Workshop Report

'The Use of Oil Spill Dispersants following the Deepwater Horizon Incident'

26 – 27 November 2012, Lisbon

Background

The explosion and subsequent blowout of the Deepwater Horizon (DWH) offshore drilling rig in the Gulf of Mexico on 20 April 2010 resulted in the largest oil spill in the United States' history. The long duration and large scale use of oil spill dispersants on the sea surface and the novel technologies used for sub-surface dispersant application during the DWH spill response operations were unprecedented. Following this incident, the European states expressed on several occasions their interest and concerns in regard to dispersant use, highlighting the need for accurate information on the dispersant applications during the DWH spill and the lessons learnt from these.

Considering the above, and given EMSA's task to facilitate a common understanding of the use of oil spill dispersants and their implications in Europe, the Agency hosted on 26 and 27 November 2012 a workshop addressing the use of oil spill dispersants during the Deepwater Horizon incident.

Participants of EMSA's Dispersants Workshop

Workshop Objectives

The workshop was attended by 27 experts representing coastal European States (EU Member States, EFTA/EEA coastal States, and coastal EU Acceding/Candidate Countries), Regional Agreements (REMPEC, Lisbon Agreement), and 9 presenters. Presenters included representatives from the US Coast Guard, BP, and other international experts actually involved in the DWH spill response. The participants list is attached (Annex 1).

The workshop's main objective was to provide a European platform for discussion, exchange of knowledge and experience on the main lessons learnt from the DWH incident and discuss the recent developments regarding large scale application of oil spill dispersants sub-sea and on the sea surface.

The following topics were addressed:

- Operational aspects of the DWH sea surface and subsea dispersant applications;
- The process of data collection and analysis regarding the spill's environmental impact assessment and monitoring;
- The regulatory developments since the DWH incident regarding dispersant usage in the US and Europe;
- The research on sub-sea dispersant application initiated post-incident;
- Main lessons learnt from the DWH spill of relevance to Europe.

Workshop Programme

The workshop was chaired by Mr Bernd Bluhm, EMSA Head of Unit for Pollution Preparedness and Response. It covered five sessions, as per the workshop Agenda (Annex 2). Abstracts of the workshop's presentations were provided in advance (Annex 3) and are summarised below together with the ensuing discussions.

Mr Bluhm welcomed the participants to EMSA's offices. He highlighted the importance of this meeting in exchanging information and knowledge on the dispersant use operations and environmental impacts with input from experts directly involved in the DWH incident. Post-incident initiated research and regulatory developments regarding dispersant use in the EU and the US are also of prime interest for this meeting.

A brief introduction on EMSA's role and activities in regard to the use of oil spill dispersants was provided by Ms Lito Xirotyri (EMSA), who emphasised that any decision to test, approve or use oil spill dispersants in Europe is regulated at national level. EMSA provides support to EU Member States in better understanding the use of dispersants and their implications. This is achieved through the dissemination and exchange of relevant information (e.g. technical reports, dedicated workshops, inventories, etc.) and the development of decision support tools, such as the Dispersant Usage Evaluation Tool (DUET) for contingency planning purposes.

Workshop Session 1 – Operational Aspects

Mr Robert Pond (US Coast Guard) presented the USCG perspective on the dispersant application operations during the response to the DWH spill, including operational facts and challenges. Pre-authorisation agreements on dispersant use in place in the US at the time of the spill enabled a rapid decision to apply dispersants on the sea surface. Regarding sub-sea applications, a dispersant monitoring and assessment directive for subsurface dispersant application was developed in May 2010. The decision whether to continue dispersant applications was made daily, based on over flights assessing the oil spill size and location. The primary objective was to ensure the safety of the response teams on the sea surface by reducing the level of volatile organic compounds (VOC). A

monitoring plan was put in place during the sub-sea applications and for the long-term. Risk communications and the public's perception regarding the dispersant use during the DWH spill were among the main challenges encountered by the response authorities. The main concerns raised by the public included the applied dispersants' toxicity, the aerial application (fear of over spraying) and the fate and impact of the sub-surface dispersed oil plume. The US policies on dispersant usage up to the time of the DWH spill were focusing on sea surface applications and limited amounts of dispersant use. Following this incident, policies on sub-surface dispersant application and long-term monitoring plans are being developed and both public and private sectors are conducting research to understand the efficacy and impacts of dispersant usage.

