

Clean and clear

A review of the OSPAR Decision on the Harmonised Mandatory Control System and its impact on the offshore chemical supply industry.

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THE OBJECTIVE OF THE OSPAR DECISION ON THE HARMONISED MANDATORY Control System (HMCS) is to protect the marine environment by restricting the discharge to the sea of offshore oilfield chemicals having the potential to cause environmental harm. Associated Recommendations provide guidance on how to compare the potential environmental impact of different chemicals. This involves the generation of an environmental data set and its evaluation using pre-screening criteria and a decision-support tool – the chemical hazard assessment and risk management (CHARM) model.

In June 2000, the OSPAR Commission adopted Decision 2000/2 on a HMCS for the Use and Reduction of the Discharge of Offshore Chemicals. The aim of the Decision is to establish a consistent framework within which contracting Parties to OSPAR, representing those countries bordering the Northeast Atlantic, can reduce the amount and harmfulness of chemicals used and discharged in the course of offshore oil and gas exploration and production processes. Chemicals used for drilling, production, cementing, completions and workovers are covered.

The Decision, supported by a number of Recommendations describing how the HMCS will work in practice, is summarised in Figure 1. The responsibilities of the chemical supplier, operating company and regulatory agency differ according to the national sector in which the chemical is to be used.

Under the HMCS, chemicals will not be permitted for use offshore without authorisation from the authorities of the intended sector of the North Sea. The details of the chemical composition, its application, the quantities to be used and discharged, and the environmental properties of the products including toxicity to aquatic organisms and the fate and effects of component substances will need to be submitted to the national authorities. The details will be submitted on a standard form that is described in OSPAR Recommendation 2000/5 on a Harmonised Offshore Chemical Notification Format (HOCNF).

Environmental testing

PLONOR listed substances are those considered to Pose Little Or NO Risk to the environment and their environmental effects are considered to be well known. The guidelines accompanying Recommendation 2000/5 specify the toxicity and other tests to be

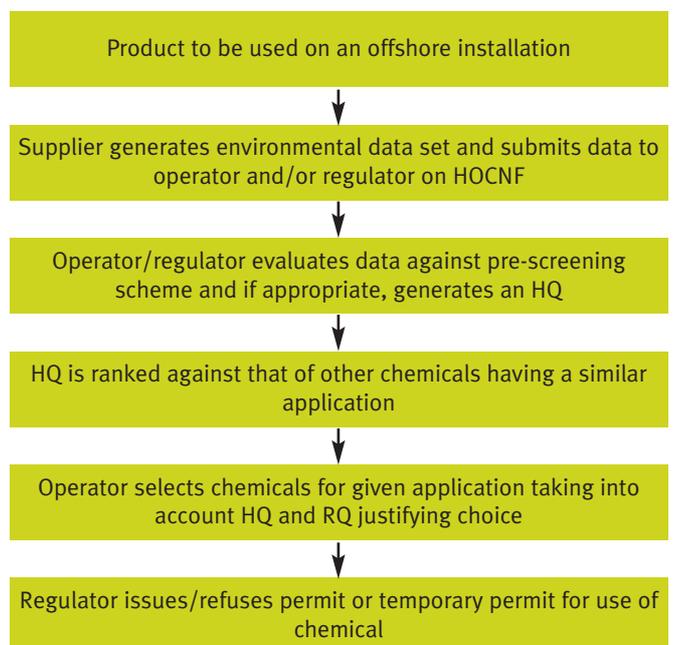


FIGURE 1. OUTLINE OF THE HMCS.

conducted on non-PLONOR substances. The marine species selected for the scheme represent different compartments within the marine environment (in other words, the water surface, water column and seabed), and also the links in the food chain, for example, fish feed on crustacea that feed on algae. The tests on the water-dwelling species (*Skeletonema*, *Acartia* and *Schopthalamus* or allowed alternates) are mandatory whereas the sediment reworker test is only required if the chemical will reach the seabed.

Biodegradation and bioaccumulation potential data on each deliberately added organic substance are also required according to the preferred protocols indicated in Table 1 which gives typical costs for the tests.

Pre-screening scheme

The first phase of assessment evaluates the data within the HOCNF against the flow-chart outlined in OSPAR Recommendation 2000/4 on a Harmonised Pre-screening Scheme for Offshore Chemicals. There are a number of possible outcomes from pre-screening as shown in Table 2. The number of chemicals refers to the products

registered at the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) in 2000. PLONOR substances will generally receive immediate approval whereas those appearing on Annex 2: OSPAR List of Chemicals for Priority Action [OSPAR Strategy with regard to Hazardous Substances (1998–16)] may be prohibited from use.

