concawe *review*

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An interview with the Secretary General

Alain Heilbrunn joined CONCAWE as Secretary General in December 2004. In this short interview he discusses his views on the association and on its direction and priorities for the future.

Alain Heilbrunn, Secretary General, CONCAWE

■ Can you tell us a little about your background and your motivation to join CONCAWE at this point of your career?

With a PhD in chemistry, I spent the first 10 years of my career in R&D followed by 15 years in management, trying to develop the business around products that my R&D colleagues had invented. Although I have spent the past few years in public affairs in more of a lobbying role, my basic allegiance and interest remained with scientific facts rather than opinions. I also had a direct involvement in CONCAWE as a member of the Scientific Council and was impressed by the quality of the work that CONCAWE delivers. I am happy and honoured to be given the opportunity to dedicate the last years of my career to CONCAWE and its development.

■ In your views what are the main strengths and weaknesses of CONCAWE?

It is now more than 40 years since oil companies decided to pool their resources and expertise to deal with the emerging Health, Safety and Environmental (HSE) issues of relevance to the downstream oil industry. Through CONCAWE, industry can feed factual information into the early stages of the EU legislative process. There is no doubt that the main strength of CONCAWE lies in its long-established reputation as a professional scientific organisation and the credibility that goes with it. The quality of the work delivered by the association is underpinned by the fact that CONCAWE relies on a large pool of experts from its member companies covering a wide range of disciplines.

In dealing with HSE issues, for which the debates are often more emotional than factual, CONCAWE constantly strives to uphold the three principles of:

- ***Sound science**, of course;*
- ***Transparency**, essential in any scientific work and particularly in our communication world;*
- ***Cost-effectiveness**, without which the best intended and technically justified endeavours flounder in the face of economic realities.*

CONCAWE's credibility amongst stakeholders allows it to foster more rationality in the discussions of many emotionally sensitive issues.

On the side of the potential weaknesses I would put the time it takes to come to consensual decisions. This is normal in an association of companies with different cultures and interests but it must be carefully managed in order to ensure the organisation keeps producing results.

■ Under your leadership what will be the priorities for CONCAWE and how do you see its role evolving into the future?

The first point to make is that CONCAWE works well and we should not change a winning team. Changes must be evolutionary rather than revolutionary.

Reputation is CONCAWE's best asset and this must be maintained by ensuring the quality of the output. Continued active support from the member companies and involvement of their experts are key success factors.

Serious scientific research takes time. In order to deliver timely information to support the legislative debates, CONCAWE must anticipate future issues before these come onto the table. It has often done so successfully in the past and this must continue. Health issues are, for example, increasingly in focus and this should be reflected in CONCAWE's priorities and work programme. Coming up with results before the debate becomes political can help to develop more scientific, rational and objective views.

Another aspect where anticipation is crucial is expertise. As the issues evolve, so does the expertise that is required to tackle them successfully. CONCAWE and its member companies must keep a watchful eye on this to ensure appropriate resourcing, particularly when the expertise required falls outside the fields traditionally covered by the oil industry. This is increasingly the case for the issues that CONCAWE deals with.

Finally, CONCAWE works with, and on behalf of, its members and its role is to uphold its members' interests. CONCAWE has developed a close relationship with its sister association, EUROPIA, and delivers timely and pertinent technical information in support of their advocacy activities. This close relationship is fundamental for our members and must be maintained.

An interview with the Secretary General

Alain Heilbrunn discusses his views on the association and on its direction and priorities for the future

CONCAWE has relations with many other associations and scientific bodies. How important is this?

The subjects we research are becoming ever more complex and can often no longer be adequately dealt with by a single organisation or branch of industry. This applies both to the breadth of expertise required and to the costs involved. Cooperation between industries, scientific organisations, academia and the regulators is the key to success.

The Joint European Well-to-Wheels study, where CONCAWE worked together with both the car industry and the Commission, demonstrates the potential of such cooperation.

The CAFE programme, with its integrated approach to a complex problem and its involvement of all stakeholders, is a good example of how we hope the Commission will tackle issues in the future. We remain hopeful that the sound science we contribute to such efforts will prevail in the political decision-making process.

The EU Commission recently introduced the concept of Technology Platforms to structure the 7th Research Framework Programme in closer cooperation with all stakeholders. I welcome this development, which endeavours to bring together all players and experts on a subject to develop a common vision and research agenda.

Such a process has been followed in ERTRAC, which is looking at all aspects of the future of road transport in Europe. CONCAWE has been very active in the areas of energy and environment, and this has been instrumental in refocusing research programmes towards conventional fuels and engines which still have a large potential for improvement and for delivering benefits in terms of pollutant emissions, energy efficiency and GHG emissions.

What impact do you think the EU enlargement will have on CONCAWE?

CONCAWE represents the large majority of the EU refining industry. As the EU enlarges CONCAWE must attract refiners from the new Member States if it is to continue representing the industry for the whole of the EU, and also to benefit from their specific views and experience. The refiners operating in the new Member States now have the opportunity to enlist CONCAWE's help to comply with EU legislation in an optimum and consistent way.

The REACH legislation on chemicals is very topical and controversial. What are your views on this?

While it is not CONCAWE's role to comment on legislative initiatives, society's desire to understand and control the risk posed by chemicals is legitimate and industry must respond accordingly. I am very proud of CONCAWE's decision to anticipate the requirements of the forthcoming REACH legislation by undertaking voluntary risk assessments covering all petroleum products. This work is expected to continue for the best part of the decade. It represents a large financial outlay and in many ways it is pioneering methodologies to tackle complex substances.

We have to mention climate change. What is CONCAWE doing on this subject?

Climate change is a very broad subject, covering areas which are far away from the traditional expertise of CONCAWE. We can't do everything and we must leave the areas where we are not experts to those who are.

