concawe

40

1963-2003

review

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Celebrating 40 years of CONCAWE

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Celebrating 40 years of CONCAWE

Contents

On the occasion of CONCAWE's 40th anniversary we have dedicated this issue to articles on each of our major fields of activity.

CONCAWE—forty years on

It is now 40 years since a small group of leading oil companies decided to pool their resources and expertise to deal with the emerging environmental issues associated with oil refining in Europe. In the early sixties, while the oil industry was experiencing very rapid growth, environmental issues were gaining increasing public attention. An oil industry body, supported by specialist scientific staff, was deemed to be the ideal instrument to undertake professional analysis of perceived problem areas and to define the steps necessary to address them. Thus in 1963 CONCAWE was born, its name, the contraction of CONservation of Clean Air and Water in Europe, illustrating the major areas of concern at the time.

Forty years on, air and water quality are still very much on the environmental agenda, but they have been joined by many other issues. What were once local issues have now become national, continental and, in many cases global, and the perception of our environment is becoming wider and more complex. The scope of CONCAWE's activities has gradually expanded in line with societal concerns, to embrace a broad range of subjects related to health and safety as well as environment. Today's preoccupations include such questions as the overall impact of emissions on human health, climate change, and the role and environmental impact of alternative fuels.

From the outset CONCAWE has been committed to supporting the application of three key principles—transparency, sound science and cost-effectiveness. CONCAWE endeavours to ensure that new legislation affecting our industry is developed in the light of these principles. The articles in this anniversary issue of the *Review* give many examples where CONCAWE's work on key environmental issues has contributed in no small way towards this aim.

Each decade brings its challenges and our industry is now faced with major European initiatives such as the REACH chemicals control legislation, the Clean Air For Europe programme and the recently launched SCALE programme. Such topics (covered in the following articles) are far-reaching and their impact is becoming increasingly recognised by society. The CONCAWE organisation provides the industry with a convenient and efficient platform from which to address these emerging issues and to seek solutions that meet societal aspirations, are cost-effective and allow our industry to continue to thrive.

CONCAWE brings together the expertise of the member companies, the dedicated permanent staff and numerous external experts. At any given time up to three hundred specialists are involved in the various CONCAWE task forces and work groups. The oil industry is fortunate that CONCAWE is in a position to continue, on its behalf, the skilful work that has been its trademark over its forty years. While legislators are being informed by well-targeted and sound research undertaken or coordinated by CONCAWE, I believe the industry remains in safe hands.

David Kent-Lemon
Chairman, CONCAWE Communications Group

Air quality

CONCAWE's contribution to an area of continued legislative focus

At the start of CONCAWE's life in 1963, air quality was seen mainly as a 'local air' issue and the bulk of legislation in force was based on the prevention of nuisance. How things have changed! Now we have legislation on air-related issues that are regional, continental and even global, such as ozone level depletion and climate change. In Europe, the first EEC Action Programme started in 1973, ten years after CONCAWE's inception. This was followed in 1987 by the Single European Act which confirmed the Community's competence for the environment. In 1993, the European Commission introduced its Fifth Action Programme on the Environment—'Towards Sustainability', and over the past ten years the pace has been maintained.

Since CONCAWE celebrated its 30th anniversary, a significant amount of air quality legislation has been passed at the European level. How has CONCAWE contributed to the various initiatives? It was early in the 1990s that CONCAWE began to encourage a move away from 'technology driven' and towards 'environmental quality driven' approaches to air-related issues. An early example of this, with respect to urban air quality, was our technical input to the European Commission on the updating of the ***Gasoil Directive*** (93/12/EEC). This involved air quality modelling of two example cities (London and Cologne), along with an assessment of the refining implications of lower sulphur gasoil. The study demonstrated that a sulphur content below 0.2% for heating oil was not justified since air quality targets for SO_2 would be met by the increased use of natural gas and the impact of other already legislated initiatives (e.g. the ***Large Combustion Plant Directive***). This study also demonstrated the 'environmental tensions' that arise in the refining sector when lower sulphur products are required i.e. the resulting increase in energy consumption and CO_2 emissions—a recurring theme in such studies since that time.

In the global arena, CONCAWE's studies in support of the discussion within the International Maritime Organization (IMO) on emissions from international shipping made a significant contribution to the establishment of an SO_2 Emissions Control Area (SECA) concept embodied in Annex VI to MARPOL. This represented an important shift away from the 'blunt instrument' of a stringent global sulphur cap on ships' fuels. CONCAWE was able to demonstrate that such a measure would not be justified on either environmental or cost-effectiveness grounds.

These two examples were the 'forerunners' of the approaches that were to underpin large and important programmes such as Auto/Oil I and II and the current CAFE programme. Over the past ten years CONCAWE has continued to play its role as a contributing stakeholder by providing technical, scientific and economic information on a large number of legislative initiatives. The content of this input has been shaped by CONCAWE's conviction that not only industry, but society as a whole, is best served by air quality legislation that is based on achieving established air quality targets in a cost-effective manner.

At this landmark in our history, it is perhaps worthwhile reflecting on some of the Directives (more than 20) and Protocols that have come into force in the past decade.

The first was the ***Control of VOCs from Storage (Stage 1) Directive*** (94/63/EC.) brought into force at the end of 1995. Its purpose was to reduce hydrocarbon emissions (VOCs) from the gasoline retail network. This was a technically complex Directive and CONCAWE provided extensive assistance to the EU Commission services during the development phase. We also contributed to crucial debates such as the relationship between emission limits, cost and energy consumption. CONCAWE's access to the detailed data on the number of storage depots, retail service stations and delivery truck fleets in the EU also provided vital input into the design of the implementation phases of the Directive. By the end of

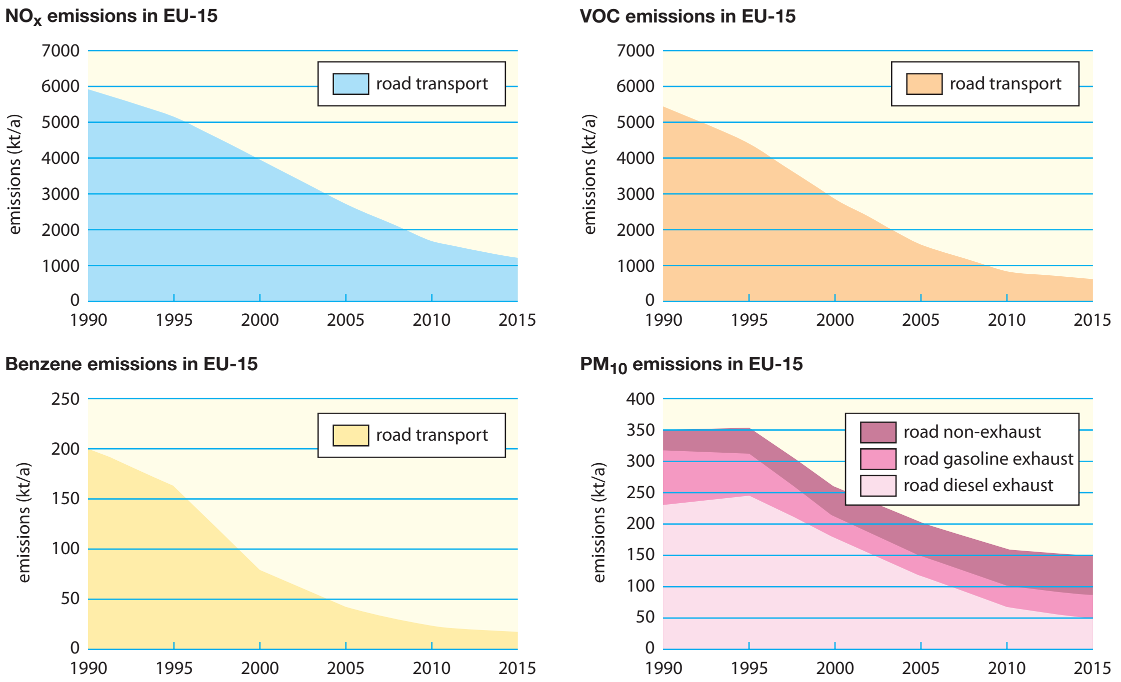


Figure 1

Actual and forecast levels of regulated emissions based on the impact of 'already mandated' measures in the EU.

These emission projections were made by the Commission's consultants as part of the Auto/Oil II Programme.

2001, more than 70% of service stations were fully equipped with 'Stage 1' vapour recovery facilities.

