

Workshop “Heavy oils : what do we know ? what do we still ignore ? which possible responses ?

Cedre in cooperation with MUMM and SINTEF for the European Commission

Brest, 29-30 November 2006

PROJECT OBJECTIVES, PARTNERSHIPS AND EXPECTED DELIVERABLES

The Specialised Workshop on Heavy Fuel Oils co-funded by the European Commission in the framework of the three-year rolling plan for Community action in the field of response to marine pollution was organised by *Cedre*, in Brest, France, from 29 and 30 November 2006. This workshop was meant for personnel involved in oil spill response at sea either in the Research and Development concerns either in the operational concerns.

The recent major incidents involving the *Erika* and the *Prestige* remind us that pollution by heavy grades of oil, especially heavy fuel, remain a real problem in terms of impact and is a real concern for spill responders.

The maritime transport of heavy fuels is continuously increasing year after year, (e.g. the oil exportation from Russia both through the Baltic Sea and from the Murmansk area). IMO, during recent MEPC sessions (MEPC 50), revised the regulations concerning these products, particularly the regulations 13H and 13G from MARPOL annex 1. Similarly, the 3rd R&D IMO-forum held in Brest (France) in 2002 was specially devoted to the problems raised by “high density oils”, the recent Interspill conference held in Trondheim in 2004 involved a specific session on “highly viscous oils” and the last tender proposed by the DG XI (through the “Management Committee for Marine Pollution – MCMP) stated heavy fuel oils as a priority.

The workshop aimed at identifying, between specialists from the European Community members, what is known and what is unknown in term of behaviour, fate and impact of heavy fuel oils transported in European waters, and according to the diversity of these products which possible response options could be addressed, both at sea and on shore.

The objectives of this training course were twofold:

- To define, from recent researches and past experiences, what is already known concerning the heavy oils;
- To identify the gaps in our knowledge on the heavy oils, and the problems raised by these products in the context of incidental marine pollution.
- To identify the research priorities for the future, related to heavy oils.

The workshop was organised by Centre de Documentation de Recherche et d'Expérimentations sur les Pollutions Accidentelles des Eaux (*Cedre*). The structure of the workshop as well as the content of each session have been defined in close co-operation with Marine Environment Technology group of SINTEF (-N-) and the MUMM (Management of the North Sea, Mathematical Model, from the Marine Ecosystem Management)(-B-).

Experienced specialists from different countries were involved in this workshop and brought and confronted their own experience on all the issues related to heavy oils.

GENERAL OVERVIEW OF THE PROCESS

Twenty-three attendees representing fifteen Member States (Belgium, Denmark, Estonia, Finland, Greece, Ireland, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Spain, Sweden and U.K.) attended the workshop. However, more people attended the discussions, especially an expert from EMSA and others from *Cedre*. A complete list giving their names and organisation is in *appendix 1*.

The discussions took place in Brest inside *Cedre* premises and hotel accommodation was in the vicinity to avoid losing time during transfer organised by bus. Lunch was served at *Cedre*.

Simultaneous interpretation was available throughout the workshop including during visits and demonstrations.

The programme included the following themes:

- Session 1 : Introductory session
- Session 2 : At sea short term behaviour of the different types of heavy fuel oil and consequence on possible response options
- Session 3 : Toxicity of heavy fuel oils and their long term persistence and impact on shore; consequences on possible response options
- Session 4 : Conclusions followed by a final round table

A copy of the programme is attached in *appendix 2*

This programme was strictly followed.

The ten highly qualified speakers from 5 member States and Russia that have positively responded, proved to be efficient voluntary partners. Their presentation were splitted into the 4 sessions managed by 4 chairmen helped by 4 rapporteurs.

