portugal Total</b>				<b>122</b>	<b>0</b>	<b>0</b>	<b>78</b>
91	Romania	Oltchim	Rimnicu Valcea	105		105	
92	Romania	Chimcomplex	Borzesti	96		96	
<b>Romania Total</b>				<b>201</b>	<b>0</b>	<b>0</b>	<b>201</b>
63	Slovak Republic	Fortischem	Novaky	76	76		
<b>Slovak Republic Total</b>				<b>76</b>	<b>76</b>	<b>0</b>	<b>0</b>
88	Slovenia	TKI Hrastrnik	Hrastrnik	16		16	
<b>Slovenia Total</b>				<b>16</b>	<b>0</b>	<b>0</b>	<b>16</b>
64	Spain	Electroquimica Onubense	Huelva/Palos	48	48		
65	Spain	Ercros	Sabinanigo	30		30	
66	Spain	Ercros	Vilaseca	190	135	55	
67	Spain	Electroquimica de Hernani	Hernani	30		30	
68	Spain	ELNOSA	Pontevedra/Lourizan	34	34		
69	Spain	Ercros	Flix	78	78		
70	Spain	Quimica del Cinca	Monzon	38		38	
71	Spain	NOVYN	Martorell	218	218		
72	Spain	Solvay	Torrelavega	63	63		
<b>Spain Total</b>				<b>729</b>	<b>576</b>	<b>0</b>	<b>153</b>
75	Sweden	NOVYN	Stenungsund	120	120		
<b>Sweden Total</b>				<b>120</b>	<b>120</b>	<b>0</b>	<b>0</b>
77	Switzerland	CABB AG	Pratteln	47		47	
<b>Switzerland Total</b>				<b>47</b>	<b>0</b>	<b>0</b>	<b>47</b>
98	UK	Runcorn MCP	Runcorn	430		430	
85	UK	Brenntag	Thetford	7		7	
97	UK	Industrial Chemicals Ltd	West Thurrock	15		15	
<b>UK Total</b>				<b>452</b>	<b>0</b>	<b>0</b>	<b>452</b>
<b>GRAND TOTAL</b>				<b>12,055</b>	<b>2,113</b>	<b>1,688</b>	<b>8,008</b>
<b>PER PROCESS</b>				<b>17.4%</b>	<b>13.9%</b>	<b>66.0%</b>	<b>3.1%</b>

**Process**

Hg = mercury  
M = membrane  
D = diaphragm

\*Others\* include electrolysis of HCl to Cl<sub>2</sub>, ODC and or molten salt electrolysis

Non Euro Chlor members are indicated in *italics*

\* Total combined production capacity of the Tessenderlo site permit = 400 kt Cl<sub>2</sub>/yr



**“It’s always satisfying to see a dog leave the refuge and begin a happier chapter in its life – but I know its kennel will not be vacant for long...”**

Hypochlorite and other chlor-alkali chemicals help keep animal sanctuaries clean and their inhabitants healthy.

**“There is undoubtedly violence around, this is why we policemen have protective gear, but there is so much gratitude in the community. It really makes it easy to get out of bed in the morning...”**

Polycarbonate face shields and Kevlar® body armour are chlorine things.



**“Fighting fires is extremely intense. The level of pressure is equalled only by the sense of achievement...”**

Fire, heat, smoke and water are no match for polyurethane and polycarbonate materials, all based on chlor-alkali building blocks.

# Communication

## The “17 successes” Communication

Euro Chlor is pleased to announce the start of a new communications initiative that highlights the benefits that chlorine, caustic soda and hydrogen provide to European workers. Called the '17 successes' programme, over the next few years Euro Chlor will publish profiles of real people whose job is made safer, healthier or more efficient thanks to our products.