The science of climate in general, and of climate change in particular, is extremely complex and we do not intend to be involved directly. We have established a relationship with MIT's Joint Program on the Science and Policy of Global Change, one of the world's leading consortia on the subject. We believe there are three specific areas upon which we should focus:

- *The interrelationship between global warming and atmospheric pollution;*
- *The energy efficiency and GHG emissions from our own installations;*
- *The impact of climate change policies on the evolution of transport.*

We have recently reviewed this internally and are developing a research programme along these lines.

Some concluding remarks?

The articles in this issue of the Review *cover a diverse range of topics: the ERTRAC process and the way forward; the impact of aromatics in fuels on engine emissions; the Water Framework Directive; and the performance of on-shore oil pipelines. They illustrate that CONCAWE continues to work to bring its contribution to today's, and hopefully tomorrow's debates.*

The issue of corporate social responsibility is increasingly coming to the fore and our members have decided to respond positively to expectations. Our role in this respect is to bring additional scientific and technical facts into the public debate. We extend an invitation to our readers to our yearly Symposium, in Brussels on 30 November and 1 December, where we will be proud to present a comprehensive overview of our contribution to relevant legislative and technical developments.

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ERTRAC—European Road Transport Research Advisory Council

A unique opportunity to improve the effectiveness of research on road transport in Europe

Road transport is one of the greatest conundrums challenging the sustainability of our lifestyles today. Mobility is essential—for the individual, for commerce and for industry. Indeed, the increased prosperity of the past 40 years has been underpinned by road transport, the growth of which has repeatedly outstripped all projections. However, this has also created a set of challenges for the sustainability of the road transport industry that we must meet if we are to maintain and improve our lifestyles.

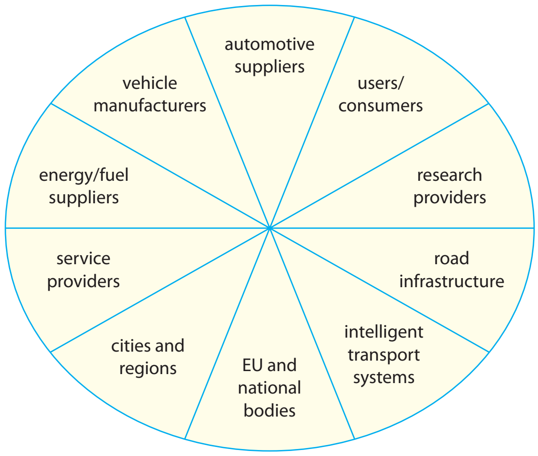
Over the years the quality of fuels and vehicle technologies have improved such that pollutant emissions from new road vehicles have been dramatically reduced. To a large extent the focus of attention has now shifted to greenhouse gas emissions. The oil industry's role is to continue meeting the energy demand in a secure and cost-effective way, while minimising the impact on the environment. Looking further ahead, some CONCAWE member companies are also engaged in research into cost-competitive renewable and alternative low-carbon options.

Clearly, the issue of road transport sustainability is complex and stretches far beyond the vehicles and fuels themselves. New approaches to transport and mobility systems are needed, including improvements to transport infrastructure, traffic management, driver training and greater consumer awareness. The many challenges associated with road transport can only be met through the combined efforts of many stakeholders.

ERTRAC—an Advisory Council

ERTRAC was originally established as an 'Advisory Council' with the objectives to develop a shared Vision of road transport in 2020+ and an associated Strategic Research Agenda, in order to achieve more effective European research in the road transport sector. Initially conceived by the automotive industry, ERTRAC has now brought together all stakeholders in the road transport sector (see Figure 1).

Figure 1 Sectors represented in ERTRAC



ERTRAC's Vision of Road Transport in 2020+ was published in June 2004, followed by the Strategic Research Agenda (SRA) in December 2004. Both are publicly available on the ERTRAC web site at www.ertrac.org. The research areas are organised under four pillars, with sustainability and competitiveness as core objectives running across all pillars (Figure 2).

ERTRAC—a Technology Platform

ERTRAC is now evolving into a Technology Platform. This is a new instrument, introduced by the Commission, which will be used under the 7th Research Framework Programme (FP-7). The first draft of FP-7 was presented in April and the final programme should be approved by year end. The first projects under FP-7 are likely to commence in 2007.

The majority of the FP-7 research agenda is likely to be implemented through existing instruments. However, a limited number of issues are expected to be identified which are very ambitious in scope and scale and where

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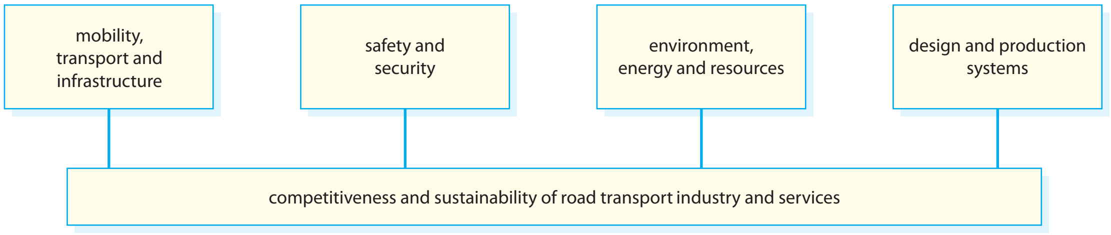
Figure 2 ERTRAC research areas



major public and private investments are needed. For these issues, the new Technology Platform instrument is envisaged. This may lead to Joint Technology Initiatives involving major public-private partnerships, contributing also to the Commission's objectives to increase European research spend to 3% of GDP.

The principal concept of a Technology Platform is: 'Stakeholders getting together to define a Strategic Research Agenda on a number of strategically important issues with high societal relevance where achieving Europe's future growth, competitiveness and sustainable objectives is dependent upon major research and technological advances in the medium to long term'. Technology Platforms will generally involve three stages:

- **Stage 1:** Stakeholders get together
- **Stage 2:** Stakeholders define a shared Vision and associated Strategic Research Agenda
- **Stage 3:** Stakeholders implement the Strategic Research Agenda

ERTRAC has now completed Stage 2 and has a well-established multi-stakeholder group with a shared Vision and Strategic Research Agenda. In Stage 3, ERTRAC has a unique opportunity to improve coordination of European research on road transport (including EU, National, private and public programmes) as well as to establish multi-sector research initiatives on the key road transport issues.