In the proposal, the initial tentative programme included the following persons :

session 1 :

Chairman :

M Clément Lavigne (Total S.A., Direction of Shipping transport -F-)

Rapporteur :

M Georges Peigné (Cedre -F-)

Experts panel composition :

M Alun Lewis (Alun Lewis Consultant -UK-)

M Ronny Schallier (MUMM -B-)

A representative from ITOPF (ITOPF -UK-)

A representative from the European down stream oil industry (e.g. CONCAWE)

session 2 :

Chairman :

M Frank Haeseler (IFP -F-)

Rapporteur :

M Julien Guyomarch (Cedre -F-)

Experts panel composition :

M Per Daling (Sintef -N-)

M Vincent Gouriou (Cedre -F-)

M Alun Lewis (Alun Lewis Consultant -UK-)

M Ronny Schallier (MUMM -B-)

M Peter Poulson (Danish Navy - DK) or Thomas Fago (Swedish Coastguard -S-)

session 3 :

Chairman :

M Michel Girin (Cedre -F-)

Rapporteur :

Mss Marine Julliand (Total S.A., Direction of Shipping transport -F-)

Experts panel composition :

Representative of ITOPF (ITOPF -UK-)

Ronan Jezequel (Cedre -F-)

Svein Ramstad (Sintef -N-)

Mickael Théron (UBO -F-)

Conclusion of the work shop

Due to the absence of some expected participants the program has been moved to

Introductory session

Chairman :

M. François Xavier Merlin -Cedre (F)

Rapporteur :

Ms. Merete Moldestad -Sintef (N)

Speakers :

M. Ronan Jezequel - Cedre (F)

M. Alun Lewis - A Lewis Consult^t (UK)

M. Gennady Semanov - CNIMF (RUS)

M. Ronny Schallier - MUMM (B)

M. Franck Laruelle - ITOPF (UK)

Session 2 : At sea short term behaviour of the different types of heavy fuel oil and consequence on possible response options

Chairman :

M. Frank Haeseler -IFP (F)

Rapporteur :

M. Julien Guyomarch -Cedre (F)

Speakers :

Ms. Merete Moldestad - Sintef (N)Cedre (F)

M. Peter Poulsen - Maritime Environment Section (DK)

M. Vincent Gouriou - Cedre (F)

M. Mads Madsen - DHI (DK)

Session 3 : Toxicity of heavy fuel oils and their long term persistence and impact on shore; consequences on possible response options

Chairman :

M. Ronny Schallier – MUMM (B)

Rapporteur :

M. François Xavier Merlin –Cedre (F)

Speakers :

Ms. Anne Bado-Nilles – Cedre (F)

M. Franck Laruelle – ITOPF (UK)

M. Ronan Jezequel – Cedre (F)

M. Svein Ramstad – Sintef (N)

Session 4 :session conclusions

Chairman :

M. Alun Lewis – A Lewis Consult^t (UK)

Rapporteur session 1:

Ms.Merete Moldestad – Sintef (N)

Rapporteur session 2:

M. Julien Guyomarch –Cedre (F)

Rapporteur session 3:

M. François Xavier Merlin –Cedre (F)

Final Round Table : General conclusions :

M. Alun Lewis – A Lewis Consult^t (UK)

M. François Xavier Merlin –Cedre (F)

M. Frank Haeseler –IFP (F)

M. Ronny Schallier – MUMM (B)

From the proposal to the implementation of the course, the number and diversity of lecturers still remained relevant.

CD-ROMs gathering all ppt presentations were sent to the participants a few weeks after the course.

The main technical delivery is the technical presentations gathered in the CD-ROM, sent out to all participants.

- The workshop actually took place on the 29 and 30 November 2006.
- The kick-off meeting took place in Brussels on 19 June 2006
- On 5 September 2006, *Cedre* sent a formal request to DG ENV, regarding an extension of the duration of the project.
- Last bookings (transportation, etc.) were made in November 2006 after receiving last entry form.
- The programme and the draft presentations were circulated to lecturers from November 10 2006. This version of the programme was similar to the final one followed during the workshop.