The ***Air Quality Framework Directive*** (96/62/EC), which came into force in November 1996, paved the way for the Commission to adopt a more comprehensive environmental quality approach to future policy development. Its purpose was to establish a framework for the setting and attainment of air quality objectives. Under this Framework Directive the Commission has proposed four Daughter Directives, the last of which has just been published. These Directives set limit values and alert thresholds for a list of air pollutants that include sulphur dioxide, nitrogen dioxide, particulate matter, lead, ozone, benzene, carbon monoxide and (in the 4th Directive) target levels for heavy metals and polycyclic aromatic hydrocarbons (PAHs).

The Commission's acidification/ozone strategy aimed to address the problems of acidification, eutrophication and regional ozone. This major initiative began in the mid-1990s and culminated in the ***National Emission Ceiling Directive*** (2001/81/EC). It was also 'effects based' and benefited from the extensive work/tools/databases of the UNECE which underpinned the development of the second ***Sulphur Protocol*** (Oslo Protocol) and of the multi-pollutant/multi-effects '***Gothenburg Protocol***'.

The 2001 revision of the ***Large Combustion Plant Directive*** (2001/80/EC) fixed new limit values for power stations and large furnaces and boilers while the ***National Emissions Ceilings Directive*** (2001/81/EC) aimed at limiting SO_2, NO_x, VOCs and NH_3.

Road transport came sharply into focus during the 1990s, as a result of growing concerns over urban air quality and the anticipated large increase in the number of vehicles. During this period, the Commission moved away from the technology-driven approach of previous Directives to an environmental quality-driven approach. This new way of thinking was applied in the two European Auto/Oil Programmes.

CONCAWE was a major stakeholder in both Auto/Oil programmes which, as a so-called 'Tripartite Initiative', involved close cooperation between the oil industry, the auto industry and the Commission. Throughout this work, our in-house modelling capabilities proved to be invaluable in understanding the impact of various emissions reduction scenarios on future air quality levels in

Air quality

CONCAWE's contribution to an area of continued legislative focus

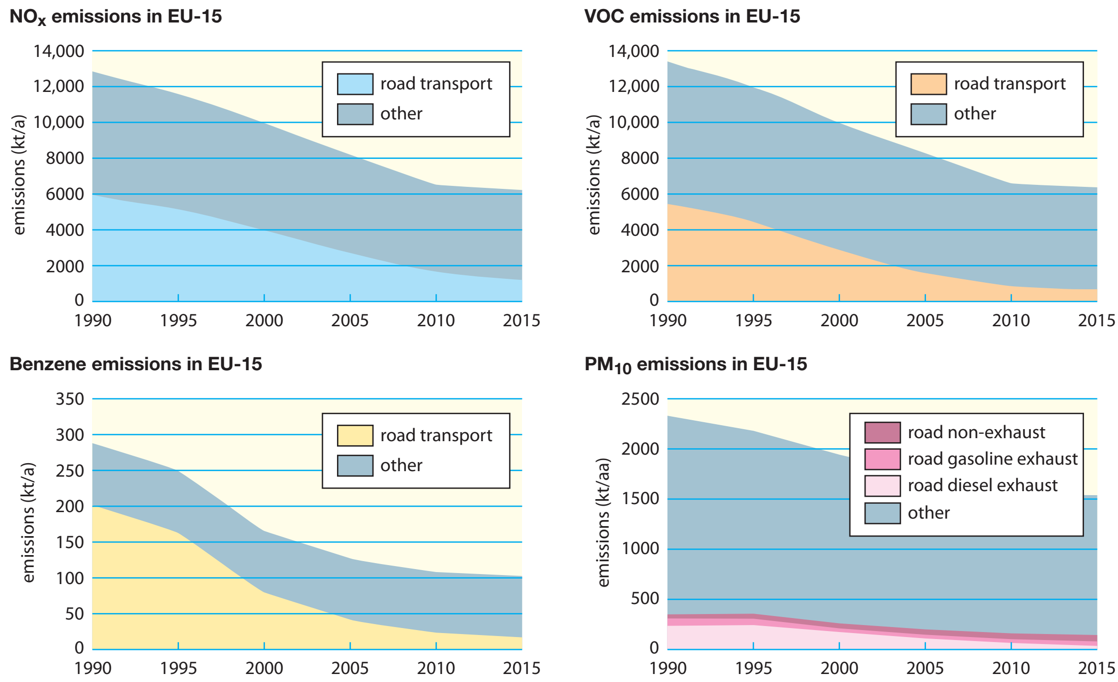


Figure 2
By 2010, emissions from transport will have been dramatically reduced, bringing other sources into focus.

Europe. The outcome of the programmes brought in new legislation that introduced sweeping changes to European road fuels specifications, not least the virtual elimination of sulphur (by 2009) and the rapid phase out of lead as a gasoline additive completed in 2000.

Achievements and challenges

What has been the impact of this legislation on air quality? Has there been an improvement between then and now? And what will the future look like? Even without further legislation in the pipeline, where will we be, in terms of air quality, in ten years time?

Figure 1 highlights the very significant actual and forecast reduction in all four regulated pollutants considered in the second Auto/Oil programme. It shows the impact of 'already mandated' measures including, for the transport sector, the requirements of Euro-4 emission standards for light-/heavy-duty vehicles and of the 2000/2005 ***Fuels Directive***. It also demonstrates, for the non-road sectors, the effect of the *National Emission Ceiling Directive*.

A fall of 60–90% in emissions is forecast by 2010, despite the anticipated continuing growth in road transport. This trend continues beyond 2010 as a consequence of further penetration of Euro-4 technology into the overall European fleet.

In the case of primary PM_{10}, it is evident that by 2015, exhaust emissions are reduced to a level that is of the same order as the non-exhaust sources (brake/tyre wear). However, when transport emissions are put in the context of all other sector contributions, particularly for PM emissions, new policy priorities are perhaps indicated (Figure 2).

These charts provide an important perspective for 'post 2010' policy. To achieve further compliance with the EU Air Quality Target for Ozone will demand further NO_x and possibly VOC reductions. The dominance of non-transport sources of these two precursor emissions in 2010/15 indicates a need to move away from the exclusive focus on road transport in developing future strategies to address ozone.

In the case of primary particulates, given the growing recognition that $PM_{10}/PM_{2.5}$ are long-range transportable pollutants, the dominance of non-road transport sources may shift the policy focus away from road transport,

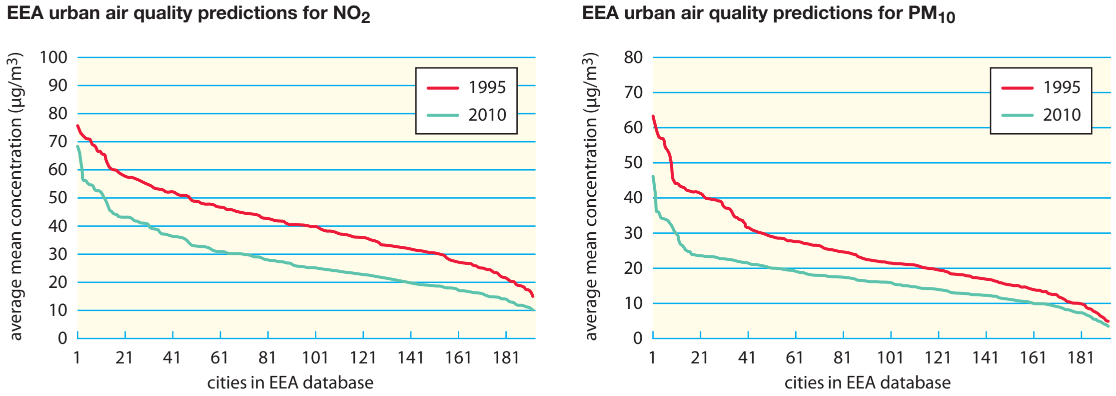


Figure 3
Significant improvements in air quality have been achieved in the past 10 years and this trend is forecast to continue during this decade as a result of already agreed measures.

unless the nature of particulates from transport is identified as having a much greater health impact than those from other sources.

Trends in emissions provide a useful perspective on the efficacy of environmental policy and future policy priorities, but they do not tell the whole story. The goal of such policy is improved air quality in the EU.

Figure 3 provides such a perspective. These charts were developed by the European Environment Agency (EEA) as part of the second Auto/Oil Programme using their so-called c-Q model to assess the improvement in air quality for some 200 EU cities based on the emission changes given in the previous charts.

The NO_2 annual mean target of 40 µg/m^3 is recognised as being much tougher than the short-term 1-hour limit of 200 µg/m^3. The EEA projection for 2010 shows a significant improvement in the degree of compliance (from 50% of the cities to about 90%). However, southern European cities in particular are expected to need to implement further measures in order to achieve compliance, given the higher conversion of NO to NO_2 due to higher levels of ozone.

