

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.

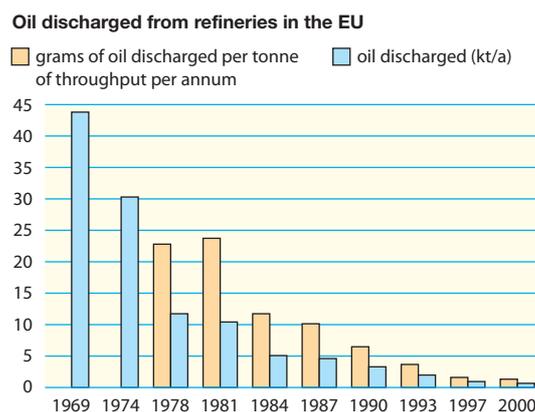
As the amount of oil and associated pollutants discharged has reduced, the focus of attention has

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.



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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.

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 OSPAR¹. 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.



'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)

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

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

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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

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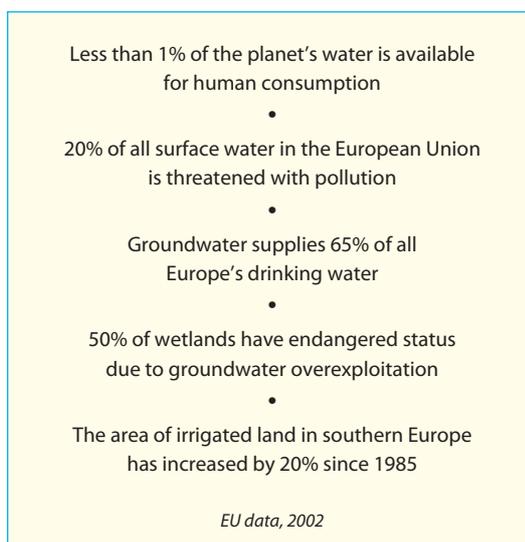
Guidelines. The EPER website will be formally launched in February 2004. The data will be publicly available and will aid member companies in handling queries from third parties. CONCAWE is investigating whether this will provide an opportunity to gather data on refinery emissions more easily and across 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.

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.