- A nearly final programme was sent to DG ENV on 8 September 2006. DG ENV sent the invitations to Member States (MCMP) on 19 September 2006, with a deadline for registration set to 15 October. This deadline was later put off to 15 November 2006.
- Unfortunately, it was not possible to send support documents to participants 1 month before the course, since most of those were not made available to *Cedre* before the course.
- CD-Roms were actually sent to all delegates on 28 February 2007.
- The technical report (first version) was sent to Mr Salsi on 13th of April 2007.

EVALUATION OF PROJECT MANAGEMENT / IMPLEMENTATION PROCESS

Positive aspects:

The workshop took place according to the proposal.

Eleven highly qualified speakers from 5 member States have positively responded and kindly participated to the specialised workshop, which is similar to that was expected at the proposal stage.

Difficulties encountered:

No special difficulties have been encountered.

European added value:

Although the participation was of high quality.

The workshop contributed to form the basis for establishing contingency plans and response decision-making involving heavy fuel oils that are based on the best currently available experience in Europe.

The attendance of a participant from EMSA was highly appreciated.

The selection of the trainees was carried out efficiently by Member State national focal points, as regards background: people attending were actually interested in the subject and involved in pollution monitoring in their respective countries.

PRESENTATION OF THE TECHNICAL RESULTS AND DELIVERABLES

This workshop was the opportunity of very fruitful discussions. As a result of the work of the attendees, various recalls, conclusions, needs and wishes were established for each session.

These issues and conclusions are listed below:

SESSION 1 :

- VHFO are IFO with a viscosity are at least 380 cSt at 50 °C
- In oil industry, a residue is not a waste but a by-product
- There are 2 different HFO type : Residual burner fuel oils (cargo) and residual marine bunker fuel oils (ship fuel)
- The specifications of HFO's are maximum limits
- The refinery processes (number and type-destillation, cracking, visbreaking) and feed oil influence the oil properties of the VHFO.
- The available data from the refinery are designed for the consumers not the oil spill responders
- Among the important parameters to be considered, density leads VHFO to specific fate and behaviour such as submerging, sinking and drift over long distance
- Oil properties and weathering

- It exists large differences in chemical properties that creates various physical properties even within same classification grade.
- Oil properties influence weathering properties.
- Submerging and sinking are important behaviour for VHFO's
- Transportation of VHFO's
 - The analysis of the maritime transport demonstrates that the risk of VHFO pollution is real, increasing and even in term of the number of ships and the size of the ships (VLCC 3000 000T)
 - Amount of Residual Fuel Oil cargo is increasing
 - A lot of VHFO trade leads to a lot of transportations from Russia, through the Baltic sea, in and out Nederland and through the English Channel
 - Limitations for sulphur content (SECA) involve high pour point oils. Does it mean that there will be more distillate fuels in the future?

SESSION 2 :

- More technical information on the VHFO should involve a better short term response
- A wish list of parameters to be linked to the cargo could be : product designation, administrative product specifications, additional operational properties: dispersibility, viscosity / density (f T°), composition (SARA ; SD / HT GC)
- HFO are products with two kind of variability
 - variability intra refinery (weekly / daily scale) and variability depending on refinery : composition, physical properties, behaviour at sea, weathering properties.
- The skimmers must be in adequation with high viscosity oils
- R & D main needs are :
 - more knowledge about behaviour of Very Heavy Fuel Oils (IFO 700) and Orimulsion
 - link dispersibility and chemical composition
 - determine long term effect of dispersants (tox. biodeg...)
 - establish rapid and simple screening methods for field operations and cargo specification
- The wreck management strategy can be divided in two parts:
 - to the shore for easier treatment and limit pollution (rarely applied)
 - far from the coast (better dispersion)
- Concerning modelling of oil drift
 - still experimental (high man power need)
 - is a real help for directing air planes (survey confirmation)
 - is complementary with the use of buoys for surface current / wind
 - need information on deeper currents (which depth?)
 - is in direct link with meteorology and oceanology
 - 3D modelling should include dynamic grid refinements, slick fragmentation, relative oil / water density (T°, weathering: Ecolab...).
 - The bottleneck is still calibration data (history matching on case studies) and higher time resolution (hour per hour) to ensure the survey of the same object in direct link with meteorology and oceanology
- Experience shows that oil do not appear at the vertical of the wreck location (f° current/depth)
- Improvement of sensing techniques:
 - need to reduce interferences for optical methods (need to cross parameters colour, chlorophyll, sediments...)
 - improvement of the complementarities between airborne sensors and satellite detection