The EEA projection here indicates a significant improvement between 1995 and 2010 but a significant level of non-compliance in 2010 against the indicative 20 µg/m^3 annual mean target.

Understanding the contributions to this residual level of non-compliance is vital for the design of appropriate amelioration policies. Figures 1 and 2 showed that, at least in terms of mass, the majority of particulates will originate from sources other than vehicle exhaust, and primarily from non-transport sources. In addition, when all these 'primary emissions' are placed in the perspective of secondary sources (derived from SO_2, NO_x and NH_3 emissions) they themselves become less important.

Data collected so far and the future predictions indicate that significant air quality improvements have been achieved in the past 10 years and this trend will continue during this decade as a result of already agreed measures.

The CAFE (Clean Air For Europe) programme embraces the concepts that underpinned the Auto/Oil programmes but with a broader scope, including all industrial sectors and incorporating the review/revision of human health or environment-based targets. Its long-term goal is stated as 'Long-term, strategic and integrated policy to protect against the effects of air pollution on human health and the environment'. The key pollutants of concern in CAFE are particulate matter and ozone. The programme is due for completion in mid-2005.

CONCAWE is participating as a stakeholder, and a specific support structure has been set up. The programme places great emphasis on improved modelling to enable the prediction of the effects of emissions down to urban scales. This is an area where CONCAWE may have a significant contribution to make. What can be done cost-effectively, and what we as an industry might need to do, is still under discussion.

Fuel quality and emissions

Rising to the challenges of increasingly demanding fuel specifications

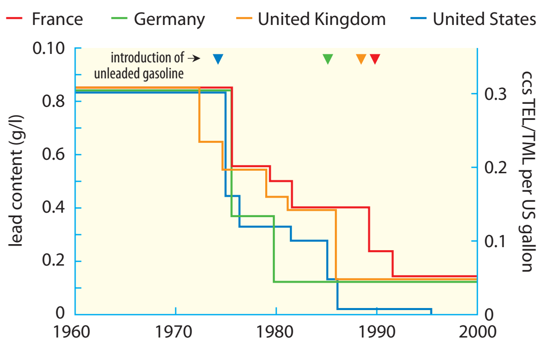
CONCAWE first embarked on work on fuels quality in relation to automotive emissions in the late 1970s. Since that time, tremendous progress has been made in reducing emissions from road transport, with improvements in fuel quality contributing substantially to these reductions. Nevertheless, there are still challenges to be faced, one of the key current issues being the reduction in CO_2 emissions from road transport. CONCAWE continues in its endeavour to use a sound science-based approach to deal with the challenges ahead.

In the early years CONCAWE's work focused on issues such as the reduction of lead content of gasoline and the determination of the optimum octane for unleaded gasoline. When CONCAWE was first formed in 1963, the legal limit for lead content of European gasolines was 0.84 g/l max. As concerns over the health effects of lead mounted and air pollution became a major issue, advances in refining technologies made it possible to continue to reduce the lead content of gasoline. The advent of unleaded gasolines in the late 1980s enabled the introduction of the first generation of catalyst cars. Lead was finally eliminated from gasolines throughout the EU in 2000 (Figure 1).

The elimination of lead required the refineries to make gasoline with a higher 'natural' octane, implying additional investment, operating cost and energy. On the other hand higher octane enabled higher engine efficiency and the optimum octane debate was open. A comprehensive study was needed to address this issue and CONCAWE's 'Rational Use of Fuels In private Transport' (RUFIT) study provided the essential technical basis for the final selection of 95 RON as the main European gasoline grade (Figure 2).

Figure 1
Progress towards elimination of lead from gasoline by year 2000.

Maximum lead content of leaded gasoline



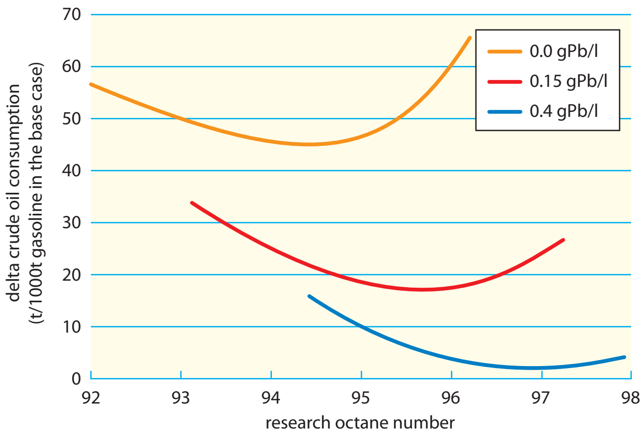
In the late 1980s, gasoline evaporative VOC emissions were the focus of much attention and several CONCAWE reports addressed this issue in relation to gasoline vapour pressure and evaporative emission control technologies. This work demonstrated that 'closing' the gasoline system through measures such as 'Stage 1' evaporative emissions controls at refineries, terminals and service stations and use of carbon canisters on-board cars was more cost-effective than reducing the vapour pressure of gasolines.

The relentless growth of the European diesel car population brought diesel fuel into environmental focus around the same time. CONCAWE carried out and reported its first work on fuel effects on emissions from diesel engines and vehicles in the mid 1980s.

As the regulations regarding vehicle emissions and fuel specifications were becoming more complex, CONCAWE identified the need for a document compiling the details of all such regulations in the world's main regions and countries. Thus CONCAWE's report on motor vehicle emissions legislation and fuel specifications was born in 1988. It has been updated almost every year ever since and has become a much appreciated and trusted source of information. The next edition is scheduled for publication in 2004.

In the 1990s it became increasingly clear that fuels and vehicles needed to be considered together rather than separately and the emphasis shifted towards the relation-

Optimum gasoline octane/energy use



Reductions in regulated emissions, 1985–2010

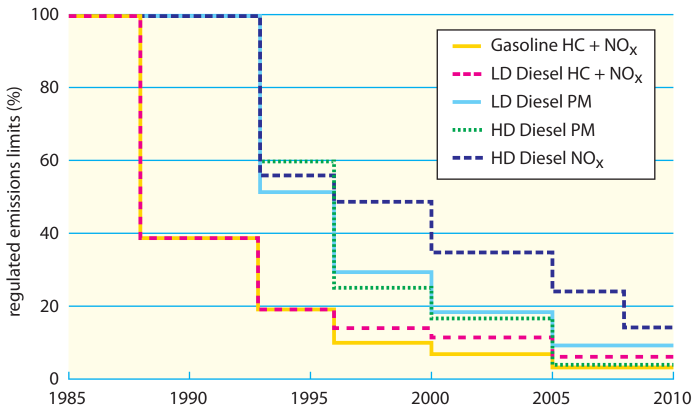


Figure 2 (above left)
CONCAWE's 'RUFIT' study provided the essential technical basis for the final selection of 95 RON as the main European gasoline grade.

Figure 3 (above right)
Impressive reductions in regulated emissions limits have been achieved since the late 1980s.

ship between vehicle technologies, fuels quality and emissions. The European Programme on Fuels, Engines and Emissions (EPEFE), carried out between 1993 and 1995, underpinned the Auto/Oil I programme. CONCAWE task forces shadowed the Auto/Oil I process, contributing much to the technical debates and assisting the EU Commission's consultants in various ways. During that period CONCAWE produced a series of reports on both gasoline and diesel fuel effects on emissions from that generation of engines and vehicles as well as on the economic consequences of changing fuel specifications on EU refineries. This pattern continued throughout the Auto/Oil II programme in the late 1990s and the related review of sulphur content of fuels in relation to advanced engines and exhaust after-treatment systems in 2000.

Around that time climate change issues and CO_2 emissions started to take over the environmental agenda and it was realised that, while more stringent fuel specifications have potential environmental benefits through reduced emissions, they also entail an environmental cost through the increase of refinery CO_2 emissions. CONCAWE contributed to the debate by pioneering the modelling of the impact that changing fuel specifications would have on refinery CO_2 emissions.

Figure 3 illustrates the impressive reduction of the regulated emissions limits of various pollutants for different vehicle types. Meeting these limits has presented a tremendous challenge to both the automotive and the fuel industries.

Fuels have played a major role, partly through direct effects such as the reduction of gasoline benzene content, and partly through enabling advanced automotive technologies to be applied. EU fuel specifications have been dramatically tightened over the past decade. The latest update of the ***EU Fuels Directive*** (2003/17/EC) published in March 2003 requires the introduction of sulphur-free gasolines and diesel fuels (10 mg/kg maximum sulphur content) on 'an appropriate balanced geographic basis' from 2005. Full market coverage of sulphur-free fuels is required from 2009, though the end date for diesel fuel remains subject to review.