From the 2.7 million European firefighters protecting themselves with advanced polymers to the animal carers who keep shelters clean with our industries derived products, chlor-alkali chemistry helps in their success at work. Amongst a wide range of jobs, we will present 17 such biographies to commemorate chlorine's special position on the periodic table of elements. Discover the story of the fireman who is a hero to his son and the policeman's pride in serving his community, both supported by chlor-alkali chemistry! ■

17.  
successes



**17 successes:** A communications initiative highlighting the socio-economic contribution of the chlorine industry and the diverse applications of chlorine-derived products.

twitter: **181% increase** in followers in 2 years

f Reaching **2,000 people** during Technology Conference via facebook

## New science dossier: health implications of water chlorination

Euro Chlor has published a new Science Dossier on “Human health aspects of halogenated organic by-products from use of active chlorine”. This dossier reviews the health implications of those by-products that form when chlorine solutions are used for the disinfection of drinking water, swimming pools and in cleaning.

Some of the active chlorine used can react with organic materials to create disinfection by-products (DBPs). The health implications of DBPs have been of particular interest to health professionals and regulators due to concerns over their cancer and/or asthma causing potential.

This new dossier reviews over 140 scientific papers and emphasises that, with correct management and use of these essential biocides, such DBP formation can be minimised. It also agrees with the World Health Organisation, who emphasise that standards of microbial protection of potable water must not be compromised because of concerns about potential risks from DBPs.

The new Science Dossier can be downloaded from the Euro Chlor website and complements a 2010 document on the environmental impact of these by-products. ■



## Euro Chlor at international science conference in Brussels



Euro Chlor represented our industry in May 2017 at SETAC Europe; an annual international congress on environmental chemistry that brought together over 1,740 academics, regulators and industry people to discuss the latest scientific findings.

The 2017 edition took place in Brussels. Many of the presentations and posters highlighted current challenges in the regulatory assessment of persistent, bioaccumulative and toxic (PBT) substances: a key issue for some of our sector groups!

Euro Chlor again had a display where our scientific library was available for collection. Here, documents on research integrity, life-cycle assessment and chlor-alkali sustainability were particularly popular.

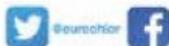
Next year's event will take place from 13-17 May 2018 in Rome. ■

## Social media activities expand to Facebook

Euro Chlor now has a presence on the world's largest social media platform, Facebook, on which 76 member companies and technical correspondents also appear. Euro Chlor's Facebook page allows people to read more about our members, discover our activities, view our videos and learn how chlorine things benefit their daily lives. The page is available at [www.facebook.com/eurochlor](http://www.facebook.com/eurochlor).

On Twitter, Euro Chlor continues to post twice a week on the six key areas (official positions, website promotion, science news, member news, earth days and a random fact on the 17<sup>th</sup> of the month).

Euro Chlor is also using social media at events. At the recent Technology Conference, an interactive wall was available where participants could see what people on social media were saying. They could also follow the meeting via the special conference hashtag (#eurochlor2017). Such activities effectively tripled our followers on Facebook, with our messages reaching nearly 2,000 people in just 3 days. ■



## Euro Chlor's YouTube Channel's continuing popularity

Two new videos have been released in the last year.

The first shows **animated avatars** of the Euro Chlor Executive Director and Chairman as they describe the essential nature of chlor-alkali chemistry and the challenges our industry faces. It also acts as a springboard for the **17 successes initiative**; demonstrating just how many European jobs rely on chlor-alkali chemistry for safety and efficiency.



The second video is a training video that details how, due to their production method, **chlorinated alkanes** are unlikely to contain SCCP impurities (a phased-out substance in Europe). This will help authorities to better understand these versatile chemicals.

These new releases complement others on the channel, including the popular **documentary "A world of opportunities"**, which describes the everyday benefits of chlor-alkali chemistry. This particular video has had nearly 4,000 views since its release! ■

## Corporate website a key communication tool

Last year, the Euro Chlor corporate website received over 208,000 page views across 86,000 separate visits. People are also accessing the site using modern smart phone and tablet technologies (22% and 4% of visitors respectively) after the site was optimised for mobile devices around two years ago.

The most popular pages are in “The chlorine universe” chapter which have popular animations of the three production process technologies. The communications corner is the second most consulted (13,000 views/year).

