

The Newsletter of the European Solvents Industry Group

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VOC REACTIVITY – heading towards better regulation

Ground level ozone comes from a reaction between nitrogen oxides (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. In the complex atmospheric processes that lead to ozone formation, different types of VOCs have different potentials for creating ozone. This is called VOC reactivity or photochemical reactivity.

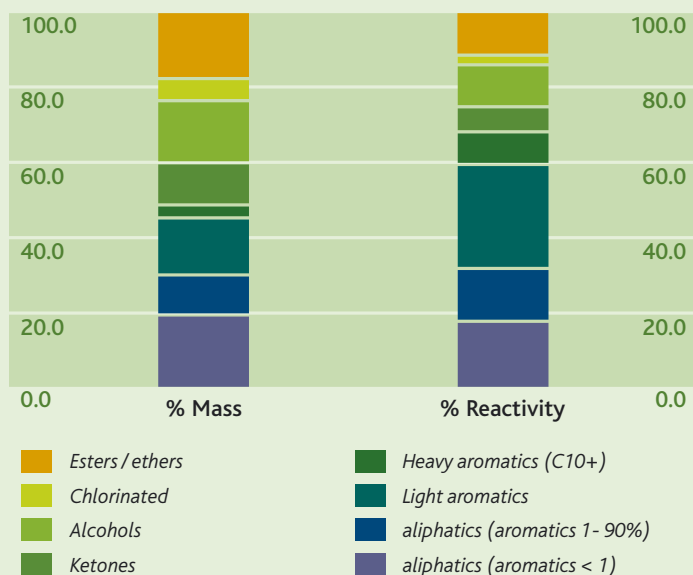


Chart derived from CEFIC solvents statistics, using Derwent's POCPs (Derwent et al., Atmospheric Environment Vol. 32 No. 14/15 1998)

The higher the reactivity of a VOC the greater its potential to form ozone

Reactivity is a measure of the potential for a particular VOC to form ozone. Over the past forty years, VOC reactivity has been the subject of intense study. It has been shown to be a good way to regulate VOCs, particularly in areas where man-made VOCs play a significant part in ozone formation. In these areas, using less reactive VOC products could be more effective than limiting VOC emissions without distinguishing between VOC species as is the case today. Is this a potential consideration for future European Air Quality measures?

The European institutions have already agreed a number of measures to limit NO_x and VOC emissions across Europe. However, the current "mass-based legislation" does not distinguish between the reactivity of different VOCs, although some can be ten times more reactive than others. If further VOC reduction measures are to be considered, then replacing highly reactive VOCs with less reactive VOCs could be a more focused, cost-effective approach. The concept of reactivity can be com-

pared to other measurements, such as the ozone depletion potential or global warming potential, which are used in other pieces of EU environmental legislation aimed at those chemicals which pose the highest risk.

A focused approach to VOC control

Ranking VOCs according to their reactivity is a complex process. A compound's reactivity is affected by all sorts of factors, including temperature, the amount of sunlight, and the concentration of NO_x and other VOC compounds. Weather is also an important factor. So how can the replacement of VOCs be prioritised?

There are two common scales for comparing the reactivity of different VOCs. The UK-developed Photochemical Ozone Creation Potential (POCP) and the US Maximum Incremental Reactivity (MIR). There is little variation in the rankings of VOCs amongst these two most commonly used scales. It is possible to identify which VOC groups are highly reactive. For example, light aromatic hydrocarbons could be replaced by less reactive products. Further research would lead to the development of a scale, representing European conditions, that could be an effective tool to develop European policy.

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An effective approach to reduce ozone emissions

Reducing the ozone forming potential of a formulation, by substituting highly reactive VOC products, will almost always be effective in reducing ozone formation. This is not so with mass-based VOC reductions. Many formulations work by using solvents, for example to dissolve a resin or emulsify dirt. Mass-based VOC reductions could limit the flexibility of these formulations and force formulators to move from lower to higher solvency products. Some of the VOCs that offer the most efficiency to the formulator also have the highest reactivity to form ozone.

The California Air Resources Board has recently introduced a regulation based on reactivity. This regulation is designed to reduce the ozone emissions from aerosol coating products. It was developed in response to industry concerns that the proposed VOC limits were not practically achievable. Industry had found that to lower the VOC content in some of

their products, formulators would have had to switch from lower solvency, lower reactivity solvents to higher solvency, light aromatic products that have higher reactivity. Paradoxically, although the VOC content of the formulation would be reduced, the ozone forming potential would actually be increased. The regulation promoted the substitution of highly reactive solvents by lower reactivity ones, rather than restricting the actual amount of VOCs allowed. This approach gave formulators greater flexibility, while at the same time contributed to a more effective way to reduce ozone formation.

Reactivity offers the potential for a more effective, and focused approach to VOC controls than traditional mass-based limits. **It is now time for industry to work with scientists and regulators to make reactivity a practical option for European VOC control in the future.**

REDUCING SOLVENT EMISSIONS – at the forefront of regulations

Industry is now gearing up for a new phase in VOC regulation, after the adoption of the Solvent Emissions Directive (the so-called VOC Directive – 1999/13/EC) and the National Emissions Ceilings Directive (the NECD – 2001/81/EC). This second phase is the analysis of VOC emissions status that has started with the Clean Air For Europe (CAFE) programme. The outcome of CAFE will serve as a guideline for future air quality legislation.