Sulphur-free fuels will enable a range of advanced engines and exhaust after-treatment systems that will achieve the new Euro-4 and Euro-5 emissions standards with best fuel efficiency, assisting the motor industry to meet their voluntary CO_2 commitments (European passenger car fleet average 140 g/km CO_2 by 2008). The transition to sulphur-free fuels can be seen as a major step when one considers that the sulphur contents of both gasolines and diesel fuels were measured in % rather than ppm levels, well into the 1990s.

Table 1 summarises the history of the key gasoline and diesel fuel specification changes over the period 1993–2009, i.e. since the introduction of the first European (EN) standards. The continuing challenge for the oil industry is to supply the required market volumes reliably at the specified quality. Apart from the issue of sulphur reduction, diesel fuel volumes are limited by

Fuel quality and emissions

Rising to the challenges of increasingly demanding fuel specifications

Table 1 Summary of European gasoline and diesel fuel specification developments

Year			1993	1995	1996	2000	2005	2009
Gasoline Unleaded 95/85 – EN228								
Sulphur	ppm m/m	max	1000	500		150	50/10	10
Benzene	% v/v	max	5			1		
Aromatics	% v/v	max				42	35	
Olefins	% v/v	max				18		
Oxygen	% m/m	max	2.5 (1)			2.7		
RVP (summer)	kPa	max	up to 80			60 (2)		
E100	% v/v	min	40(s)/43(w)			46		
FBP	°C	max	215			210		
Diesel (standard grade) – EN590								
CI		min	46					
CN		min	49			51		
Sulphur	ppm m/m	max	2000		500	350	50/10	10 (3)
Density	kg/m^3	min	820					
		max	860			845		
T95	°C	max	370			360		
PAH	% m/m	max				11		
Lubricity	µm @ 60 °C	max			460			

1 *Up to 3.7% at Member State discretion. Individual limits apply to specific compounds*
2 *70 kPa max allowed in Member States with arctic or severe winter conditions*
3 *End date for full introduction of 10mg/kg S max diesel remains subject to further review*

constraints on density and back-end distillation points, while demand increases steadily. For gasoline the challenge is to satisfy the octane and distillation requirements, while the reduction in aromatics content from 2005 continues to decrease the choice of molecules available to the blending pool.

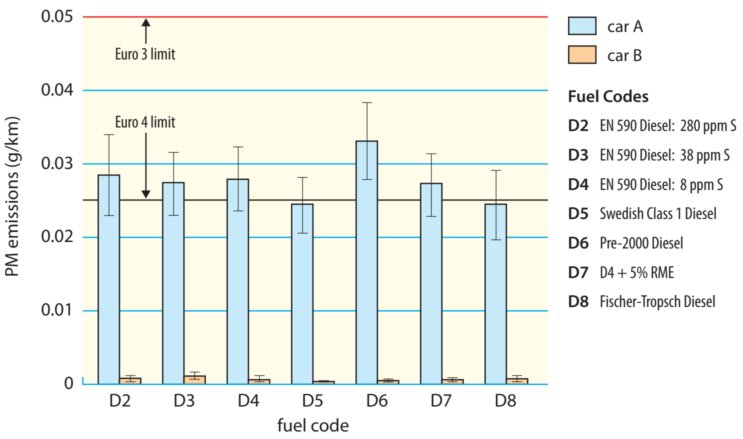
Despite the progress made, pressures for further improvements remain. The Clean Air For Europe (CAFE) programme provides an integrated approach on air pollution, human health and the environment, taking into account emissions from all sources. CONCAWE supports this approach which should be the framework within which any additional measures are evaluated for overall cost-effectiveness towards meeting environmental and health targets.

There are nevertheless other initiatives that run parallel to CAFE which may result in additional legislation on fuels. The 2003 ***EU Fuels Directive update*** already requires a review of the road fuel specifications to be completed by end 2005. In parallel, a new initiative to develop the next generation of engine/vehicle emissions standards, Euro-5 for light-duty vehicles and Euro-6 for heavy-duty engines, has just been formally launched by the EU Commission, with its primary focus on particulate and NO_x emissions from diesel engines.

In order to be prepared to contribute to the ensuing debates, CONCAWE has continued to test fuel effects on emissions from advanced engine/after-treatment technologies as they enter or approach the market. Recent work comparing low sulphur/sulphur-free conventional diesel fuels with more extreme fuel compositions has shown that advanced engine technologies such as particulate traps are much more effective in controlling emissions than further changes to fuel properties. Figure 4 provides an example for PM emissions from two diesel cars, one with and one without a particulate filter, tested on a series of fuels, D2 to D8, encompassing a wide compositional range (see Table 1). The costs associated with the introduction of sulphur-free fuels must now be compensated by harnessing the ability of these fuels to enable advanced vehicle technologies.

The particulate emissions debate has moved on from simple measurements of particulate mass to measurements of other properties of particles, especially size and

PM emissions from two diesel cars (with and without a particulate filter)



Trends in regulated emissions, 1990–2010

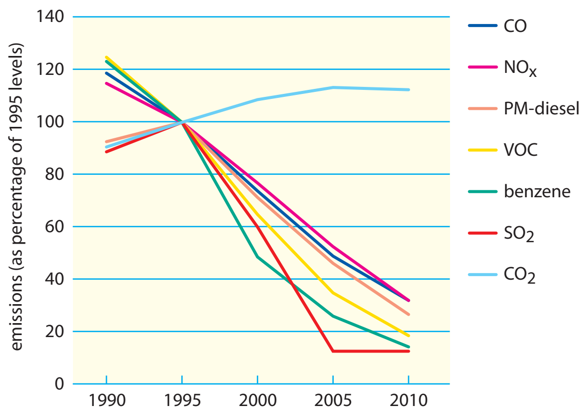


Figure 4 (above left)
Particulate filters are much more effective than further fuel changes in reducing PM emissions.

Figure 5 (above right)
The current challenge is to reduce greenhouse gas emissions while also achieving very low regulated emissions.

number. CONCAWE has been active in this area with a number of reports, SAE papers and collaborations such as the UK DETR/SMMT/CONCAWE programme reported by Ricardo in May 2001, and the DG TREN Particulates Consortium currently approaching completion.

The EU Commission's study for Auto/Oil II highlighted the inadequacy of measures to tackle CO_2 emissions (Figure 5). Indeed the latest trends emerging from the CAFE programme confirm that attention should now focus on reducing CO_2 emissions while maintaining or even further reducing air pollutant emission levels.

The car industry's commitment to achieving an average CO_2 emissions level of 140 g/km by 2008 for the European passenger car fleet is a first step in addressing the issue of fuel efficiency. As road transport continues to grow, further measures to reduce CO_2 emissions from vehicles can be expected.

In addition, the potential contribution from 'renewable' fuels such as RME, ethanol, other biomass-derived fuels and hydrogen are increasingly in focus. CONCAWE's first report on alternative fuels was published in 1995. In the context of the EU Commission's Biofuels Directive proposal[1], CONCAWE published in 2002 the results of a literature review on the overall energy and greenhouse gas balance of ethanol and RME (report no. 2/02).

Unlike other air quality issues that tend to play at local or regional level, the greenhouse gas (GHG) issue is global and needs to be addressed as such. In order to contribute to the understanding of the complex interactions between fuel production and fuel usage, CONCAWE is collaborating with EUCAR and the EU Commission's Joint Research Centre (JRC) in a comprehensive well-to-wheels study on alternative fuels and powertrains. The full study results are due to be released at the end of this year.

Outlook

Tremendous progress has been made in controlling emissions from road transport. Further benefits can be expected as the new generation of low emission vehicle technologies enters the market, enabled by the new generation of sulphur-free fuels. Nevertheless, major challenges remain, in particular with regard to GHG emissions, where it is critical that considerations of future fuel/powertrain technologies are taken into account on a realistic well-to-wheels basis. After 25 years of CONCAWE's involvement in road fuels and emissions issues, there is no let up in the challenges for the industry; testing and exciting times continue to lie ahead. In striving for further improvements in environmental performance other aspects such as vehicle driveability, security of supply and European competitiveness should not be forgotten. More than ever there is a need to bring sound scientific evidence to support cost-effective regulatory decisions.