The presentation by Mr Arden Ahnell (BP) reinforced the operational challenge of the unprecedented scale of response undertaken during the DWH spill, highlighting the industry's commitment to further develop its capabilities and practices to enhance safety. The DWH spill resulted in the largest known mobilisation of boom, and required the coordination in challenging conditions of a large number of responders, response vessels, and aircraft. Some operational data on the aerial and sub-sea dispersant applications during the DWH were provided, as well as generic guidance on the use and value of dispersant applications sub-sea. In regard to the selection of the chosen dispersant products the factors of product availability, efficacy and toxicity were taken primarily into consideration. It was emphasised that the sufficient supply of dispersant during the DWH spill response was an identified operational limitation. It was also clarified that the sub-sea dispersant injection system, which was developed during the incident, can now be installed rapidly (within 7-10 days). Regarding concerns raised on the dispersed oil's toxicity, the analysis of data is still on-going; however it was mentioned that monitoring indicated rapid dilution of dispersants and oil in the marine environment and laboratory and field data showed biodegradation of dispersant-oil mixtures.

Mr Thomas Coolbaugh (ExxonMobil) presented the general principles of dispersant usage as an oil spill response tool and their potential effects and impacts. Preliminary observations in regard to the sub-sea dispersant injection from the DWH experience showed that dispersants can be an option for reducing oil reaching the surface and shoreline. Of particular advantage in spills similar to that of the DWH incident (considering the spill location, dispersibility of oil, sea state) is the very high encounter rate of dispersant with oil when injected sub-sea and close to the wellhead. It was emphasised that more data analysis is needed to quantify the dispersed oil and to evaluate its long-term fate and effects, including its toxicity.

Workshop Session 2 – Environmental Impact Assessment

Ms Deborah French McCay (RPS ASA) is currently under contract for the US National Oceanic and Atmospheric Administration (NOAA) as the Co-Lead of the Offshore and Shelf Water Column, Fish & Invertebrate Technical Working Group and the Lead for exposure and injury quantification using modelling. She presented the current status of

the analysis and on-going field-based assessment of the dispersed oil monitoring and DWH oil spill impacts. The Natural Resource Damage Assessment (NRDA) is still in progress and related studies are currently confidential. The modelling approach used in this process includes hydrodynamic modelling for currents; oil fate modelling, exposure and toxicity analysis, and determination of lost future biological production. The data collection and analyses to support and verify the modelling involve an unprecedented field effort, including environmental sampling, chemistry, oil and particulates, and biota in multiple trophic levels of the offshore ecosystem. The main limitation in this large logistical effort is ensuring a comprehensive data collection and analysis. Once the data is analysed and quality assessed, it will be made public. The importance of having access to background data of the spill area (chemistry, biological, toxicological, wind/current, environmental sensitivities) was highlighted.

Ms French McCay (RPS ASA) also provided information on the sampling techniques and modelling used during the DWH spill response to evaluate the effectiveness of the subsurface dispersant applications and their potential impacts to water-column organisms, as well as to track the fate of the dispersed oil. During the time of the oil release, water chemistry samples and oceanographic sensor data were collected to test for the presence and characterise the droplet sizes of subsurface dispersed oil. Modelling was used to guide and support the 'adaptive' field sampling approach used for subsurface oil (which focused the sampling in areas and depths where oil and contaminants were expected to have moved from the wellhead area, in addition to sampling other areas at a lower level of effort). Available Acoustic Doppler Current Profilers (ADCPs) (i.e. current meters) proved to be very useful in this respect. The complexity of tracking the fate of the dispersed oil, given the large range of oil droplet size was highlighted. Vertical sampling based on real-time sensor measurements and chemistry samples, was used in the DWH spill. The use of Remotely Operated Vehicles (ROVs) and the analysis of images and acoustic sensors were very useful in allowing a comprehensive and focused sampling.