Under the Energy, Environment and Resources pillar, which is the primary interest area for CONCAWE, research falls into two key areas:

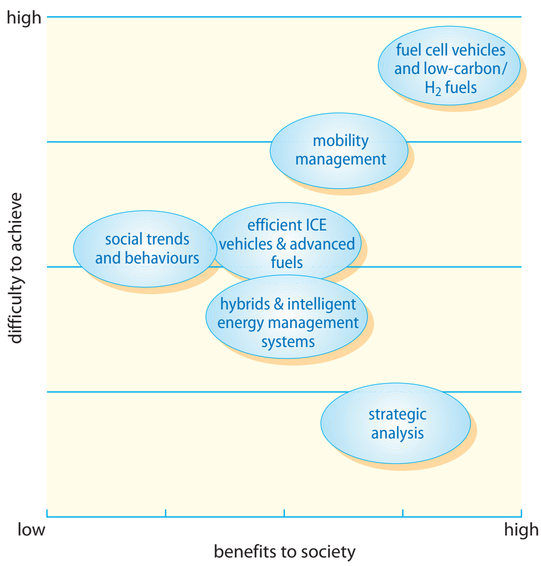
- reducing GHG emissions, and more efficient energy use; and
- environment, including impact on communities and natural habitats.

The principal research themes that have been identified under these two areas are shown in Figures 3 and 4.

GHG emissions and efficient energy use (see Figure 3)

Up to 2020, the main improvements in energy use and GHG emissions will come from efficient internal combustion engines (ICE), and their associated advanced fuels. Hybrids and intelligent energy management systems will be an important associated technology. Research is also needed on hydrogen and fuel cell vehicles, although these will not make a significant contribution in the market until after 2020. Strategic analysis, including well-to-wheel studies, will be important to making the right technology choices. Energy use will also be influenced by mobility management, including high quality infrastructure and use of intelligent transport systems to ease traffic flow, and by social trends and behaviours which may impact upon transport demand and fuel-efficient driving.

Figure 3
GHG emissions/efficient energy use



ERTRAC—European Road Transport Research Advisory Council

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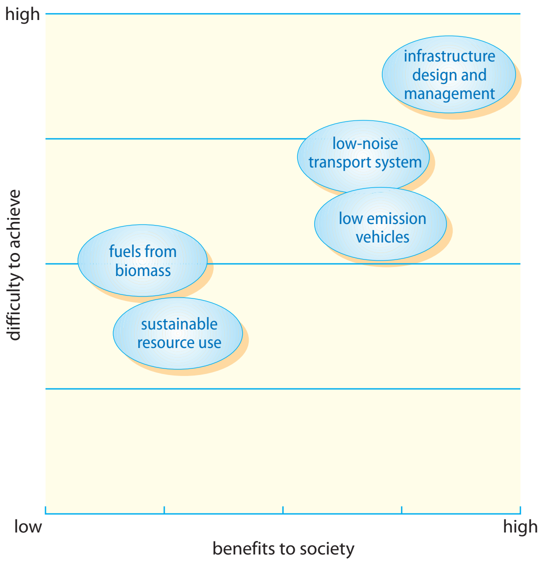
Environment, including impact on communities and natural habitats (see Figure 4)

Low emission vehicles, meeting Euro 4, 5 and 6 and progressively introduced up to 2020 will dramatically reduce air pollution from road vehicles, while developing a low noise transport system will require an integrated approach. Research is needed on road infrastructure design and management to mitigate its impact on people and natural habitats. Increased use of renewable materials and recycling will lead to sustainable resource use. The impact of biofuel crops on water pollution and biodiversity also needs to be considered.

Figure 4
Environment, including impact on communities and natural habitats



Future CONCAWE role

CONCAWE will continue its active role in ERTRAC's overall research planning process, in particular on the issues relating to Energy, Environment and Resources. This will provide opportunities for the oil industry to participate in specific projects, either through CONCAWE or as individual companies depending on the subject.

In addition to ERTRAC, many other Technology Platforms are at various stages of development.[1] In March 2004 there were more than 25 proposals, though only a few are likely to be finally implemented as Technology Platforms. Others may be progressed in other ways, for example as so-called 'integrated projects'. CONCAWE is currently also involved in the development of Technology Platforms on industrial safety and water.

[1] *Further information on 'Technology Platforms' is available at www.cordis.lu/technology-platforms*

Automotive PAH emissions

Effectively reduced with advancing emissions controls

Polycyclic aromatic hydrocarbon (PAH) emissions have been of concern for many years due to potential carcinogenic effects, with several individual PAHs having been classified by IARC as either 'probably carcinogenic to humans' or 'possibly carcinogenic to humans'. Wood burning is the largest global source of PAH emissions and is forecast to contribute by far the greatest proportion of the total EU PAH emissions by 2010. As a result of advances in technology and fuel quality, PAH emissions from automotive sources have been, and continue to be, substantially reduced. According to the EU's PAH position paper[1] they should account for only about 8% of total EU atmospheric PAH emissions by 2010.

Over the years, CONCAWE has carried out a number of studies on the relationships between fuels, vehicle technologies and emissions, including PAH emissions. In 2004, tests were completed on two advanced diesel cars using fuels with a wide range of polyaromatics content, and on two advanced gasoline cars with a fuel representative of 2005 quality with (total) aromatics content at the maximum allowed level. These data have been combined with data from tests using earlier vehicle technologies and will soon be published as a CONCAWE report.

