Evaluation of the hazard and risk of chemicals used by the UK offshore oil and gas industry and the management and reduction of use of those considered of greatest environmental concern

Background to OCNS

The Offshore Chemical Notification Scheme (OCNS) is regulated by the Department of Trade and Industry (DTI), using scientific and environmental advice from Cefas and the Fisheries Research Services (FRS) in Aberdeen.  
- 1979: OCNS first established as a voluntary system, the chemicals were placed into categories depending only on their toxicity.  
- 1993: The ‘revised’ Notification Scheme was introduced this used biodegradation, bioavailability and toxicity as its assessment criteria.  
- 2002: OSPAR Harmonised Mandatory Control Scheme (HMCS) for the use and reduction of offshore chemicals. It ranks chemicals according to their Hazard Quotient (HQ), calculated using the CHARM (Chemical Hazard and Risk Management) model.

Hazard Assessment

There are two methods of hazard assessment, CHARM or NonCHARM.

CHARM

Table 1: The OCNS HQ and colour banding

<table>
<thead>
<tr>
<th>Hazard Quotient Value</th>
<th>Lowest Hazard</th>
<th>Low Hazard</th>
<th>Medium Hazard</th>
<th>High Hazard</th>
<th>Highest Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>Yellow</td>
<td>Green</td>
<td>Blue</td>
<td>Red</td>
<td>Brown</td>
</tr>
<tr>
<td>1-10</td>
<td>Green</td>
<td>Blue</td>
<td>Red</td>
<td>Orange</td>
<td>Brown</td>
</tr>
<tr>
<td>10-100</td>
<td>Blue</td>
<td>Red</td>
<td>Orange</td>
<td>Brown</td>
<td>Brown</td>
</tr>
<tr>
<td>100-500</td>
<td>Red</td>
<td>Orange</td>
<td>Brown</td>
<td>Brown</td>
<td>Brown</td>
</tr>
</tbody>
</table>

The CHARM model calculates the ratio of predicted exposure concentration against no effect concentration (PEC: NEC), and is expressed as a Hazard Quotient (HQ), shown on Table 1. The model uses the following data to make its assessment:
- Use and discharge
- Biodegradation, toxicity and partitioning
- Default values for depth, mud density etc.
- Chemical dosage

NonCHARM

Table 2: The toxicity values that assign the initial OCNS letter group

<table>
<thead>
<tr>
<th>Hazard Quotient Value</th>
<th>Lowest Hazard</th>
<th>Low Hazard</th>
<th>Medium Hazard</th>
<th>High Hazard</th>
<th>Highest Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>Yellow</td>
<td>Green</td>
<td>Blue</td>
<td>Red</td>
<td>Brown</td>
</tr>
<tr>
<td>1-10</td>
<td>Green</td>
<td>Blue</td>
<td>Red</td>
<td>Orange</td>
<td>Brown</td>
</tr>
<tr>
<td>10-100</td>
<td>Blue</td>
<td>Red</td>
<td>Orange</td>
<td>Brown</td>
<td>Brown</td>
</tr>
<tr>
<td>100-500</td>
<td>Red</td>
<td>Orange</td>
<td>Brown</td>
<td>Brown</td>
<td>Brown</td>
</tr>
</tbody>
</table>

Products not applicable to CHARM e.g. inorganic substances, and hydraulic fluids or chemicals used only in pipelines, are products assigned a grouping A – V. Products that only contain substances considered by OSPAR to be environmentally benign in seawater, are termed PLONOR.

Data used in the assessment includes the following:
- Toxicity for initial grouping
- Biodegradation and bioaccumulation for the final grouping however,
- No consideration is taken for use and discharge.

Environmental risk assessment

A full Environmental Statement (ES) is mandatory for all large projects and in any sensitive or previously unexploited areas.

Small projects do not need a full ES. Operators submit a Petroleum Operations Notice 10 (PON 10) to the DTI, which includes a risk-based application to use chemicals.

If the products being used can be put through the CHARM model then a Risk Quotient (RQ) is derived. If the products being used can be put through the CHARM model then a Risk Quotient (RQ) is derived. Chemicals that appear in PORT1s that have RQ’s >1, ROU/RG or carry a substitution warning, require further written justification for their use.

Reported chemical use and discharge

DTI annually reports chemical use and discharge figures to OSPAR.

High use of PLONOR chemicals (Figure 2) may result from increased drilling activity when oil prices are high (PLONOR substances make up the majority of products used in water-based drilling muds). Substances that are candidates for substitution are present in lower amounts but are often difficult to observe or do not have potential environmental effects, provide a comparative management of PBT chemicals.

Other issues in the management of offshore chemicals

- Phase out of hazardous substances: e.g. lead 2010, is on OSPAR’s list of priority chemicals.
- Substance based test data: Wes introduced in December 2006 all registered products will have or have no substitution warnings and are termed ‘ Ranked’.
- Review of substitution warnings: New approaches to testing e.g. use of extended biodegradation protocols) are reviewed regularly. Greater attention is paid to chemicals which appear to cause the potential of surfactants to bioaccumulate
- Limit testing: In March 2005, ‘limit’ testing was introduced to reduce the number of fish used in toxicity tests. Estimated to reduce the number of fish used in tests by about 75%

Summary

Offshore oil and gas production is important to the economy but must be managed in a way that protects the marine environment.

The first part of the new Harmonised Mandatory Control Scheme (HMCS) ensures that based on HQs the most effective and least hazardous chemical, for a given purpose, will be chosen. The second part of the scheme assesses the potential that chemical discharge will have upon natural resources in the specific area around the installation. This raises an important question, together with the commitment of the industry to seek alternative chemistries and minimise potential environmental effects, provides a comprehensive management of PBT chemicals.

Acknowledgements

This work is funded by the DTI

Notes

1. PLONOR (Poses Little Or No Risk) are substances considered to be environmentally benign in seawater. 100% PLONOR products are given an OCNS E grouping.
2. The 1999 OSPAR Convention is the current instrument guiding international cooperation on the protection of the marine environment of the North-East Atlantic.

© Crown Copyright 2007

dave.sheahan@cefas.co.uk