Mr Alun Lewis (Oil Spill Consultant) addressed what could have happened if dispersants had not been used in the DWH spill, based on publicly available information. In particular, the estimated figures and data published in the two 'Deepwater Horizon Oil Budget Calculators' (published by the US Government in August and November 2010) were reviewed and compared. The two documents include estimates on the fate of the released oil, which is classified in several categories as: directly recovered from the well head; naturally dispersed; evaporated or dissolved; burned; skimmed; chemically dispersed; and other oil. Among the limitations of this technical documentation is the fact that it is based on non-real-time estimates with varying degrees of uncertainty and it does not estimate the consequences of longer-term processes (e.g. biodegradation of dispersed oil, sedimentation of oil). The presentation discussed what could have happened if no dispersants had been used at the DWH spill and if all other estimates and response actions were the same.

Workshop Session 3 – Regulatory Developments

Mr Robert Pond (US Coast Guard) presented the post-DWH regulatory developments in the US. In light of the unprecedented application of dispersants, the US National Response Team (NRT) has drafted guidance for the Environmental Monitoring of Dispersant Operations. This guidance document specifically addresses the monitoring and assessment of sub-surface and prolonged surface dispersant applications.

On behalf of IPIECA, Mr Alun Lewis presented an overview of the national dispersant regulations currently existing globally, addressing the importance of pre-planning of dispersant use and the various dispersant product approval procedures. Some countries, but not all, have introduced regulations about dispersant use, which vary in scope and complexity. While the existing dispersant regulations often share the common aim of ensuring that the dispersants used are reasonably effective, not too toxic and should not be used on spilled oil in shallow waters or too close to the coast, the specific requirements of the various regulations are often quite different. A variety of different testing protocols are used in different countries to assess dispersant effectiveness and toxicity, aiming to provide more 'realistic' simulations of dispersant use on oil at sea. The toxicity testing of the dispersant versus that of the dispersed oil (dispersant and oil) was also addressed. A paper prepared by Mr Lewis on behalf of IPIECA on 'Global dispersant regulations' was circulated at the workshop and is attached to this report (Annex 6).

Recent regulatory developments on dispersant approval and use in European countries were briefly presented as follows:

- Mr Kevin Colcomb (MCA) presented the UK's current regulations and procedures for dispersant product approval and use, mentioning the recent review of the national oil spill treatments product approval scheme. In regard to the sub-sea use of dispersants for offshore spills, the UK regulators are currently addressing this topic with the aim of achieving a better understanding of the relevant issues involved.

- Mr Francois Merlin (Cedre) described how the French policy on oil spill dispersant usage is being currently updated to expand the geographical limits applicable for the use of dispersants. This revision is based on specific criteria taken into consideration including the results of the project DISCOBIOL (Dispersants and response techniques for shoreline areas: biological impact assessment and contributions to the regulation) and may result in keeping the three geographical limits currently applicable, but increasing the quantity of oil acceptable to be dispersed within these limits. The CEPPOL (Centre of Practical Expertise in Pollution Response) must validate and include the results of this study to define a new response strategy for each limit.

- Mr Dierk-Steffen Wahrendorf (Federal Institute of Hydrology) described the current oil pollution response strategies in Germany including the application of dispersants, which can be used only in pre-defined geographical offshore areas in the North Sea on the basis of specific criteria. Germany does not own national dispersant stockpiles. The national concept for the use of dispersants is currently being revised with the aim of simplifying the decision making procedure, establishing prior permission arrangements and shortening the operational response time.