One of the issues to contend with in a study of PAH in automotive exhaust emissions is that there is no standard sampling protocol or analytical procedure for measuring PAHs. Also there is no consensus on which PAH species should be measured, although the EU's fourth Air Quality Daughter Directive[2] has recently established a target level for benzo[a]pyrene in ambient air and requires monitoring of six other PAHs. For the CONCAWE work reported here the selection of PAHs to be measured was based on the EPA-16[3] list shown in Table 1.

Table 1 EPA-16 PAH list

This table also identifies those individual PAHs that are included in the 2+ring and 3+ring summations used in this study.

EPA 16 PAH	2+ ring	3+ ring
Naphthalene	Yes	
Acenaphthene + Acenaphthylene[1]	Yes	
Fluorene	Yes	
Phenanthrene	Yes	Yes
Anthracene	Yes	Yes
Fluoranthene	Yes	Yes
Pyrene	Yes	Yes
Benz(a)anthracene	Yes	Yes
Chrysene	Yes	Yes
Benzo(b)fluoranthene	Yes	Yes
Benzo(k)fluoranthene	Yes	Yes
Benzo(a)pyrene	Yes	Yes
Dibenz(a,h)anthracene	Yes	Yes
Benzo(g,h,i)perylene	Yes	Yes
Indeno(1,2,3-cd)pyrene	Yes	Yes

[1] *Acenaphthene/acenaphthylene cannot be separated using High Performance Liquid Chromatography (HPLC) technique.*

CONCAWE testwork

In CONCAWE's work on automotive PAH emissions, our objective was to evaluate the total PAH emissions, i.e. both particulate-bound PAH and vapour-phase PAH emissions. In order to achieve this, an analytical system was developed in conjunction with Ricardo Consulting Engineers. The sampling system used a special probe with a filter and absorbent resin, to sample both particulate-bound and vapour-phase PAH from a standard

[1] *EU Commission's position paper on PAH emissions, 2001*

[2] *EU Directive 2004/107/EC of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air*

[3] *16 PAHs designated by the US Environmental Protection Agency as Priority Pollutants*

Automotive PAH emissions

Effectively reduced with advancing emissions controls

Table 2 A wide range of vehicle technologies were tested

Code	Phase	Year	Fuel	Engine (litres)	Combustion system	Exhaust after-treatment
A	1	1997	diesel	1.9	IDI	none
A_{cat}	1	1997	diesel	1.9	IDI	oxidation catalyst
B	1	1993	diesel	2.5	IDI	oxidation catalyst
C	1	1997	diesel	1.9	DI	oxidation catalyst (close coupled)
D	2	2002	diesel	1.9	DI	oxidation catalyst
E	2	2001	diesel	2.2	DI	particulate filter
X	1	1998	gasoline	1.4	MPI	TWC
Y	2	2002	gasoline	1.8	MPI	TWC
Z	2	2002	gasoline	1.6	lean DI	TWC+NO_x trap

IDI = indirect injection DI = direct injection MPI = multi point injection TWC = 3-way catalyst

dilution tunnel[4]. Sampling was carried out using a single probe over the duration of the standard European legislative emissions test cycle (NEDC). Both exposed filter (particulate-bound) and resin (vapour-phase) PAH emissions were collected and analysed by the same technique. For evaluation of the results the particulate-bound and vapour-phase data for each PAH were added together and the total PAH emissions were then summed in two ways:

- 2+ ring PAHs—the full EPA-16 list including the volatile 2 ring species; and
- 3+ ring PAHs—those PAH species which are predominantly emitted to the atmosphere bound to particulates (see Table 1).

As mentioned earlier, PAH emissions tests were completed in 2004 on two advanced diesel cars and two advanced gasoline cars (referred to in Table 2 as Phase 2). Earlier work had been carried out on older engine/vehicle technologies (referred to in Table 2 as Phase 1)[5]. Overall, a wide range of vehicle technologies was tested, from Euro-1 through to the latest diesel vehicle technology with a particulate filter (see Table 2). A wide range of diesel fuel qualities was also tested.

Test results

Only a brief summary of the results of the studies can be given in this article. Figures 1 and 2 show the effects of advances in emissions control technologies. In these charts, all of the light-duty vehicle test data are averaged by car, across all fuels tested. Older diesel cars showed relatively high PAH emissions but the latest generation of diesel cars gave very low PAH emissions, equal to or even better than the advanced gasoline cars (depending on the specific PAHs).

In the older diesel vehicles, 3+ring PAH emissions increased linearly with diesel fuel polyaromatics content. There was a similar trend of 2+ring PAH emissions with diesel fuel polyaromatics content and to a smaller degree with mono-aromatics content. However, reducing the polyaromatics content to zero did not eliminate the PAH emissions, because a significant proportion is generated during combustion. With the advanced diesel vehicle emission control systems, the PAH emissions were very low, close to or below the limits of detection and showed no discernible sensitivity to fuel aromatics/polyaromatics content.

[4] *SAE (1998) Collier A.R., et al.* Sampling and analysis of vapour-phase and particulate bound PAH from vehicle exhaust. *SAE 982727*

[5] CONCAWE Review, *April 2001*

Automotive PAH emissions

Effectively reduced with advancing emissions controls

Figure 1
2+ ring PAH emissions
2+ ring PAH emissions are well controlled with advanced emission control technologies. Advanced diesel vehicles achieved 2+ring PAH emissions even lower than the advanced gasoline cars tested.