[1] *Directive 2003/30/EC on the promotion of the use biofuels or other renewable fuels for transport.*

Water and waste

Providing guidance to the industry on water and waste management

Water is an essential resource that has, over the years, come progressively higher on the international agenda because of its intimate relationship with both human health and ecosystem development. In the 40 years of CONCAWE's existence water quality over the world in general, and in Europe in particular, has improved steadily. Today, substantial parts of Europe's surface and groundwater resources can be classified as being of at least 'good' quality (as defined in the *Water Framework Directive*). Nevertheless there is relentless pressure on water resources in terms of quality and, to an increasing extent, quantity.

Water in oil refining: much improvement over the years

Like most heavy industries, oil refineries use large quantities of water, handling roughly as much water as oil, in one form or another. The industry has made progress in reducing both its intake of fresh water and the contamination of the effluent. Effective management of water, from supply through handling and treating to final dispersal back into the environment, is a key requirement for the efficient operation of the modern refinery and a condition for its acceptance by the community.

The name of CONCAWE includes 'clean water' and this was one of the first issues dealt with by the Association. In the early years much work was devoted to reducing oil discharges from refineries. Figure 1 illustrates the achievement in the past three decades with reductions of more than 98% of the total oil discharged and 94% of the oil discharged per unit of crude oil intake. This was achieved through the installation of increasingly sophisticated treatment systems which also allowed significant reductions in the discharge of other pollutants such as phenols.

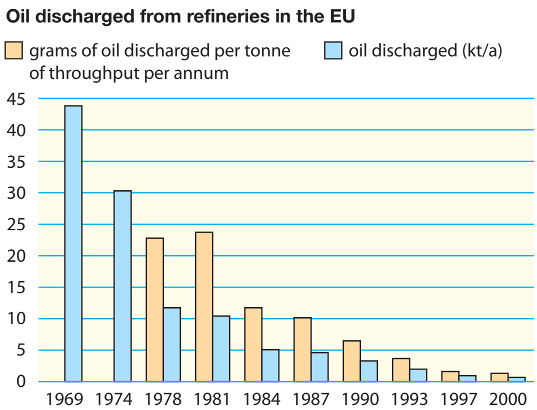
As the amount of oil and associated pollutants discharged has reduced, the focus of attention has shifted towards minimisation of the impact of industrial water usage on the environment.

The European regulatory framework

The *Water Framework Directive* (2000/60/EC) was developed to draw together related but hitherto separate pieces of related water legislation in Europe. A very comprehensive piece of legislation covering water resources, water quality and hazardous substances, it provides an integrated approach to water management. For the first time in Europe the Directive introduces the concept of Environmental Quality Standards (EQSs) alongside the more conventional Emission Limit Values (ELVs). Definitions of water quality are made both in conventional chemical terms and, again a novel concept for EU water legislation, ecological quality. Although the Directive was enacted in 2000, much remains to be decided including, for example, the list of priority substances to be considered and measures for their control, the status of the various water bodies in Europe (river basins, other surface waters such as lakes and groundwater aquifers), the definitions of ecological quality

Figure 1

The total volume of oil discharged has fallen by more than 98% over the past three decades.



and, most importantly, the development of a ***Groundwater Directive*** arising out of specific requirements of the ***Water Framework Directive***.

The ***Integrated Pollution Prevention and Control Directive*** (IPPC), which became law in 1996, considered the use of Best Available Techniques (BAT) to optimise resource use, minimise pollutant generation and control discharges in the major industrial sectors. Although its scope is much wider, water is one of the key issues addressed by the Directive. A 'European IPPC Bureau' was established in Seville and given the task of preparing BAT Reference documents (so-called 'BREFs') for all the industries covered by the IPPC Directive, including one for refineries. Drafting of the BREFs was meant to involve the industries concerned directly, and CONCAWE acted on behalf of the refining industry in the Technical Working Group that was set up by the Bureau for this purpose, providing significant technical input, both as actual performance data and operational experience.

'Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such'.

(EU Water Framework Directive)

The first challenge was to try and define what would constitute BAT for refineries, what emissions these technologies could be expected to produce and what their costs would be. This required member companies detailing what new pollution control equipment they had installed at what cost and providing information on the performance levels achieved. The resulting CONCAWE report also included the results of past and present CONCAWE studies on refinery wastes and effluents.

In 1993 CONCAWE had first carried out a comprehensive refinery effluent survey in association with OSPAR[1]. This was repeated in 1997 and proved to be an extremely useful source of information during the BREF drafting process. The results from a further survey covering the year 2001 will be published shortly.

The Refinery BREF was promulgated in 2002. Although CONCAWE succeeded in incorporating some of the views of the industry, there were many aspects of the document which CONCAWE felt were unwarranted.

CONCAWE has now published a set of guidelines advising refineries on how to interpret the BREF when holding discussions with their competent authorities, pointing out where additional information (particularly on costs) can be found and where CONCAWE feels that the BREF's assertions are incorrect.

A similar but less arduous process was followed for the development of so-called horizontal BREF documents for both Industrial Cooling (both air- and water-based processes) and Common Waste Water & Waste Gas Systems, where CONCAWE was influential in several areas related to our industry sector. These horizontal BREFs were intended to apply to a range of industry sectors, although various aspects of the topics covered were also mentioned to a greater or lesser extent within the Refinery BREF.

CONCAWE has also followed the development of European waste legislation and is currently participating in the drafting of BREFs on incineration and on waste treatments. The latter includes treatments of used lubricating oils for which CONCAWE has tabled the study it reported in 1996 on the quantities and methods of

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[1] *The OSPAR Commission for the protection of the marine environment of the North East Atlantic.*

Water and waste

Providing guidance to the industry on water and waste management

disposal and re-refining. CONCAWE has also reported on quantities and disposal routes of refinery waste. It is currently updating its guidance on the disposal methods which formed part of the input for the Refinery BREF.

OSPAR is an important actor on the European water scene as it deals not only with the seas but indirectly with all main water basins discharging into the North Sea or Eastern Atlantic. As a direct result of the large reductions in oil discharged by refineries as indicated by the CONCAWE data, OSPAR decided a few years ago that refineries should now have a low priority and discontinued their specific refinery effluent surveys although they still request CONCAWE data to monitor the situation.

OSPAR has been in the forefront of the development of the measurement of biological effects for the understanding and control of their impacts upon the environment. Such an approach seeks to monitor effects either directly upon the environment (e.g. studies of population effects or species diversity) or using surrogates for the environment (e.g. test species with response to certain stimuli or stresses resulting from the presence of pollutants). This approach is also now being more commonly adopted within Member States and the EU itself (particularly in the Water Framework Directive). CONCAWE is participating in the OSPAR expert group on whole effluent assessment (WEA) which is currently carrying out a demonstration programme on the applicability of WEA methods to real discharges. Although refineries are not directly involved in the programme, the methodologies being evaluated could become a standard part of future legislation both for OSPAR and the EU, covering virtually all European countries. WEA is a tool whereby a sample of effluent is assessed against a range of biological tests (potentially covering e.g. acute and chronic toxicity, potential to bio-accumulate, persistence and some genetic effects) to assess whether it may cause harm to the environment. There are many questions unresolved as yet on the efficacy of this type of testing, which could potentially lead to very stringent requirements for effluent control. CONCAWE is bringing data from member company studies into the debate, particularly in the areas of persistence and potential for bioaccumulation.

There is no doubt that the introduction of biological effects measurements, in addition to the more traditional chemical-specific approaches currently used to regulate refineries, will cause different issues to become a priority. It is argued that such an approach more closely addresses the actual impacts upon the environment. It is also a potential benefit to operators, allowing a more readily acceptable demonstration of no harm to the environment. The key issue is whether the measurements made in a laboratory relate to real environmental effects in the receiving water. This is particularly so for some of the longer-term chronic and genetic tests where the relation to actual population effects is not always clear. This could lead to significant changes to effluent control systems which may not achieve real environmental improvements.

The European Pollutant Emissions Register (EPER) is a first attempt to provide a web-based collection of emissions data (covering air and water) across the EU. The data are in a format which allows tracking of performance of EU legislation to drive down emissions in each Member State. CONCAWE has experience of collecting similar information from member companies and was able to make a number of proposals for EPER reporting, which were accepted by the EU and included in their

Guidelines. The EPER website will be formally launched in February 2004. The data will be publicly available and will aid member companies in handling queries from third parties. CONCAWE is investigating whether this will provide an opportunity to gather data on refinery emissions more easily and across a wider range of pollutants than the traditional questionnaire-based survey of refinery discharges.

CONCAWE has also paid attention to the clean-up of contaminated land and published guidelines for a risk assessment-based method for determining whether there is a need to clean up contaminated sites and, if so, what standards should be aimed at with respect to the final level of contaminants. These guidelines have recently been revised and expanded. On a related topic, CONCAWE published field guides for oil spill control. Although dating back some 20 years, much of the information is still relevant and the guides remain an acknowledged and valuable resource in this area, frequently requested by member companies and third parties. They are usefully supplemented by a more recent publication by a member company.