- Ms Kirsti Natvig (Climate and Pollution Agency) and Ms Hilde Dolva (Norwegian Coastal Administration) presented recent developments in the regulations and requirements for dispersant use and product approval in Norway. Currently, dispersant use is allowed in Norway if properly planned; testing of effectiveness and toxicology is required for product approval according to specified methods. Documentation of Net Environmental Benefit Analysis (NEBA) is required and new guidelines concerning the basis for documentation are currently being issued. The main developments post-DWH incident are that now the sub-sea dispersion effectiveness must be documented according to the acknowledged methodology and all offshore production fields have to develop plans on dispersant use (if relevant). In regard to dispersant application capabilities, new ship based dispersant spray booms have been developed; due to safety reasons helicopters are not used anymore in Norway for dispersant spraying. A national project is currently on-going to evaluate the use of dispersants in the governmental preparedness, considering including dispersant stockpiles in the governmental depots (supplementary to the industry's existing stockpiles) and focusing on the dispersibility of Heavy Fuel Oils (HFOs).

- Mr Luigi Alcaro (Institute for Environmental Protection and Research - ISPRA) described the current dispersant approval and usage practices in Italy, based on a three-step precautionary approach with strict dispersant product approval procedures in place. The recently developed Protocol of "Best Practices for the use of sorbents and dispersants during an oil spill response" was also presented. This Protocol of Best Practices was developed by a national multi-Agency working group taking into account the quantity and characteristics of the spilled oil, the weather conditions, sea depth and distance from the shore and from environmentally sensitive areas.

The use of dispersants in brackish waters was also brought-up by Sweden and Latvia and discussed among the workshop participants. The availability of dispersants for use in lower salinity waters was mentioned; in particular, it was stated that the configuration of existing dispersants could be modified to enable their use in brackish waters. However, pre-approved dispersants for use in low salinity waters are currently not available, unless the respective countries showed interest in their use.

Workshop Session 4 – Relevant Research initiated Post-DWH

A large amount of public/governmental and industry led dispersant-related research projects have been initiated in the US and Europe after the DWH incident, with the availability of substantial funding. Such R&D developments were presented as follows:

- Mr Robert Pond (US Coast Guard) referred to the role of the Interagency Coordinating Committee on Oil Pollution Research (ICCOPR), which coordinates and oversees government research projects in this field; post-DWH the focus is on dispersant use. The National Oil Spill Response Research & Renewable Energy Test Facility at Ohmsett remains fully operational and is used for testing of mechanical recovery and dispersant application. The large-scale, multiple-year Subsea Dispersant Program aiming to conduct controlled experiments on dispersants effectiveness and effects of dispersed oil on deep-water marine environments developed by the American Petroleum Institute (API) was also mentioned. Furthermore, a plethora of university-led research studies have been initiated focusing on dispersant use and effects, and reference was made to the Gulf of Mexico Research Initiative supplying funding of $500 Million for research, including dispersant related topics.

- Mr Thomas Coolbaugh (ExxonMobil) presented an overview of the current industry led dispersant research activities, referring to the several international joint industry research programs aiming to further enhance industry knowledge and capabilities. In particular mentioned were the following:
  - API JITF project on 'Sub-sea Dispersants - D3', which aims to conduct R&D on sub-sea dispersant injection in order to provide optimal implementation methods; this project addresses issues such as dispersant effectiveness, dispersed oil fate and effects, modelling, monitoring and communications.
  - The OGP Arctic Oil Spill Response Technology Joint Industry Program, which aims to create an international research program to further enhance knowledge and capabilities in the area of Arctic oil spill response. Dispersant use is among the programme's key research areas.
  - The NewFields Joint Industry Research Program on the Toxicology and Biodegradation of Crude and Dispersed Oil in the Arctic Marine Environment.