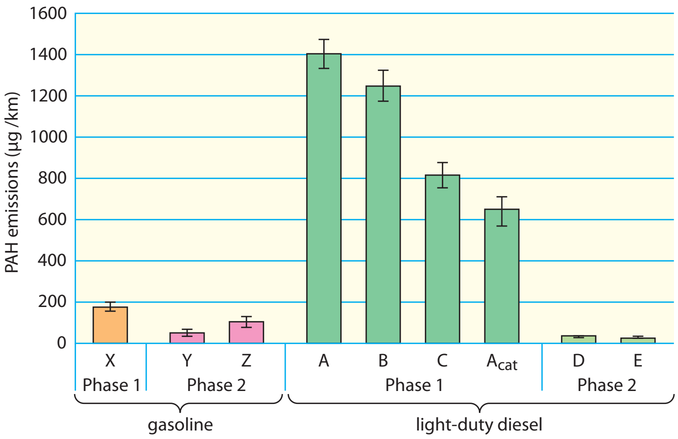
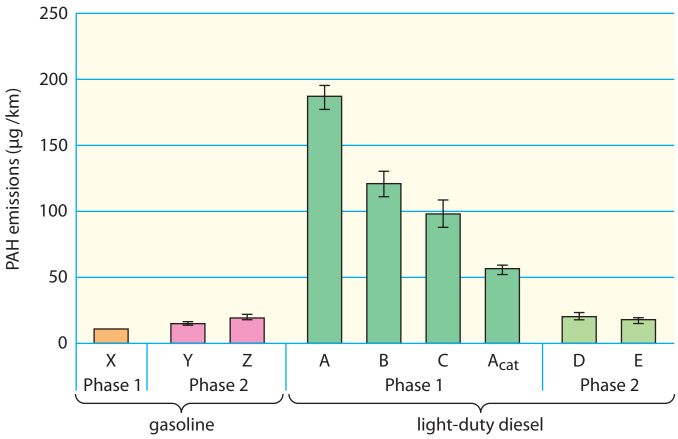
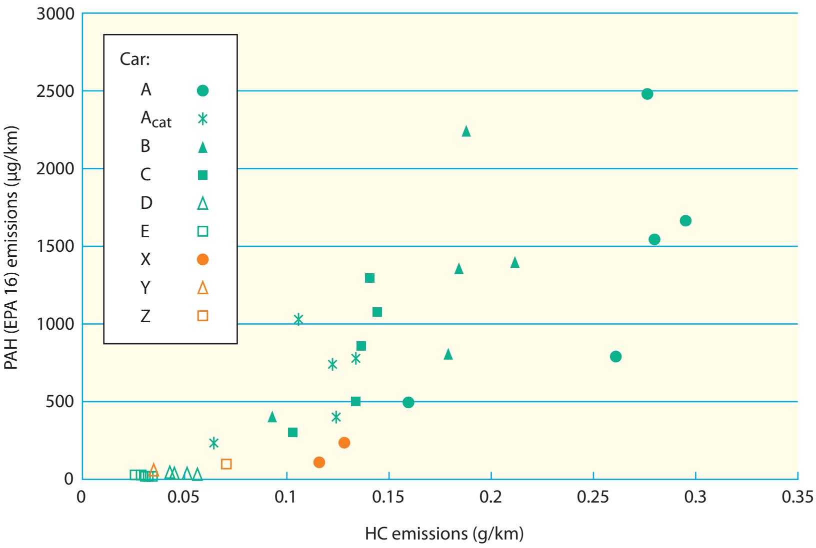


Figure 2
3+ ring PAH emissions
3+ ring PAH emissions are well controlled with advanced emission control technologies. Advanced diesel vehicles achieved 3+ ring PAH emissions as low as advanced gasoline cars.



It is clear from Figures 1 and 2 that the emission control technologies that are being employed to meet legislation on regulated emissions (HC, PM) are also controlling PAH emissions. In order to check the relationships between PAH emissions and regulated emissions, the average PAH emissions for each vehicle/fuel combination tested were plotted against HC and PM emissions. The trends were fairly consistent and confirmed that the measures taken to address regulated emissions are indeed also dealing with PAH emissions. It is also clear that the range of data, which includes fuel effects in the older technologies, becomes very small as the total HC emissions are reduced. Figure 3 shows a plot of 2+ring PAH emissions versus HC emissions for all the vehicles and fuels tested.

Figure 3
2+ ring (EPA-16) PAH emissions versus HC emissions
PAH emissions track the improvement in regulated HC emissions. Diesel fuel polyaromatics effects seen with the older vehicle technologies are no longer observed with the advanced technologies.



Overall assessment

In older diesel vehicles, there was a relationship between diesel fuel polyaromatics content and PAH emissions, although reducing diesel fuel polyaromatics content even to zero would not eliminate PAH emissions, as a significant proportion is combustion-generated. Advanced diesel vehicles, including a diesel particulate filter equipped vehicle, showed very low PAH emissions and no longer showed any sensitivity to diesel fuel polyaromatics content.

The emission control technologies that are being implemented to achieve regulated emissions limits are also controlling PAH emissions. Lower sulphur fuels have paved the way for a wide range of advanced vehicle technologies to be applied. With increasing market penetration of these advanced vehicles, PAH emissions from road transport should soon no longer be a concern.

A European framework for water quality

Key features and potential impacts on the downstream oil industry

In October 2000 the European Commission published an all-encompassing Directive for water. Five years on from the first concept, the Water Framework Directive (WFD) was intended to replace a patchwork of other legislation, often overlapping and even contradictory, on various aspects of water management and quality. It has been hailed as one of the most far-reaching and comprehensive pieces of water legislation in the world. Issues covered include surface and groundwater quality (both chemical and 'ecological'), water resource management, costs of water and minimum standards required. The Directive introduced two concepts new to most European countries: firstly, the notion of water bodies within river basins as the basic building block of water management; and secondly, the dual approach to standards, i.e. discharge limits combined with environmental quality objectives and standards. The WFD covers inland surface water, transitional water, coastal water and groundwater, and will cause repeal of seven earlier Directives (and various amendments) over the next 15 years.