The remaining offshore chemicals will go to one of two other outcomes. Substances having a low rate of biodegradation, or a combination of this with low toxicity or high potential for bioaccumulation will go to the 'substitute' box. These are predominantly products containing substances of a polymeric nature. The operating company would be expected to try to find an alternative product with a better environmental profile. This may be difficult in the short term, but is a future challenge for the industry. If an alternative cannot be found, temporary permission for use of the product may be granted. Substances going through the scheme to 'ranking' and those given temporary permission go to the second stage of the assessment, evaluation by the CHARM model.

CHARM

The CHARM model comprises a set of calculation rules to generate a hazard quotient (HQ) representing the ratio of the predicted environmental concentration (PEC): predicted no effect concentration (PNEC). There are different rules for production chemicals, surfactants, water-based drilling muds, cementing, completion and workover chemicals reflecting the different ways that they are applied on the installation. CHARM assessment is run on each component substance within a product to assess the overall product. The CHARM model does not currently cover all offshore operations in which chemicals are used and algorithms for other applications are being discussed.

Environmental data and the percentage of the substance in the preparation or mixture are needed to calculate the HQ. The dose rate used for the HQ is that assumed to be required by a 'standard installation' and so is somewhat arbitrary especially where new and untested products are concerned. The HQ of two substances can be directly compared giving an operator visibility to select the chemical having the better environmental performance.

The operating company must justify the selection of the chemicals to be used on an installation to the authorities. The marine environmental effects of the chemical are only one parameter in the selection process. The chemical must perform effectively, but human health effects and cost should also be considered. Where actual use rates differ significantly from that for the standard installation then a site-specific HQ or risk quotient (RQ) can be generated and used for assessment. The UK authorities are the only ones who accept the use of the risk-assessment module in CHARM as part of this justification process.

HMCS and national legislation

OSPAR contracting parties having offshore activities in the North Sea are in the process of incorporating the HMCS into their national legislation. Differences exist in the way that each country intends to operate the system even though it is 'harmonised'.

The Danish Environmental Protection Agency (EPA) and operators are working closely on implementation of the HMCS. This will be initially by administrative action and then via an amended marine law. The registration process involves the submission of the completed HOCNF with full composition to the Danish Product Register. Products currently in use must be re-registered by 2005, on a prioritised basis.

Denmark requires toxicity data at the substance level. This has huge cost implications. The testing cost for a demulsifier comprising four component substances could be as much as £20,000. The chemical supplier will also give an HOCNF with generic composition to the operating company. This provides the information the operator needs to perform the pre-screening and CHARM assessments. Health and safety criteria will also be integrated into the decision-making process. Permits will be granted to operators for up to three years and will apply across all installations operated. The site-specific risk assessment module of CHARM is not accepted although the Danish Authorities can still impose site-specific conditions, regulating the use and discharge of chemicals based on their intrinsic properties.

In the Netherlands, implementation of HMCS will be through a new mining law. Until then, the HMCS will be implemented by 'administrative action'. The Inspector General (IGM) of the State Supervision of Mines can write a so-called Order in Council that effectively means that use and discharge will be controlled via the HMCS. The HMCS will work under the framework of the Environmental Covenant within a broader goal of phasing out harmful substances by 2010. The objectives of the Dutch approach will be to reduce progressively the use and discharge of all chemicals.

The State Pollution Control Authority (SFT), which regulates the Norwegian sector of the North Sea, has issued a draft of the new Norwegian regulations incorporating the HMCS within a broader HSE regulatory framework. Chemicals are registered at the KPD Centre who quality-check the data and enter it into the Chems database that is available to operating companies and the SFT. A full HOCNF is required for each chemical additive, even for closed-system chemicals, such as organic phase drilling fluids, not normally discharged. In a drilling fluid, this could amount to more than 50 data points and a cost of over £50,000. The value of all this data has to be questioned.

Companies are granted Frame Permits by SFT and within these can select chemicals giving consideration to their environmental profile.

TABLE 1. ENVIRONMENTAL TESTS REQUIRED UNDER THE HMCS AND THEIR TYPICAL COST.

Test required	Test protocol	Typical cost (£)
Algae	72hr EC ₅₀ : <i>Skeletonema costatum</i> ISO/DIS 10253	950
Crustacean	48 hr LC ₅₀ : <i>Acartia tonsa</i> ISO TC147/SC5/WG2	850
Fish	96hr LC ₅₀ : <i>Schophtalamus</i> maximus, juvenile OECD 203 modified for marine species	960
Crustacean — sediment reworker	10 day LC ₅₀ : <i>Corophium volutator</i> PARCOM	900
Biodegradation — water-soluble substances	28 day aerobic, marine OECD 306	660
Biodegradation — water-insoluble substances	28 day aerobic, marine BODIS (BOD for insoluble substances)	660
Bioaccumulation potential	Octanol/water partition co-efficient (log P _{ow}) OECD 117 or 107 or Blue Mussel Bioconcentration Factor test OECD 305	400 or 900 >10,000 0

Evaluation includes assessment according to the pre-screening scheme. For products containing persistent and bioaccumulative substances, a phase-out plan is agreed between the operating company and the chemical supplier. CHARM is not as central to the process as in other countries, with operators having developed an advanced model for performing impact assessments.