- Mr Nicolas Passade-Boupat (Total Petrochemicals) presented research results of a new evaluation methodology being developed for sub-sea oil spill dispersant effectiveness. An overview of the new experimental test protocol developed to simulate conditions closer to sub-sea injection was presented. This protocol allows the screening of several additives in a minimum time. The stabilisation of the dispersion (small oil droplets) and the adaptation of the dispersant formulation for use in lower salinity waters were in particular addressed.

- Mr Per Johan Brandvik (SINTEF) presented results of tank studies of subsurface oil release and the effectiveness of various dispersant injection techniques conducted by SINTEF. These studies have been performed in SINTEF's Tower Basin (a six meter high cylindrical basin holding 40,000 litres of sea water), which is equipped with an advanced system for releasing oil and gas, and for monitoring oil droplet size distributions and oil/dispersant concentrations in the released plume. SINTEF also has a 100 litres bench-scale apparatus (MiniTower), which is used for small-scale studies, where a wider range of parameters can be studied at lower costs. The presentation described the main principles and capabilities of the SINTEF Tower Basin and MiniTower for both meso-scale and bench-scale studies and how the results and data from these studies have been used to improve existing algorithms for predicting droplet sizes for subsurface release (improved Weber scaling). The summary results of some of the experimental studies of sub-surface dispersant injection techniques were also presented and discussed. According to these, the dispersant injection method itself is not of primary importance; it is more important where (at which point above the release) the injection is made.

- Mr Francois Merlin (Cedre) presented the current status of the work of the Technical Correspondence Group on Dispersants (TCG Dispersants) established under EMSA's Consultative Technical Group on Pollution Preparedness and Response (CTG MPPR). The TCG Dispersants is comprised of EU Member States' experts on dispersant use and its work is coordinated by France and EMSA. One of its tasks is to review dispersant studies related to the DWH spill, and define relevant output for Europe. Preliminary observations from the DWH-related literature review undertaken by the group to date were presented. The Group's other task is to address the feasibility of mutual acceptance of dispersant product testing procedures in Europe.

Workshop Session 5 – Plenary discussion on the main lessons learnt from the DWH spill dispersant applications

The final workshop discussion in plenary, aiming to identify the main lessons learnt from the large-scale DWH oil spill dispersant application operations, was moderated by Mr Walter Nordhausen (EMSA) and was guided by a list of questions prepared in advance of the workshop (Annex 4).

Due to time limitations not all questions could be addressed. Following the discussions, the main lessons learnt from the DWH spill identified by the workshop participants included:

- Oil spills from offshore drilling platforms are a real possibility that can happen anytime, anywhere;

- The long-term environmental impacts of such large scale unprecedented dispersant applications (surface and sub-sea) are not known yet and may never be fully understood;
- Human health and safety during response operations is of the highest priority;
- The importance of pre-planning of dispersant usage and relevant logistics (before an emergency occurs) was highlighted;
- Public perception towards dispersant usage and risk communication is very important and can affect the response operations;
- Dispersant application and sub-sea dispersant injection close to the wellhead can be considered as an important response tool for responding to deep-sea spills;
- Post-DWH, the focus of research work and regulatory revisions is on dispersant usage, deep-water oil releases and oil releases in cold water;
- A lot of information and scientific and operational data already exist on dispersant usage; what is less known is their use, effectiveness and environmental impacts in deep-water releases;
- Sub-sea dispersant application is a potential response option in case of a well blow-out also in European waters. Whereas the industry is now technically prepared for sub-sea dispersant applications in Europe, most European countries still need to discuss, prepare and adapt their regulations. In case of an emergency situation however, dispersant use sub-sea would be approved in some European countries;
- More information on the tracking and environmental impacts of the dispersed oil plume in the water column is required;
- Defining the recommended dispersant on oil ratio during sub-sea injection is of interest;
- When planning dispersant usage, it is important to know the national environmental sensitivities and also to know the characteristics of the oil (importance of prior testing of oil dispersibility);
- Mechanical recovery has limitations, especially in such large scale offshore spills with long duration.