The WFD sets out to manage water principally by defining quality requirements which, in turn, also have a secondary effect upon availability and supply. The basic building block of the Directive is a series of water bodies within each Member State, a water body being defined as 'a discrete and significant element of surface water such as a lake, reservoir, stream, river or canal, part of a stream, river or canal, a transitional water or coastal water' and 'a distinct volume of groundwater within an aquifer or aquifers'. Overlying these water bodies is a set of river basins, which are further combined into River Basin Districts, and are used as the basic management tool by Member States. The Directive itself includes a series of broad quality definitions (see Table 1) covering both the chemical and ecological properties of water within each water body. Using a prescribed monitoring regime, each water body is required to attain 'good status' or better 15 years after the date of entry into force of the Directive (i.e. by 2015). Measures also need to be in place to prevent deterioration of status. Further detail on values will be developed in associated guidance documents and by the Member States themselves.

> *Is water special?*
>
> *Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such.*

Under certain circumstances, where a water body has been so modified by human activity, or its natural condition is such that it is not feasible or is unreasonably costly to achieve good status, lower standards may be set. All practicable steps should still be taken to avoid further deterioration. Such a case might, for example, arise where a river has been canalised to facilitate river traffic. In such a situation, only chemical quality standards will be set for the water body, but will be set so as to ensure that it achieves the best possible water quality. Hence the definitions for such heavily modified water bodies are in terms of 'ecological potential' rather than actual ecological status. In all cases achieving a quality capable of sustaining a broad ecology is the goal for all water bodies covered.

What does this mean in practice for refineries?

There are a number of aspects of the WFD which are especially relevant to downstream oil operations and their discharges to controlled waters.

Article 10 of the Directive refers to the combined approach of emission controls and environmental quality standards (EQS). This specifically requires the use of BAT for emission controls (e.g. as defined in the IPPC or Urban Waste Water Directives). If, however, the use of

Table 1 Status definitions

Status level	General definition	Chemistry definition
High	No, or very minor, variation by anthropogenic influence from undisturbed state	Close to zero or less than detection limits for synthetic substances; undisturbed (i.e. background levels) for non-synthetic substances
Good	Low level of variation by anthropogenic influence from undisturbed state	Below EQS for both synthetic and non-synthetic substances
Moderate	Moderate variation by anthropogenic influence from undisturbed state	No specific description
Poor	No specific description—worse than moderate	No specific description
Bad	No specific description—worse than poor	No specific description
Chemical parameters for surface water	**Ecological parameters for surface water**	**Parameters for groundwater**
Thermal condition Oxygenation levels Salinity Acidification state Nutrient state Pollution by PS Pollution by other synthetic substances discharged in significant quantity	Composition and abundance of aquatic flora Composition and abundance of benthic invertebrates Composition, abundance and age structure of fish fauna	Oxygenation level pH Conductivity Nitrate Ammonia
	Additionally for transitional and coastal waters composition, abundance and biomass of phytoplankton	
	Heavily modified water bodies are classified according to max/good/moderate ecological potential	

BAT does not achieve compliance with EQS, then more stringent emission controls shall be set. This could enable a regulator to require a refinery to go beyond the BAT descriptions in the relevant BREF to obtain good status in a particular receiving water.

What is zero?

One of the requirements of Article 16 is the cessation of emissions, releases and losses of all priority hazardous substances. There is considerable debate as to what this means in practice—below detection limits; some de minimis *value; a threshold below which there is no discernable increase in concentration in the receiving water; no discharge at all, i.e. in effect cessation of use. All could be argued to be in the spirit of the WFD. A debate to watch closely.*

Article 16 of the WFD deals with specific measures to be adopted against individual substances, or groups of substances, considered to pose a significant risk to the aquatic environment. A selection process has taken place to identify priority (PS) and priority hazardous (PHS) substances. Table 2 lists those currently selected. A number of substances are listed as PSR. This means they are priority substances under review as possible priority hazardous substances. The list of PS and PHS is to be reviewed every four years from entry into force of the Directive. This means it should have been reviewed for the first time by now. In practice this process is just beginning.

Article 16 is spawning a Daughter Directive of its own to deal with the controls on PS and PHS, and the standards required. An important aspect here is that emissions of PHS should cease by 2015 (see box on left) and that emissions of PS shall have adequate controls placed upon them in the same timescale. As Table 2 indicates, a number of substances relevant to downstream oil operations are included as PHS (for example cadmium, PAHs (list of 5),

A European framework for water quality

Key features and potential impacts on the downstream oil industry

mercury, etc.) and PS (for example benzene, nickel, fluoranthene, etc.). The initial indications from the Commission on the Article 16 Daughter Directive suggested significant extensions to the current requirements of the WFD and other related Directives. This is an area still under review and further public consultation is awaited. CONCAWE is working with other industry bodies to ensure sound science and effective management tools are applied in this Directive.

Table 2 Priority and Priority Hazardous substances

Substance	Classification	Notes
Alachlor	PS	
Anthracene	PSR	Under review as possible PHS
Atrazine	PSR	Under review as possible PHS
Benzene	PS	
Brominated diphenyl ethers	PHS	
Cadmium and its compounds	PHS	
C10-13 chloroalkanes	PHS	
Chlorphenviphos	PS	
Chlorpyriphos	PSR	Under review as possible PHS
1,2-dichloroethane	PS	
Dichloromethane	PS	
DEHP	PSR	Under review as possible PHS
Diuron	PSR	Under review as possible PHS
Endosulphan	PSR	Under review as possible PHS
Fluoranthene	PS	Indicator of other PAHs
Hexachlorobenzene	PHS	
Hexachlorobutadiene	PHS	
Hexachlorocyclohexane	PHS	
Isoproturon	PSR	Under review as possible PHS
Lead and its compounds	PSR	Under review as possible PHS
Mercury and its compounds	PHS	
Naphthalene	PSR	Under review as possible PHS
Nickel and its compounds	PS	
Nonylphenols	PHS	
Octylphenols	PSR	Under review as possible PHS
Pentachlorobenzene	PHS	
Pentachlorophenol	PSR	Under review as possible PHS
PAHs (list of 5)	PHS	benzo(a)pyrene, benzo(b)fluoranthene benzo(ghi)perylene benzo(k)fluoranthene indeno(1,2,3-cd)pyrene
Simazine	PSR	Under review as possible PHS
Tributyl tin compounds	PHS	
Trichlorobenzenes	PSR	Under review as possible PHS
Trichloromethane	PS	
Trifuralin	PSR	Under review as possible PHS