The European Solvents Industry Group (ESIG) and the European Solvents VOC Co-ordination Group (ES-VOC-CG) will continue their efforts to find as cost-effective solutions as possible that help reduce the potential impact of solvents on the environment. Since 1990, solvent-related VOC emissions have already been cut by 50%¹.



Implementing the Solvent Emissions Directive

The Solvent Emissions Directive was adopted in March 1999

- it limits solvent emissions in a number of industrial sectors, but does not limit their use as such
- it outlines the VOC levels which solvents-using industries can emit per installation, but is flexible about how this may be applied to reduce emissions
- it allows installations to choose the best emission reduction method for their process

Every three years, EU Member States have to provide information to the EU Commission on their implementation status (the compliance deadline is October 2007). The Commission expects to publish its first report in September 2005.

Industry can also play its part by providing data on its progress to date and ESIG and ES-VOC-CG plan to collect qualitative information among their members to provide this industry data.

CAFE has shown that existing legislation will deliver most of the environmental benefit of the next few years. Industry and regulators should therefore focus their efforts on fully and consistently implementing current legislation.

Calls to reintroduce information forum

In 2000, the French-German Institute for Environmental Research, under the sponsorship of the EU Commission, launched an Internet-based forum to exchange information about the use of organic solvents and their potential substitution among EU Member States, industry and the Commission itself.

ES-VOC-CG was an active contributor to this forum, which included information to help solvent users implement the Directive, such as:

- New technologies
- Performing abatement techniques
- Good practice guides about the responsible use and application of solvents
- Case studies about process changes and product improvement

"The forum was an excellent initiative to facilitate and accelerate the implementation of a major piece of legislation. It was a unique tool to promote the exchange of information between regulators and industry and a model for future regulatory activities. It was closed before it could highlight its benefits" said Pierre de Kettenis, Secretary General of ES-VOC-CG.

Unfortunately, due to budget restrictions, the website was closed down in 2003. **ESIG and ES-VOC-CG urge the Commission to reintroduce this tool or discuss ways to revive the information that the original website contained.**

The NEC Directive

The National Emission Ceilings Directive was adopted in June 2001

- it limits the emission levels of VOCs and other pollutants per country
- it requires Member States to adopt national legislation and draw up national plans to achieve the required emission ceilings
- it requires Member States to draw up emission inventories and regularly adjust emission forecasts for 2020

In March 2005, IIASA (the International Institute for Applied Systems Analysis) issued a 'baseline scenario' predicting emission levels for different pollutants in 2010 and 2020. This was based on initial VOC emissions projections calculated using the RAINS² model.

The baseline scenario estimated that in 2020 total VOC emissions would amount to 5 million tons, of which 2 million tons would result from the

use of solvents. Interestingly, this would then mean that, in comparison, natural VOC emissions would exceed man-made emissions.

The Solvents Emissions Directive has already made a key contribution to reducing VOCs, and is expected to continue to do so at a national level to achieve NEC requirements. Despite this, the persistent increase in background ozone levels, (see article below) although largely due to intercontinental transport of pollution from outside the EU, may encourage the EU Commission to propose revising the emission ceilings already adopted for ozone precursors. The NEC directive will be revisited in 2006.

Updating VOC emission inventories

Some uncertainties have been identified in the RAINS model and the IIASA baseline scenario. Understanding the relative contribution of solvent-related VOC emissions to ozone formation will be an important element to developing a more appropriate environmental regulation. As will, analysing and adjusting other factors, such as cost-effectiveness, environmental benefits, harmonisation of implementation and communication of measures.

ESIG and ES-VOC-CG are working with individual EU Member States to develop a working programme that will contribute to accurately assessing national emission inventories and the role of solvents in national emission scenarios to support a revised NEC.

¹ Solvents industries' estimation

² RAINS is a multi-pollutant multi-effect model developed by IIASA, that is used by the European Commission to support the design of EU air quality policies. It combines data on emission quantities and sources, atmospheric chemistry, environmental impacts and emission control options with their associated costs.

BACKGROUND OZONE

The level of background ozone has been the subject of scientific debate for many years. While there is no firm conclusion - as levels vary according to location, season, and time - it is apparent that levels are rising.

Background ozone is generally defined as the amount of ozone in a given area that cannot be attributed to local man-made sources.

Within the current debate on the improvement of air quality in Europe, background ozone has an important role to play. This is because background ozone represents the lower level that could be achieved by eliminating local man-made VOCs and NO_x (referred to as ozone precursors).

The four sources of background ozone are:

1. Reactions of natural ("biogenic") VOCs with natural NO_x
2. Ozone production from natural methane and NO_x
3. Transport of stratospheric ozone through the free troposphere to ground level
4. Long range transport of ozone from distant pollution sources which, in the case of the EU, means Asia and North America

Background Ozone

Recent scientific studies¹ have shown that background ozone in Europe increased by 8 ppb between 1987 and 2003, with a reported average annual increase of 0.5 ppb.