Outlook

Debates in the sustainable development arena and many other forums, from Rio (1992) through Johannesburg (2002) to this day, have focused on water as an essential resource for life. These colour attitudes to water in a manner not felt for most other raw materials. The EU has taken a positive lead in the debate on water resources and indeed the ***Water Framework Directive*** opens with the phrase *'Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such'*. The IPPC Directive mentions the effective use of resources and uses water as one of its examples, specifically requiring operators to take measures to use water effectively within their installations.

Water resources are coming under pressure in Europe, especially, though not exclusively, in the south. Agriculture is the largest water user in most areas, but industry is also a significant abstractor. Water is essential for efficient refinery operation and some refineries can be large local users of water. It is important that all sectors work together to understand and manage the local and regional water supply and quality issues.

Less than 1% of the planet's water is available for human consumption

•

20% of all surface water in the European Union is threatened with pollution

•

Groundwater supplies 65% of all Europe's drinking water

•

50% of wetlands have endangered status due to groundwater overexploitation

•

The area of irrigated land in southern Europe has increased by 20% since 1985

EU data, 2002

CONCAWE's activities in the areas of water and waste cover a range of environmental and operational issues within the refining industry, ranging from water supply and resource management through operational optimisation to minimisation of waste generation and environmental impact. The information generated through surveys and studies continues to be recognised by both the industry and third parties, including regulators, as a valuable contribution to the ongoing debates. As water rises up the political agenda the importance of this contribution can only increase.

Health

Understanding the health concerns behind environmental regulatory initiatives

CONCAWE has been working on health issues virtually since its inception. In the early years the focus was on occupational health in relation to oil industry workers. Over the years, and particularly in the past decade, broader human health issues have become progressively more central to the environmental debate, with 'health' increasingly the driver behind environmental improvement initiatives. The focus of CONCAWE's activities has shifted to deal with the new issues being raised.

Health issues are complex and need to be addressed by experts in several different areas. Through its member companies, CONCAWE has been able to maintain, as its 'Health Management Group', a strong team of occupational physicians, toxicologists, industrial hygienists and product stewards with particular expertise in oil industry related issues. As appropriate, academics are also called upon to carry out specialist work, such as detailed reviews of scientific literature.

In the April 2001 issue of the *Review* we reviewed CONCAWE's most important achievements in the area of health, in the form of toxicological studies and industry-wide surveys of hazardous occupational exposures. We spoke also of CONCAWE's continuing cooperation with key international organisations under the United Nations and in the European institutions on environmental and occupational health aspects of oil products and operations.

In this article we specifically review CONCAWE's involvement in three important EU programmes addressing health effects from air pollution, the safety of chemicals and a global environment and health strategy with a special focus on children.

The CAFE programme

As the work towards an EU strategy for air quality management unfolds under the Clean Air For Europe programme, it becomes clear that the principal driver for additional measures will be the protection of human health which is viewed as being at particular risk from exposure to fine particles and to ozone. Traditional forms of pollution, in particular acidifying pollutants such as sulphur dioxide, appear to be retreating into the background, as agreed management controls take effect and prove to be effective.

Thus far, the valuation of human health effects of airborne pollutants relies mostly on observational epidemiology investigations rather than on data from controlled clinical and toxicological studies. CONCAWE has reviewed the methodologies used and the reported findings from a number of epidemiological investigations and found a number of serious shortcomings. The authoritative Health Effects Institute in the USA, sponsor of a large body of research in the field of public health effects from air pollution, recently revised the conclusions of one of its main studies following the detection of methodological errors. Other studies have also been criticised, for example with regard to the accuracy with which personal exposures are estimated; the ability to quantify life expectancy effects of air pollution changes; and possible double-counting of pollutant effects. This leads to the conclusion that air pollution epidemiology is still an immature field of science. Such valuations intrinsically carry a high degree of uncertainty and this should be fully realised when using such results as the basis for legislative policies. Representatives from CONCAWE have voiced these concerns within the CAFE programme and the UNECE's work programme on Long-Range Transboundary Air Pollution.

Chemicals legislation

The desire to inform the public better about the health and environmental hazards of chemicals, including oil products, and to devise more comprehensive controls has led the European Commission to issue its consultation paper on a new European chemicals control policy based on the REACH (Registration, Evaluation and Authorisation of Chemicals) system. (See also article on Petroleum Products.) Although the exact requirements are still under discussion, it appears that information on human exposures, in the form of both descriptions and measured data, will be necessary for the risk assessment of all chemicals concerned. These include most petroleum products for which exposure data was so far not required. In support of its risk assessment programme CONCAWE has initiated an ambitious programme to acquire this information.

The exposure information for gasoline is essentially complete, following exposure data reviews and measuring campaigns in 2000 and 2002. Current efforts focus on exposure information in relation to production and use of gas oils and kerosenes. In preparation for further risk assessments, the methodologies for monitoring airborne levels of LPG and bitumen fumes have been updated.

The chemical risk assessments under REACH also require experimental toxicological information on health effects other than those traditionally included in hazard profiles, such as test data for effects on reproductive organs. CONCAWE conducted a test programme on gasoline vapour which indicated there are no such effects. Similar studies are now being planned for other product groups. This work is partly carried out in cooperation with other oil industry organisations, notably the American Petroleum Institute. Issues to resolve include identification of test samples that meet the different European and US product specifications and development of study designs which satisfy the different test requirements in the EU and in the USA.

The SCALE initiative

During the summer of this year the Commission's Directorates-General for Health and Consumer Affairs, Research, and Environment, in cooperation with the Joint Research Centre at Ispra in Italy, announced the launch of a new environment and health strategic programme, called SCALE (Science-based, Children-focused, Awareness-raising, using Legal instruments, and constantly Evaluated). The announcement made reference to 'growing' health problems related to environmental degradation, of which particularly children are the victims.

The SCALE programme will start with the establishment of a work plan to be implemented during the period 2004–10. Indications are that 'stakeholders' can participate in this activity and nominations have been made for the 'consultative forum' and some of the working groups.

Much progress has already been made in improving European environmental quality, and further improvements will result from the full implementation of already agreed measures. The oil industry has contributed to this by phasing out lead, reducing sulphur and lowering the benzene content in gasoline, and by reducing VOC emissions.

Although the goals of the SCALE initiative are laudable, the methodologies that may be used give cause for concern. One of the probable new initiatives is the introduction of large-scale bio-monitoring or studies of environmental contaminants in the human body in the general population. Modern analytical techniques are increasingly sensitive and capable of detecting very low levels of pollutants in test samples. New test methods are constantly being developed which can detect minute biological changes of unknown medical relevance and often associated with multiple stimuli such as tobacco smoking, drinking of alcohol and consumption of spicy food.

The mere presence of a pollutant, be it in food, air, water or the body, does not necessarily imply that environmental or health effects will ensue. Any scientific evaluation of bio-monitoring results should therefore be based on established and specific cause-effect relationships and include a reference value to determine the significance of detected changes.

Conclusion

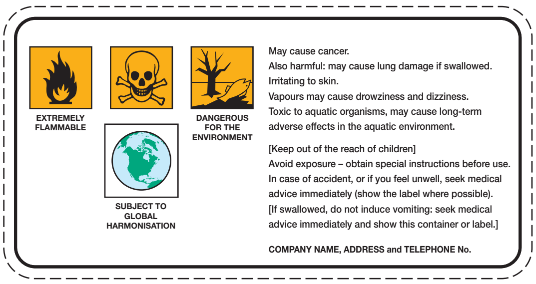
The three initiatives described above emphasise the need for thorough technical and scientific understanding and analysis in the cost-effective management of health risk. CONCAWE remains committed to this principle in its health science activities, as in all the other areas of its remit.

Petroleum products

From Classification and Labelling to Risk Assessments

The field of 'Petroleum Products' in CONCAWE deals with product stewardship and chemical control legislative issues relating to the production, marketing and use of petroleum substances. Since its early days, CONCAWE has provided guidance to its member companies for compliance with emerging and evolving EU legislation related to the control of chemicals. At present, the key legislation affecting the control of chemicals consists of the ***Dangerous Substances Directive*** (issued in 1967), the ***Existing Substances Regulation*** (issued in 1993), and the ***Dangerous Preparations Directive*** (revised in 1999).