PS = priority substance; PSR = priority substance under review; PHS = priority hazardous substance

A further aspect of relevance to our industry is Article 7 which deals with waters used for the abstraction of drinking water. This short article has provisions for water quality to ensure the appropriate drinking water standards can be achieved, and furthermore that these be achieved with a reduced level of treatment (interpreted by some as a low or minimum level of treatment). The requirements under Article 7 have been extensively discussed and proposals have been made which, in effect, require all surface (and potentially ground) waters likely to be used for drinking water to meet drinking water standards for all PS and PHS. CONCAWE, with other industry bodies, has been active in development of a technical argument to support a less stringent requirement, allowing for reduction of substance levels by treatment within the drinking water purification plant and only applying the quality standards at the point of abstraction for water actually used for drinking water production. This is still under debate but is being widely supported as a practicable way forward.

Where are we now, and what is the CONCAWE response?

The WFD is a complex piece of legislation which will require major changes in the way water quality is controlled in most Member States. Guidance is being developed by the Commission for many aspects of the Directive. In an attempt to simplify the implementation process for Member States and to encourage a common approach the Commission has put in place a Common Implementation Strategy for the WFD. As part of this process a Pilot River Basin Project has been initiated to work through the various aspects of implementation of the WFD. This is currently under way in 15 river basins across the EU (see Table 3). Feedback from this project so far indicates the WFD can be implemented but that a number of practical problems will have to be addressed. Many of these relate to how the various water bodies are to be classified and controlled in a cost-effective and protective manner. The outcomes from this project will also be used to modify the guidance documents based on real practical experience of implementation.

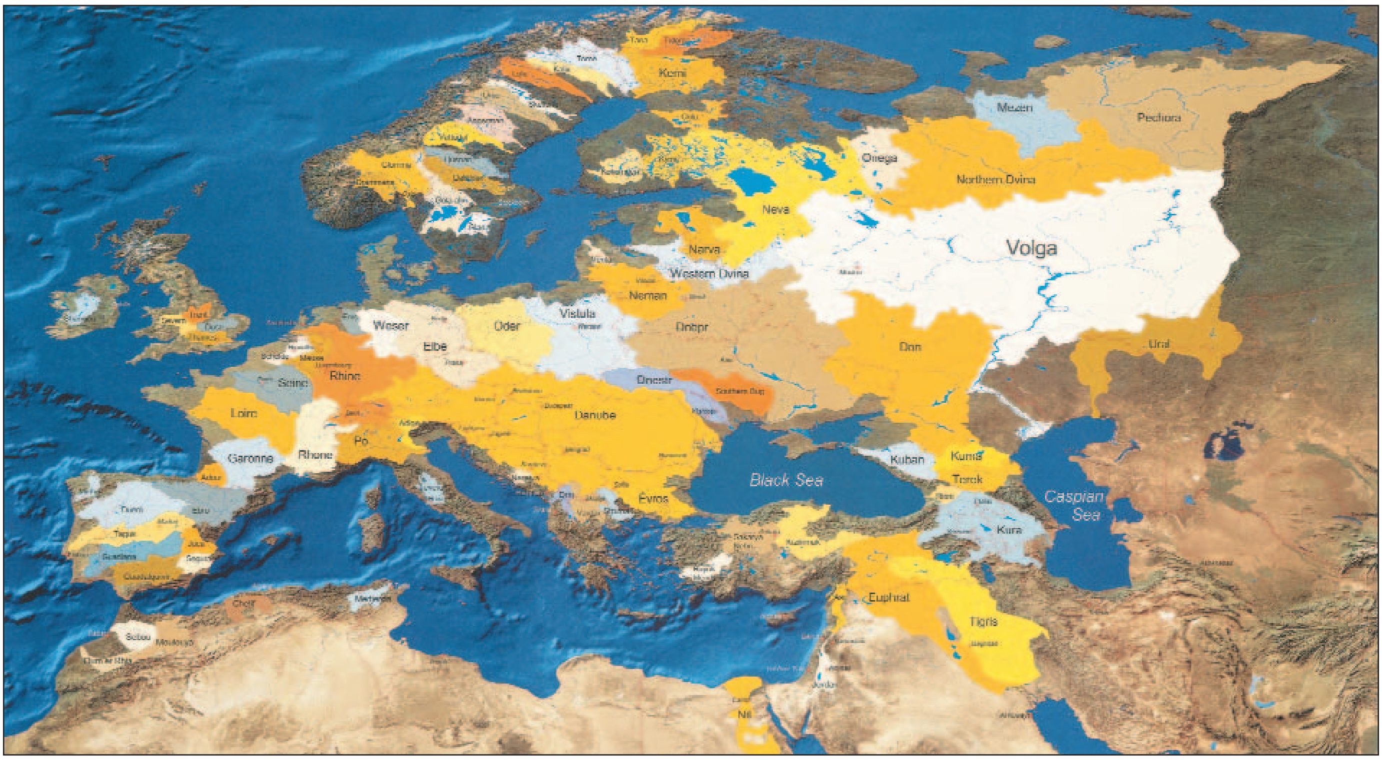
The timelines for the full implementation of the WFD may seem long but, given the ramifications for industry, work has already commenced in an effort to fully understand all factors involved. Some of the activities, for example in relation to water quality standards, have been mentioned above. Additionally, CONCAWE's Water Quality Management Group has formed two Special Task Forces to gather data on discharges and receiving water quality. This data will help in identifying further actions required to ensure the downstream oil industry continues to minimise its effect upon surface and ground waters.

Further information can be obtained at the DG Environment website: http://europa.eu.int/comm/environment/water/water-framework/index_en.html and through the CIRCA portal: http://forum.europa.eu.int/Public/irc/env/wfd/library.