Workshop Conclusions and Way Forward

The workshop enabled for productive discussions and exchange of experience between EU, US and industry experts, concluding that while a lot of data on the DWH spill environmental impacts are still being analysed, dispersant usage (and sub-sea dispersant application) has become an important oil spill response tool, in particular for sub-sea oil releases. This should be properly regulated and considered in national contingency plans. The workshop also recognised that data on the actual effectiveness of the DWH dispersant applications are still not conclusive.

Furthermore, the DWH oil spill initiated a large amount of research and regulatory developments focusing on dispersant usage and dispersant testing. This momentum

should be used by national administrations and industry to further explore dispersant application possibilities and the implications of regulatory aspects for dispersant use on the sea surface and sub-sea.

Concluding remarks that can be made taking into account the information provided at this workshop include the following:

- The large scale, large quantities and long duration of the dispersant applications during the DWH spill response were unprecedented and logistically challenging.
- The currently limited publicly available information on the dispersant effectiveness during the DWH spill is based primarily on estimates (Oil Budget Calculator document). Measurements and sample analysis are on-going and data on the actual effectiveness of the DWH dispersant applications are still not conclusive.
- Visual (aerial) observations for guiding dispersant applications and for monitoring dispersant effectiveness were vital during the DWH spill response.
- There is still very limited information available on the environmental impacts of the DWH spill – preliminary results on some aspects are expected in 2013 and will be made public after consideration by the main players (US governmental agencies, BP, the affected States).
- Great efforts in sampling and analysis have been conducted. However, the effects and impacts of the dispersed oil in the water column and the marine environment are not yet fully known.
- The collection, organisation, analysis, sharing and quality assessment of environmental impact assessment data under the NRDA process requires a huge logistical effort and is a complex process.
- Access to historical/background data on the spill area (chemistry, biological, environmental sensitivities) is very important in facilitating the environmental impact assessment.
- The use of modelling and ADCP measured current data can be very useful for sampling and monitoring dispersant effectiveness for sub-sea oil releases.
- The value of the ‘adaptive’ sampling approach (focus on where the oil is expected to go) versus the ‘standardised’ sampling was identified.
- Several EU Member States (UK, Italy, Germany, France) and Norway (an EFTA/EEA coastal country) are considering or have already undertaken regulatory changes regarding dispersant approval and dispersant usage, post-DWH. These revisions include developing or updating geographical limits/areas where dispersants can be used in national waters and, in some cases, addressing sub-sea dispersant approval and use. In Norway, regulatory changes had been implemented before the DWH spill and the relevant guidelines are now being further developed.
- Dispersant usage pre-authorisation agreements being in place in contingency plans are very important in order to facilitate a rapid response.
- Risk communication was very challenging during the DWH spill. The main public concerns regarded the toxicity of the dispersant used; the selection of the

dispersant product; the aerial applications of dispersants (concerns of over-spraying); and the effects of the sub-surface plume of dispersed oil.

- Operational sub-sea dispersant injection technologies have now been developed by the industry and are being continuously improved through relevant research.
- It would have been beneficial if more detailed information on the actual DWH deep-sea dispersant application operations had been provided during this workshop.

In regard to the way forward, there was a clear wish by EU Member States experts for EMSA to continue providing the platform for exchanging information, knowledge and expertise on dispersant usage (including sub-sea dispersant applications). This can be achieved through the work of EMSA's Technical Correspondence Group on Dispersants (TCG Dispersants), and by potentially holding another dispersants workshop in the future when the outcome of the environmental impact assessment studies from the DWH spill is known.

Furthermore, EMSA may also consider exploring the availability of operational tools in Europe for dispersant application for spills originating from offshore installations.

This workshop report and its annexes will be published on the EMSA website.

Annexes

1. List of participants
2. Workshop Agenda
3. List of Abstracts
4. List of questions for final plenary discussion in Session 5
5. Presentations
6. Paper by Alun Lewis on behalf of IPIECA on " Global dispersant regulations"