Through our site’s ‘download centre’, thousands of downloads of our publications occur each year. Every month, nearly 100 visitors learn how they can produce small quantities of chlorine in their home kitchen. ■

**208,000 pages**  
are viewed each year

50% of all visitors  
are **younger**  
than **34 years**

**7,000** Euro Chlor **publications**  
downloaded per year



## The Euro Chlor Federation

In Europe, 35 Members of Euro Chlor produce chlorine at 65 manufacturing locations in 21 countries. About 7,500 jobs are directly related to European production sites of chlorine and its co-product caustic soda. When the numerous downstream activities are also taken into consideration, like the PVC sector, polyurethane production, the aluminium sector, construction etc., the sum of direct and indirect employment is many times higher.

In addition to the chlor-alkali producers, Euro Chlor also has 57 Associate Members and 55 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.

Euro Chlor was founded 64 years ago (1953) as a production-oriented, technical organization. The association was officially named “Euro Chlor” 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 based arguments coupled with continual health, safety and environmental improvements, which are complemented by open and transparent communications with all stakeholders. One of Euro Chlor’s major objectives is to obtain the full recognition of the benefits of chlorine chemistry. ■

Euro Chlor members  
operate **65**  
manufacturing locations  
in **21** countries

## Management Committee

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Chairman: **Dieter Schnepel**

Dow Deutschland Anlagengesellschaft mbH

Vice Chairman: Vacancy

**Jürgen Baune** (Akzo Nobel Industrial Chemicals BV)

**Wouter Bleukx** (Inovyn)

**Hanno Brümmer** (Covestro AG)

**Agustín Franco Blasco** (Ercros SA)

**Jaroslav Pancek** (PCC Rokita SA)

**Stefan Plaß** (Evonik Performance Materials GmbH)

**Hans-Christoph Porth** (VESTOLIT GmbH)

**Daniel Tamchyna** (Spolek pro chemickou a hutni výrobu, a.s.)

**Jacques Terjan** (Vencorex)

**Johan Van Den Broeck** (VYNOVA International)

**Thomas Wehlage** (BASF SE)

**Michael Winhold** (Vinnolit GmbH)

## Full Member Companies

---

Akzo Nobel Industrial Chemicals BV

Altair Chimica SpA

Anwil SA

Arkema SA

BASF SE

Borregaard AS

BorsodChem Zrt

CABB AG

CABB GmbH

Chimcomplex SA

Covestro AG

CUF - Químicos Industriais SA

Donau Chemie AG

Dow Deutschland Anlagengesellschaft mbH

Electroquímica de Hernani

Electroquímica del Noroeste SA

Electroquímica Onubense SL

Ercros SA

Evonik Performance Materials GmbH

Ing. Luigi Conti Vecchi SpA

INOVYN ChlorVinyls Limited

International Chemical Investors Group (ICIG) – *including*

*HydroChem Italia Srl, PPC - Potasse et Produits Chimiques*

*SAS, and VYNOVA International*

Kemira Oyj

MSSA SAS

PCC Rokita SA

Produits Chimiques de Loos

Produits Chimiques d'Harbonnières

Química del Cinca SA

Società Chimica Bussi SpA

Solvay

Spolana a.s.

Spolek pro chemickou a hutni výrobu, a.s. (Spolchemie)