Table 3 Pilot river basins

Country/countries	River basin	Transboundary?
Belgium/France/The Netherlands	Scheldt	Yes
Denmark	Odense	No
Finland	Oulujoki	No
France/Germany/Luxembourg	Sarre-Moselle	Yes
France	Marne	No
Germany/Poland/Czech Rep	Neisse	Yes
Greece	Pinios	No
Ireland	Shannon	No
Italy	Cecina and Tevere	No
Norway	Suldalsvassdraget	No
Portugal	Guadiana	No (only Portuguese side)
Romania/Hungary	Somos	Yes
Spain	Júcar	No
United Kingdom	Ribble	No

Figure 1 European inland waters and river basins



European cross-country pipelines

Performance report for 2003

The yearly CONCAWE report on the safety and environmental performance of European cross-country pipelines is complete and will be published soon.

The data collected for 2003 from 65 companies and other bodies covers 250 different pipelines with a combined length of more than 36 000 km. In 2003 these lines transported some 817 million m^3 of crude oil and refined products for a total traffic volume of 143 x 10^9 m^3 x km, up 11% compared to 2002. The database includes virtually the entire land-based oil pipeline inventory in the EU-15 and is being gradually extended to the new Member States.

There were 10 reported oil spills from these pipelines during 2003 with no associated fires or injuries. This is somewhat less than the long-term average of 12.7 spills per year since 1971. Taking into consideration the fact that the length of pipelines included in the survey has increased over the years, it is much better than the average result as measured by the frequency (0.27 spills per 1000 km/year in 2003 versus a long-term average of 0.53 spills per 1000 km/year).

2830 m^3 of oil were spilled of which nearly 90% was from a single event. A total of 1210 m^3, i.e. 43% of the spill, was recovered or safely disposed of. The net oil loss into the environment amounted therefore to 1620 m^3, 86% of which was from the same single event. This large single spill, resulting from a slow undetected leak following damage by third-party machinery, makes the total the worst figure for many years both in terms of gross and net spillage. Relative to the total length of pipeline under survey the performance was still of the same order of magnitude as the long-term annual average (78 litres per km gross and 44 litres per km net in 2003 compared to long-term averages of 90 and 40 litres per km per year).

One (minor) event was caused by mechanical failure but all of the remaining nine events were attributable to third-party actions. Three events were due to accidental direct damage, four were caused by criminal activities (theft) and two resulted from hitherto undetected damage to the pipeline caused by a third party in the past.

Figure 1 shows how improved operational, monitoring, inspection and maintenance practices have, over the years, successfully reduced the number of incidents due to mechanical failure, operational mishaps and corrosion. In this connection the report also contains an account of the intelligence pig inspection activities in 2003 and in previous years.

The industry has thus steadily improved the reliability and safety of oil pipelines in Europe. However, third-party activities remain a major issue and must be the focus of attention. They have historically been the major reason for spills from pipelines and the 2003 figures clearly reinforce this trend.

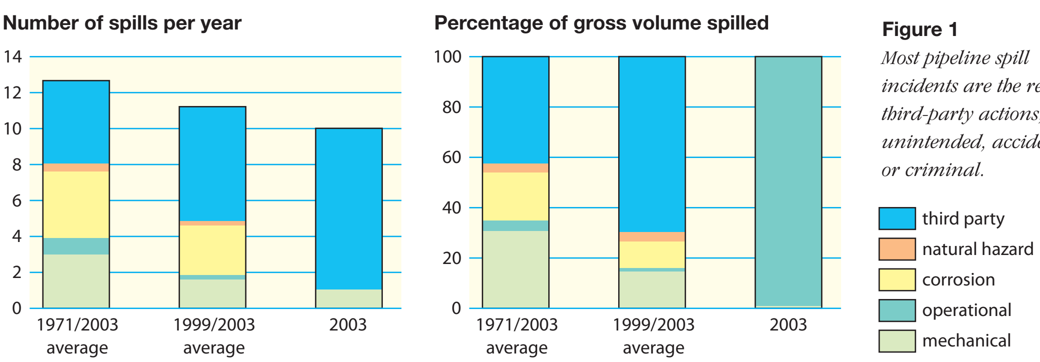


Figure 1
Most pipeline spill incidents are the result of third-party actions, either unintended, accidental or criminal.

Abbreviations and terms used in this CONCAWE *Review*

BAT	Best Available Techniques
BREF	BAT Reference document: Full title: 'Reference Document on Best Available Techniques for …' (A series of documents produced by the European Integration Pollution Prevention and Control Bureau (EIPPCB) to assist in the selection of BATs for each activity area listed in Annex 1 of Directive 96/61/EC)
DI	Direct Injection
EPA	US Environmental Protection Agency
EQS	Environmental Quality Standards
ERN	European Rivers Network
ERTRAC	European Road Transport Research Advisory Council
FP-7	The EU Commission's 7th Research Framework Programme
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HC	Hydrocarbon
HPLC	High Performance Liquid Chromatography
HSE	Health, Safety and Environment
IARC	International Agency for Research on Cancer
ICE	Internal Combustion Engine
IDI	Indirect Injection
IPPC	Integrated Pollution Prevention and Control (EU Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control)
MIT	Massachusetts Institute of Technology
MPI	Multi Point Injection
NEDC	New European Driving Cycle (The standard European legislative emissions test cycle)
PAH	Polycyclic Aromatic Hydrocarbon
PHS	Priority Hazardous Substance
PM	Particulate Matter
PS	Priority Substance
PSR	Priority Substance under Review
SAE	Society of Automotive Engineers
SRA	Strategic Research Agenda
TWC	3-Way Catalyst
WFD	Water Framework Directive

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11/04	European downstream oil industry safety performance—statistical summary of reported incidents—2003
12/04	Method for monitoring exposure to LPG containing small amounts of 1,3-butadiene
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