The ***Dangerous Substances Directive*** establishes criteria for classification and labelling of chemicals based on the inherent health and environmental hazards that a chemical presents. In 1985 CONCAWE published its first guidance on the classification and labelling of petroleum products marketed in the European Community, at a time when the European Commission had yet to undertake a formal evaluation of petroleum substances. Since then, EU legislation for the classification and labelling of petroleum substances has evolved considerably. Requirements for the environmental classification of substances and preparations have been introduced, as have new criteria for evaluating health hazards. CONCAWE has kept abreast of these legislative changes, updating its classification recommendations to enable industry to adopt a harmonized approach to the classification and labelling of petroleum substances. A stand-alone report has also been published providing the rationale for the environmental classification of petroleum substances. As this article goes to press, work is under way on a new update of the classification recommendations, in response to the 29th ***Adaptation to Technical Progress to the Dangerous Substances Directive***, which is soon to be published.



Although they are regulated by the same legislation as single-component chemicals, petroleum substances are different. Unlike single component chemicals, petroleum substances have a complex and varying composition, generally consisting of hundreds, if not thousands, of individual chemical components. For that reason, test methods developed for the classification of 'chemicals' cannot always be suitably applied to petroleum substances. Nevertheless, there is still a need for petroleum substances to be classified and, in response to this need, CONCAWE has been instrumental in developing appropriate test methods for determining the aquatic toxicity and the inherent biodegradability of petroleum substances, and has published reports describing these.

The ***Dangerous Preparations Directive***, provides criteria for the classification and labelling of preparations (i.e. mixtures). First published in 1988, the Directive was revised in 1999 to include criteria for the classification and labelling of preparations on the basis of environmental hazards. As a consequence of revisions to the Dangerous Preparations Directive, the Safety Data Sheet Directive was also amended in 2001. CONCAWE has issued reports giving guidance on the implementation of these revised Directives.

The ***Existing Substances Regulation***, published in 1993, required all producers and importers to supply certain information (i.e. classification, toxicity and eco-toxicity information, physico-chemical properties and production volumes) on high production volume chemicals to

the Commission. The objective was to include this information in a database at the European Chemicals Bureau at Ispra, Italy. The database, known as IUCLID (International Uniform Chemical Information Database), is now used as the source of information for subsequent risk assessments by the Member States in accordance with the *Existing Substances Regulation*.

In the 1990s, CONCAWE initiated a massive activity in the coordination, compilation and submission of health and environmental information on petroleum substances into harmonised electronic datasets (HEDSETS), as required by the *Existing Substances Regulation* for high production volume chemicals. This work is particularly noteworthy in that it was carried out on behalf of the entire industry, including manufacturers and importers that were not members of CONCAWE.

CONCAWE has also summarised the available health, environmental and safety information on petroleum substances, and published the results in a series of product dossiers that continue to serve as a valuable source of information to regulatory authorities, companies and users.

Towards a new approach to chemicals control

Over the past few years, the perceived slow progress of the *Existing Substances Regulation* has prompted considerable debate, amongst the Commission, Member States, NGOs and industry with regard to the need to overhaul the existing legislative framework of chemicals control in the EU. In late spring 2003, the EU Commission issued a consultation document for the Registration, Evaluation, and Authorisation of Chemicals (REACH) that would, if enacted into law, radically transform the responsibilities of industry and the authorities for the control of chemicals. In particular, the REACH consultation document calls for a shift of responsibility for undertaking the health and environmental risk assessment on substances from the authorities to industry. Given the ambitious deadline proposed by the Commission for completing risk assessments on high production volume substances (i.e. three years after adoption of the legislation) the challenge to industry appears daunting.

The risk assessment process (Figure 1) builds on the inherent toxicity/eco-toxicity of a substance (i.e. effects assessment) and introduces the aspect of exposure. The actual risk that a substance presents is characterized as the product of its inherent toxicity coupled with the actual exposure, of either man or the environment, to the substance.

The risk assessment process

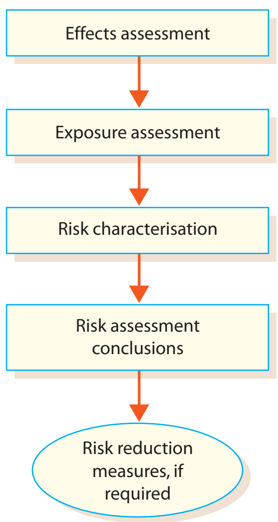


Figure 1
The risk assessment process builds on the inherent toxicity/ eco-toxicity of a substance (i.e. effects assessment) and introduces the aspect of exposure.

Petroleum products

From Classification and Labelling to Risk Assessments

Guidance for conducting risk assessments of single component chemicals has been developed under the *Existing Substances Regulation*. Though administered as a 'substance' under EU legislation, petroleum substances are, as mentioned earlier, different from single component chemicals. Assessing the risks attached to such complex products is in many ways entering uncharted territory.

Recognizing the magnitude of the effort and time required, and the need to develop an appropriate methodology, CONCAWE has, ahead of legislation but in consultation with the Commission, taken the initiative to conduct health and environmental risk assessments of all petroleum substances by 2010 on behalf of its member companies.

It is clear that the risk assessment process requires a multi-disciplinary input. Accordingly, a coordination group has been formed in CONCAWE, bringing together experts from virtually all disciplines represented in the CONCAWE work portfolio. The group's task is to coordinate the risk assessment programme and to develop and manage a multi-year plan for completing this programme by the target date of 2010.

The European Inventory of Existing Commercial Chemical Substance (EINECS) includes nearly 700 petroleum substances. It would obviously not be feasible to conduct individual risk assessments on every one of them. CONCAWE is proposing a pragmatic methodology based on a refinement of the grouping scheme originally developed for classification purposes in the 1990s. The proposed grouping scheme for risk assessments consists of 13 product groups, ranging from petroleum gases to bitumen, and grouping products and components of similar physico-chemical properties and uses (Table 1). Sulphur is also included as one of the thirteen product groups because the oil industry is a major producer of sulphur as a consequence of product de-sulphurisation.

Table 1 Grouping scheme for risk assessment

• Crude oil	• White mineral oils
• Petroleum gases	• Aromatic extracts
• Gasoline streams	• Petroleum waxes
• Kerosine streams	• Bitumen
• Gas oil streams	• Petroleum coke
• Fuel oil streams	• Sulphur
• Lubricant base oils	

One of the core information needs for environmental risk assessments is a speciated compositional analysis which, in practice, is feasible only for light products. For high boiling substances (i.e. heavy fuel oils, base oils for lubricants etc.), even state-of-the-art analytical techniques do not deliver a compositional analysis with the required level of detail. To overcome this limitation, CONCAWE has recently proposed an alternative methodology, making use of physico-chemical properties rather than compositional information. The proposed methodology was presented to various European regulatory authorities and academics at a workshop in spring 2003. Response was favourable and CONCAWE has now launched a project to further develop this generic environmental risk assessment methodology.

As of September 2003, risk assessments on gasoline and gas oils are under way and work on kerosines is planned to start later in the year. Though 2010 is still a number of years away on the horizon, there is much to be done.

Safety

Supporting the oil industry's commitment to safe operation

In an industry that deals with inflammable and potentially explosive products, safety considerations have to be paramount.

Since the mid 1990s CONCAWE, with the input of its member companies, has been compiling personal incident statistics of downstream oil industry workers and publishing these in a yearly report. These statistics bear witness to the oil industry's commitment to safety, demonstrating a marked improvement since the early 1990s (Figure 1). Thanks to its efforts, the oil industry can report much lower incident rates than industry at large. It is intended to extend this incident monitoring to include hydrocarbon spills and fires. Through regular meetings of safety experts within CONCAWE, member companies also have the opportunity to exchange valuable information on actual incidents, and to share the lessons to be learned more generally on a range of safety management issues.

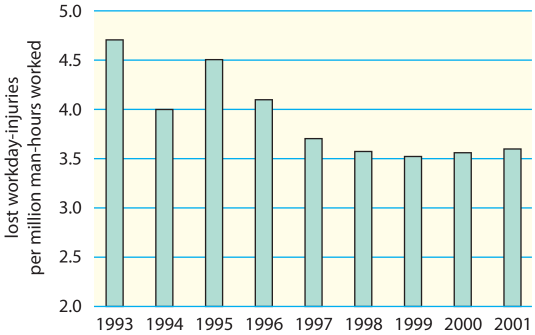
Over the years CONCAWE has also published a number of reports and guidance documents on specific subjects such as risk assessment techniques and the auditing of barge operation.

The CONCAWE structure provides a convenient and efficient channel through which the oil industry can put forward its opinions and comments during the legislation development process. CONCAWE has been involved in all major European legislative issues related to safety, particularly the ***Control of Major Accident Hazards*** (COMAH) ***Directive*** or so-called '***Seveso***' ***Directive***.