- need for the detection to be independent of cloud situation marine
- 3D modelling should include dynamic grid refinements, slick fragmentation, relative oil / water density (T°, weathering: Ecolab...).
- The bottleneck is still calibration data (history matching on case studies) and higher time resolution (hour per hour) to ensure the survey of the same object.
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SESSION 3:

- Sublethal effects of VHFO water-soluble fraction have been observed in bivalves (oyster) and fish
- Pertinent, early biomarkers have been identified to prove contamination by HFO for both oyster and fish
- With HFO there is no bio-accumulation only some weeks after contamination.
- VHFO leads to smothering and toxicity; smothering is due to the residue whereas toxicity is due to the diluent
- So far, there is no evidence of tainting from VHFO; but tainting is mainly due to light compounds (possibly the VHFO diluent)
- Impact is:
 - High for sea surface organisms, shoreline benthos and shellfish, sediment
 - Low in the water column, for pelagic species and subtidal benthos Except for sea surface life, and despite economic consequences (fishing ban...) VHFO induces relatively low mortality.
- The lack of knowledge are: :
 - 1- the tainting by VHFO
 - 2- the respective role of the residu and the diluent
 - 3 the possible impact and recontamination by sunken oil
- Adhesion of VHFO depends on the bio-colonisation of the surface
- The difference observed in persistence and impact under same environmental conditions are due to the VHFO type (the chemical composition of the VHFO is of prime importance)
- The degradation of VHFO (PAHs) is mainly caused by photo-oxydation (more than 50%); biodegradation is insignificant
- The biological recolonisation occurs over film of degraded VHFO
- The recolonisation contribute to the removal of a part of VHFO film
- During the Rockness incident the biological effects and monitoring have been studied in the water column (biomarkers) and on the shoreline (diversity index): no significant effect have been recorded
- The shoreline clean-up techniques : mechanical / manual / washing remained costly
- There are needs to:
 - Develop cost-effective clean-up techniques, strategies & products
 - Improve knowledge on natural processes
 - Develop numerical models on shoreline oil weathering for NEBA
 - Establish harmonized criteria for quantifying biological effects and evaluating the cleanliness

SESSION 4:

The main propositions from the workshop are the following :

- 1) To create a database on VHFO based on refineries information (crude which are currently processed, specific process capability of raffineries)
- 2) To be able to carry out on field rapid simple tests (ex dispersibility). There is a need to have field techniques to sample and assess HFO characteristics
- 3) To improve the technical documentation attached to the VHFO cargo and to the batches of IFO. Additional data to the regular information ex Safety Data Sheet
- 4) To carry out systematic studies of oil properties and weathering
- 5) To develop specific model based on experimental data.

DISSEMINATION

Workshop documents consisted in a CD-ROM gathering all presentations which has been sent to the participants..

These presentations are available from *Cedre*'s website, English pages: <http://www.cedre.fr> , under "Publications" heading, in "conferences" section.

EVALUATION OF THE TECHNICAL RESULTS AND DELIVERABLES – FOLLOW UP

This action was indeed useful since now all Member States (at least those which attended) reached the same level of basic knowledge on heavy oils which cause specific problem to responders in case of a major spill. This workshop encourages the exchange on Heavy Oils between a group of experts at European level. This is especially important as the transport of Heavy Oils increasing in European waters years after years.

The main areas for which our knowledge remains insufficient has been identified and a large number of pertinent research topics on Heavy Fuel Oils has been listed.

This workshop will be the basis to set future research programs on Heavy Oil in the coming years.