Vencorex

VESTOLIT GmbH

Vinnolit GmbH

## Associate Member Companies

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Adama Makhtshim Ltd  
Alchemist International Ltd  
ANE - Asociación Nacional de Electroquímica  
Angelini A.C.R.A.F. SpA  
AQUAGROUP AG  
Arch Chemicals SAS  
Asahi Kasei Chemicals Corp.  
Atana Limited  
Axiall, LLC  
Banner Chemicals Limited  
BARCHEMICALS SRL  
Biomca Química SL  
Bochemie Inc  
Brenntag UK Ltd  
BWT AG  
Caffaro Brescia SRL  
CBee Europe Ltd  
Chemieanlagenbau Chemnitz GmbH  
Chemoform AG  
CIA - Chemicals Industries Association Ltd  
De Nora Deutschland GmbH  
essencia ASBL  
EuSalt aisbl – European Salt Producers' Association  
Fater SpA  
FEDERCHIMICA - Federazione Nazionale dell' Industria Chimica  
GAZECHIM  
GHC Gerling, Holz & Co Handels GmbH  
Haixing Eno Chemical Co., Ltd.  
HELM AG  
IKEM - Innovation and Chemical Industries in Sweden  
Industrial Chemicals Limited  
INQUIDE SA  
K+S Entsorgung GmbH  
Kapachim SA  
Leuna Tenside GmbH  
LOMBARDA H Srl  
Lonza AG  
Nankai Chemical Industry Co., Ltd  
NCP Chlorchem (PTY) Ltd  
Nippon Soda  
Novacid  
Olin (Blue Cube Operations, LLC)  
SCHP - Association of Chemical Industry of the Czech Republic  
Scienceindustries  
Sinopec Jiangnan Salt & Chemical Complex  
Sojitz Europe plc  
Syngenta Crop Protection Monthey SA  
Syngenta Ltd  
Teijin Aramid BV  
ThyssenKrupp Uhde Chlorine Engineers GmbH  
Tosoh Corporation  
Unilever R&D Vlaardingen  
VAN DEN HEUVEL WATERTECHNOLOGIE BV  
VCI - Verband der Chemischen Industrie e. V.  
Veltek Associates, Inc.  
Vinyl Vegyipari KFT  
VNCI - Vereniging van de Nederlandse Chemische Industrie

# Euro Chlor

## Technical Correspondents

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**AGC Chemicals Europe Ltd.**  
[www.agcce.eu.com](http://www.agcce.eu.com)