The Seveso accident in 1976 led to a complete reappraisal of the way industrial sites are regulated and controlled in Europe. The 'Seveso' Directive and its subsequent updates provided a new regulatory framework with which the oil refineries, depots and terminals had to comply, particularly with respect to information, permitting and operating requirements. To support the industry's involvement in the legislative debate, CONCAWE has published a number of reports on Safety Management Systems and has been representing industry on a number of the Technical Working Groups set up by the EU to support the implementation of the ***Seveso Directive***.

Figure 1
The downstream oil industry has improved its performance since the mid-1990s and reports much lower incident rates than other industry sectors:
- *Upstream oil industry (2001, source: OGP):*
  - *Europe: 2.5*
  - *World: 1.6*
- *European chemical industry: 9.9 (2000, source: CEFIC)*
- *European industry: 22.9 (1999, source: EU)*

Personal incident statistics relating to the European downstream oil industry



One of the issues addressed in the Directive was the use of land around industrial sites. A set of European guidelines was published at the end of the 90's but these did not require changes to the legislation in place in the Member States. Following the recent major industrial accidents in Enschede and Toulouse, this issue of land-use planning is once again on the agenda at the European level, with a call for harmonisation of EU legislation. The EU Commission has set up an expert group structure in which CONCAWE participates. One of the essential prerequisites when determining the level of risk associated with an industrial installation is to define credible accident scenarios and model their potential consequences. Through CONCAWE the industry is bringing its long experience and historical records into the debate, to help ensure that the legislation addresses the real issues without imposing an unwarranted burden on the industry.

Oil pipelines

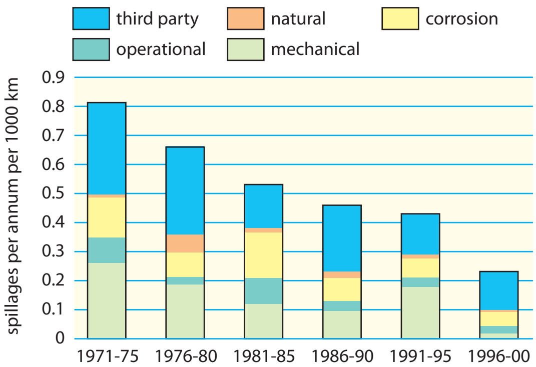
Monitoring the performance of European cross-country oil pipelines

CONCAWE first became involved with oil pipeline safety issues in the mid 1960s when it started collecting information and statistics on incidents and spills related to European cross-country oil pipelines. The first report was published in 1969 and an update report has been issued yearly since 1972. A 30-year overview was also produced in 2002. During more than 30 years the fraction of the total pipeline network covered by the CONCAWE survey has increased, in particular through the incorporation of the NATO lines in 1988 and of the East German network in 1991. The statistics now cover virtually all cross-country oil pipelines in the EU and are being gradually extended to include the former Eastern block countries.

This series of reports has become a unique and trusted source of information throughout the industry and for other parties such as the EU institutions and Member States. Beyond the pure statistics, the large volume of data collected allows many additional conclusions to be drawn and analyses to be made on what are the most important factors affecting the safety and integrity of cross-country oil pipelines. A further report published in 1998 describes the appropriate methods and procedures for the prevention and detection of spills, and for dealing with their consequences.

Figure 1
Most pipeline spillage incidents are the result of third-party actions, either unintended, malicious or criminal.

Causes of cold pipeline spillages, 1971–2000



Through this work CONCAWE has demonstrated that pipelines are a reliable and safe means of transporting oil products. Over the years, both the number of incidents and the volume of oil spilled have consistently decreased. This has been achieved in spite of the increasing age of the pipeline system. Indeed the data clearly demonstrate that there is no link between pipeline age and failure rate, which can be attributed to continually improving maintenance and inspection techniques. Most pipeline spillage incidents are the result of third-party actions, either unintended, malicious or criminal (see Figure 1). On this basis CONCAWE, along with the representatives of pipeline operators for the on- and off-shore transport of chemicals, natural gas and industrial gases, has consistently argued that a 'Seveso' type Directive specifically geared to pipelines is unnecessary. Such a Directive would inevitably impose heavy costs and administrative burdens on the industry for very little (if any) return.

CONCAWE's pipeline activities are carried out through an Oil Pipeline Management Group, membership of which is open not only to CONCAWE Member Companies but also to all companies operating oil pipelines in Europe. Beyond the compilation of the statistics the group serves as a forum for exchanging information on a number of topics, such as: causes of incidents and lessons learned; developments in safety management; and pipeline condition monitoring, especially the use of intelligence pigs.

The 'CONCAWE Oil Pipeline Operators Experience Exchange' (COPEX) seminar takes place every four years and is open to all pipeline operators in Europe (the next one is planned for 2006). These seminars provide a unique opportunity for a broader and very practical exchange of knowledge, experience and best practices in this field. They have enjoyed continued popularity, which bears witness to their relevance.

Proceedings of the 2002 seminar are available on the CONCAWE website.

Abbreviations and terms used in this CONCAWE *Review*

BAT	Best Available Techniques
BREF	BAT Reference document
CAFE	Clean Air For Europe
CEFIC	European Chemical Industry Council
COMAH	Control of Major Accident Hazards
COPEX	CONCAWE Oil Pipeline Operators Experience Exchange
DETR	Department of the Environment, Transport & the Regions (UK Government)
DG TREN	The EU Commission's Directorate General for Transport and Energy
EEA	European Environmental Agency
EINECS	European Inventory of Existing Commercial Chemical Substances
ELV	Emission Limit Value
EPEFE	European Programme on Fuels, Engines and Emissions
EPER	European Pollutant Emissions Register
EQS	Environmental Quality Standard
EUCAR	European Council for Automotive Research and Development
Geneva Convention	1979 UNECE Geneva Convention on Long-range Transboundary Air Pollution
Geneva Protocol	The 1991 Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes (Protocol to the Geneva Convention)
GHG	Greenhouse gas
HEDSET	Harmonized Electronic Dataset
IMO	International Maritime Organization
IPPC	Integrated Pollution Prevention and Control
IUCLID	International Uniform Chemical Information Database
JRC	The EU Commission's Joint Research Centre
LRTAP	Long-Range Transboundary Air Pollution (addressed in the Geneva Convention)
MARPOL	1973 International Convention for the Prevention of Pollution from Ships
OGP	International Association of Oil & Gas Producers
Oslo Protocol	The 1994 Oslo Protocol on Further Reduction of Sulphur Emissions (Protocol to the Geneva Convention)
OSPAR	OSPAR (previously 'Oslo and Paris') Commission for the Protection of the Marine Environment of the North-East Atlantic
PAH	Poly Aromatic Hydrocarbons
$PM_{2.5}/PM_{10}$	Particulate with an aerodynamic diameter less than or equal to 2.5/10 µm
Primary particulates	Fine particles emitted directly into the atmosphere, as opposed to precursor emissions from pollutants which are (partly) transformed to particles (the so called secondary fraction) by photo chemical reactions in the atmosphere.
REACH	Registration, Evaluation and Authorisation of Chemicals
RME	Rapeseed Methyl Ester
RON	Research Octane Number
RUFIT	Rational Use of Fuels In private Transport
SAE	Society of Automotive Engineers
SCALE	Science-based, Children-focused, Awareness-raising, using Legal instruments, and constantly Evaluated
SECA	SO_x Emissions Control Area
SMMT	The Society of Motor Manufacturers and Traders Limited (UK)
UNECE	The United Nations Economic Commission for Europe
VOC	Volatile Organic Compounds
WEA	Whole Effluent Assessment

CONCAWE news

Secretariat staff

It is with great sadness that we have to report the untimely death of our colleague Denis Lyons on 26 June 2003, after a brief but relentless illness. Denis had been associated with CONCAWE since the mid 1980s, serving first as Technical Coordinator until his retirement from Exxon in 1996, and subsequently as consultant to the Refinery Technology and Oil Pipelines groups. His name is associated with numerous CONCAWE endeavours such as the RUFIT study in the late 1980s, all the refining cost studies carried out by CONCAWE through the 1990s, in particular during the Auto/Oil programmes, and the annual oil pipelines performance reports. He was also instrumental in the creation of the CONCAWE *Review* and was its editor until his retirement. We have lost a true professional and a valued colleague.

Mats Fredriksson, who until recently worked for ChevronTexaco and who has been closely involved in a number of CONCAWE's activities over the past 10 years, has taken over the refinery modelling consultancy activities. For the time being, the oil pipelines performance reports are being coordinated by Eric Martin.

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