In the UK, The Offshore Chemicals Regulations, bringing into effect the OSPAR Decision came into effect in mid August 2002. Introduced by the Department of Trade and Industry (DTI) under the Integrated Pollution Prevention and Control Act, the Regulations, a Regulatory Impact Assessment and a set of Guidance Notes were all subject to a public consultation process. Operators are required to have a permit for use and discharge of offshore chemicals for each installation. All existing installations currently have 'deemed permits' which will be called in over a two-year phase-in period according to the size of the operation and the sensitivity of the area in which the operation is taking place. All new activities will need a new permit. Applications will include a 28-day public notice period when applicants have to signal their intention to seek a discharge through an appropriate medium.

Impact on offshore chemical-supply industry

The degree of harmonisation achieved by the framework of the HMCS is very positive for the chemical supply industry. Standardisation of the reporting formats (HOCNF), environmental test protocols, the use of the pre-screening scheme and CHARM helps suppliers to source the required data more efficiently. The transparency of the system enables suppliers to invest resources

into products with good environmental performance that will be more successful under the scheme.

Conversely, the differences encountered in the national schemes lead to confusion for companies that register products for use in more than one country. Frequently, companies (particularly those handling registrations from the USA) believe that if they have registered a product in the UK, they can also sell it in the Netherlands or Norway and this is not the case. Indeed, it may be the case, that the environmental data generated for registration in one county is not valid for registration in the others. For example, if toxicity data is generated on a preparation for the UK, it may not be accepted in Denmark. Additional testing to satisfy these differences adds to the compliance costs and the time to generate the data.

This increased cost of environmental testing including the introduction of the mandatory fish test could result in companies shortening their list of available products for use in the OSPAR area. As with the Biocide Directive, the HMCS is likely to hinder new product development by reducing the level of R&D that companies are willing to invest in. This is contrary to the objectives of continual improvement through the HMCS.

Greener chemistries are often much more expensive than traditional products. Though a 'green' scale inhibitor has been developed, it is five times the price of phosphonates or polymers and, unsurprisingly, a market is still to be realised for these products.

The UK is publishing the ranking list on the internet. This is a concern for the chemical-supply industry as it could have a significant negative commercial impact if misinterpreted or misused. The HQ is generated from a set of calculations using parameters of 'standard installations' and the outcome of the standardised assessment may incorrectly suggest the chemical is a bad actor.

Future of the industry

Despite the concerns over testing costs, recent history has frequently shown that the chemical supply industry is developing increasingly environmentally acceptable chemicals. This is sure to continue as the relative positions on the hazard-ranking list will stimulate competition among companies for the best position.

The major challenge for the chemical supply industry is to develop products with high technical and good environmental performance. This is particularly difficult for corrosion inhibitors comprising of fairly toxic chemistries such as imidazolines and quaternary ammonium compounds and demulsifiers that comprise persistent polymeric chemistries in organic solvents.

While the HMCS provides a common framework for OSPAR countries there are still differences in the way that the national schemes

TABLE 2. PROPORTION OF CHEMICALS ARRIVING AT DIFFERENT PRE-SCREENING OUTCOMES.

Rebrand of Substances or Products containing Substances...	Number of Chemicals	Percentage (%)	Pre-Screening Outcome
PLONOR chemicals	604	30	Permitted for use
Listed on Annex 2 to OSPAR Strategy on Hazardous Substances	43	2	Prohibited for use
Rebrand of inorganic substances (if LC/EC ₅₀ >1 mg/l)	119	6	Expert Judgement
Products containing inorganic substances (if C/EC ₅₀ >1 mg/l)	398	20	Expert Judgement
Biodegrade <20% in 28 days	615	31	Substitute
Meets 2 of the 3 criteria (for persistence, toxicity and potential for bioaccumulation.)	193	10	Substitute
Go to Ranking	377	19	CHARM Assessment

work in practice. In the future, we may see increasing harmonisation at the national level.

Acknowledgement

This article is an adaptation of the paper 'Impact of the Ospar Decision on the Harmonised Mandatory Control Scheme on the Offshore Chemical Supply Industry', presented at Chemistry in the Oil Industry VII, Royal Society of Chemistry & EOSCA, 2001. ●

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