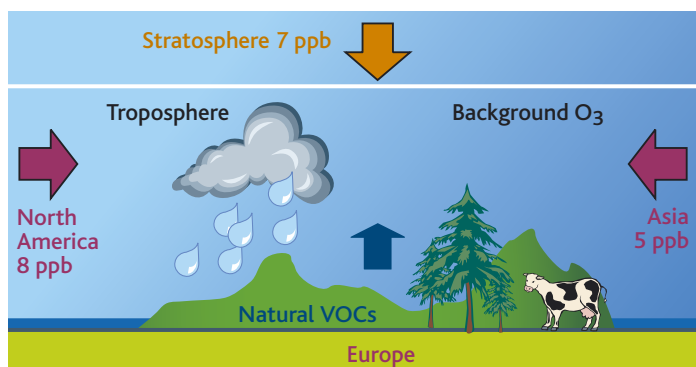
In addition, ozone peaks have been falling due to a decline in ozone precursors, mirroring industry's and EU policy makers' efforts to reduce emissions.

"The average global background surface ozone concentration is expected to be in the range of 35 - 48 ppb by 2040..."². CAFE, the current EU air quality programme, uses 35 ppb as its background level. However, natural levels vary from location to location.

The gap between ozone regulatory standards and actual background ozone levels is decreasing every year. Improving air quality efficiently is a growing world-wide challenge.

The movement of air pollution from one region to another (or trans-continental pollution), which is not yet subject to policy regulation, is increasingly becoming a factor that can no longer be ignored especially as EU policy-makers are reviewing new legislative directions. To develop a better understanding of the growing scientific evidence on the importance of the transport of pollutants, the Executive Body of the UNECE Convention on Long Range Transboundary Air Pollution has

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Main sources of European ozone background³

established a Task Force on Hemispheric Transport of Air Pollution, co-chaired by the European Commission and the US EPA (see www.htap.org). Will this lead to Europe, the US and Asia considering the development of a harmonized approach to ozone control?

For more information related to this topic, please visit the ESIG website at: www.esig.org

¹ Simmonds et al (2004), Vingarzan (2004), EMEP work (2004), ISBN 82-7144-032-2

² Vingarzan (2004)

³ Source: Derwent et al., "Intercontinental transport and the origins of the ozone observed at surface sites in Europe", *Atmosph. Environment* 38 (2004).

PRODUCT STEWARDSHIP INITIATIVES

Helping solvent users to maintain the highest levels of safety and health standards remain a high priority for ESIG. Here are some current initiatives:

Solvents "Do's and Don'ts" Poster – extending its reach

Following the successful pilot rollout of the "Do's and Don'ts" packs in 2004, ESIG is now planning to distribute the poster to several thousand more companies all over Europe. The poster provides simple, visual messages about how to handle solvents safely in the workplace. Many users display the poster in the workplace as a daily reminder of these simple, but effective messages to safety.

Update of the ESIG Exposure Database

ESIG has been an advocate of data collection about workplace solvents exposure. In fact, the first ESIG solvents exposure database, containing more than 100 references about 69 solvents, was compiled in 1999.

The data has been an invaluable reference source for the HPV (High Production Volume) Chemical programme and selected European Risk Assessments. ESIG industrial hygiene experts are currently reviewing the literature and data collected from 1999 to 2005 to update the current data references.

Building on an ESIG award winner project

In 2004, Kartoflex, the Dutch association of Cardboard and Flexible Packaging, was recognised for its contribution to "workplace improvement" (2004 ESIG Awards). Kartoflex and ESIG are now exploring avenues to expand the tools and materials developed by the Dutch printing sector to other countries and/or to other solvent industry sectors. The objective of this exercise is to identify practical ways for solvent users to reduce exposure to solvent vapours.

If you would like to receive additional information on any of the above projects, please contact ESIG at esig@cefic.be

CALENDAR

June 2005 - January 2006

UK Presidency of the European Union

June – December

National Emission Ceilings (NEC) revision – review of data and modelling by IIASA

July 1st

Adoption by the Commission of the proposal on the Thematic Strategy on Air Pollution (CAFE programme)

End September

Commission report on SED implementation progress

September 27-29

Eurocoat 2005 (International Fair in Coating in Southern European markets) in Lyon (France) - <http://www.eurocoat-expo.com/main.cfm>

September – December

Debate and conclusions of the Council and the European Parliament on the CAFE (Clean Air for Europe) Thematic Strategy

October

Deadline for EU Member States to transpose the "Paint Directive" (2004/42/CE)

October 24-25

European Responsible Care Conference in Dublin (Ireland)

October 25

IPPC in practice workshop organized by CEFIC in Brussels (Belgium)

End October

EIS-ChemRisks Conference organized by the Joint Research Centre in Brussels (Belgium) - <http://www.jrc.cec.eu.int/eis-chemrisks/>

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