**Applitek NV/SA**  
[www.applitek.com](http://www.applitek.com)

**BATREC INDUSTRIE AG**  
[www.batrec.ch](http://www.batrec.ch)

**BELL-O-SEAL VALVES P. LIMITED**  
[www.bellowseal.com](http://www.bellowseal.com)

**Blackhall Engineering Limited**  
[www.shawvalves.co.uk](http://www.shawvalves.co.uk)

**Bluestar (Beijing) Chemical Machinery Co Ltd.**  
[www.beijing-bluestar.com](http://www.beijing-bluestar.com)

**Chemtec UK Limited**  
[www.rmarmstrong.com](http://www.rmarmstrong.com)

**CHLORAN CHEMICAL PRODUCTION CO. (CCPC)**  
[www.chloran.com](http://www.chloran.com)

**CONVE & AVS INC.**  
[www.conveavs.com](http://www.conveavs.com)

**Coogee Chlor Alkali Pty Ltd.**  
[www.coogee.com.au](http://www.coogee.com.au)

**Descote**  
[www.descote.com](http://www.descote.com)

**DSD Chemtech Projects & Services GmbH**  
[www.dsd-chemtech.com](http://www.dsd-chemtech.com)

**Econ Industries GmbH**  
[www.econindustries.com](http://www.econindustries.com)

**ERAMET SA**  
[www.eramet.fr](http://www.eramet.fr)

**Eynard Robin**  
[www.groupe.eynardrobin.com](http://www.groupe.eynardrobin.com)

**Fariman Petrochemical Industries**  
[www.iranfpc.com](http://www.iranfpc.com)

**Flowstream International Limited**  
[www.flowstream.co.uk](http://www.flowstream.co.uk)

**F.M.I. SPA UNIPERSONALE**  
[www.fmi-spa.com](http://www.fmi-spa.com)

**Garlock GmbH**  
[www.garlock.eu.com](http://www.garlock.eu.com)

**Huntsman (Europe) BVBA**  
[www.huntsman.com](http://www.huntsman.com)

**ISGEC**  
[www.isgec.com](http://www.isgec.com)

**IXOM (formerly ORICA Chemicals)**  
[www.ixom.com](http://www.ixom.com)

**Jiangsu Ancan Technology Co., Ltd.**  
[www.ancan-cn.com](http://www.ancan-cn.com)

**Kronos Europe NV**  
[www.kronostio2.com](http://www.kronostio2.com)

**KSB-SISTO ARMATUREN SA**  
[www.sisto.lu](http://www.sisto.lu)

**KUROTEC-KTS Kunststofftechnik Stade GmbH**  
[www.kurotec-kts.de](http://www.kurotec-kts.de)

**Lubrizol Advanced Materials Europe BVBA**  
[www.lubrizol.com](http://www.lubrizol.com)

**Melbourne Water**  
[www.melbournewater.com.au](http://www.melbournewater.com.au)

**MERSEN PGY SAS**  
[www.mersen.com](http://www.mersen.com)

**Micro Bio Ireland Ltd.**  
[www.micro-bio.ie](http://www.micro-bio.ie)

**Nirou Chlor Co.**  
[www.nirouchlor.com](http://www.nirouchlor.com)

**Nuberg Engineering Limited**  
[www.nubergindia.com](http://www.nubergindia.com)

**Occidental Chemical Belgium BVBA AZ**  
[www.oxy.com](http://www.oxy.com)

**PERMASCAND AB**  
[www.permascand.com](http://www.permascand.com)

**Pfeiffer Chemie-Armaturenbau GmbH**  
[www.pfeiffer-armaturen.com](http://www.pfeiffer-armaturen.com)

**Phoenix Armaturen-Werke**  
[www.phoenix-armaturen.de](http://www.phoenix-armaturen.de)

**Powell Fabrication & Manufacturing Inc.**  
[www.powellfab.com](http://www.powellfab.com)

**PRINCE RUBBER & PLASTICS CO., INC.**  
[www.princecp.com](http://www.princecp.com)

**PROFILCO BV**  
[www.profilco.nl](http://www.profilco.nl)

**R2**  
[www.r2000.com](http://www.r2000.com)

**Remondis QR GmbH**  
[www.remondis-qr.de](http://www.remondis-qr.de)

**RESTORE**  
[www.restore.eu](http://www.restore.eu)

**Richter Chemie-Technik GmbH**  
[www.richter-ct.com](http://www.richter-ct.com)

**National Institute for Public Health and the Environment (RIVM) – Centre for External Safety (CEV)**  
[www.rivm.nl](http://www.rivm.nl)

**SALCO PRODUCTS INC.**  
[www.salcoproducts.com](http://www.salcoproducts.com)

**Sasol Polymers**  
[www.sasol.com](http://www.sasol.com)

**SAVINO BARBERA SRL**  
[www.savinobarbera.com](http://www.savinobarbera.com)

**Senior Ermeto**  
[www.senior-aerospace-ermeto.com](http://www.senior-aerospace-ermeto.com)

**SIEM - SUPRANITE**  
[www.siem.fr](http://www.siem.fr)

**SITA REKEM**  
[www.sita.fr](http://www.sita.fr)

**STEULER-KCH GMBH**  
[www.steuler-kch.de](http://www.steuler-kch.de)

**Technip France**  
[www.technip.com](http://www.technip.com)

**Tronox Pigments (Holland) BV**  
[www.tronox.com](http://www.tronox.com)

**W.L. Gore & Associates GmbH**  
[www.gore.com/sealants](http://www.gore.com/sealants)

**Xomox International GmbH & Co. OHG – CRANE ChemPharma & Energy**  
[www.cranecpe.com](http://www.cranecpe.com)

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Euro Chlor provides a focal point for the European chlor-alkali industry's drive to achieve a sustainable future through economically and environmentally sound manufacture and use of its products. Based in Brussels, 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. Furthermore, Euro Chlor communicates in a transparent way with all stakeholders and systematically highlights the benefits of chlorine based chemistry as well as the socio-economic importance of the chlor-alkali sector.

Euro Chlor represents 35 full member companies producing chlorine at 65 manufacturing locations in 21 European countries. About 7,500 jobs are directly related to these European production sites of chlorine and its co-product caustic soda.



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[www.eurochlor.org](http://www.eurochlor.org) [www.chlorinethings.eu](http://www.chlorinethings.eu)

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