Economic Commission for Europe

Inland Transport Committee

17 January 2013

Working Party on the Transport of Dangerous Goods

Joint Meeting of Experts on the Regulations annexed to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) (ADN Safety Committee)

Twenty-second session
Geneva, 22–25 January 2013
Item 4 (c) of the provisional agenda
Interpretation of the Regulations annexed to ADNss

CONCAWE / EUROPIA study on "HFO ADN Emissions and Exposure Assessment"

Transmitted by EUROPIA

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The oil companies' European organization
for Environment, Health and Safety
in refining and distribution

europia

Chris Beddoes
Director General

Mr Olivier Kervella
Chief, Dangerous Goods and Special Cargoes Section
UN Economic Commission for Europe
Transport Division
Palais des Nations
CH - 1211 Geneva 10
Switzerland

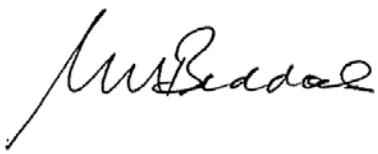
Brussels, 18th January 2013

Dear Mr Kervella,

In view of the participation of Mr. Marius van Westerhuis to the 21–25 January 2013 ADN Safety Committee in Geneva as EUROPIA representative, and with reference to what had been discussed during the ADN Safety Committee of August 2012 regarding the requirement for HFO (UN 3082) loading as described under ADN 7.2.4.25.5, I would kindly ask you for the inclusion of the attached paper in the agenda of the Committee.

The document provides a description of the study CONCAWE / EUROPIA are preparing on the "HFO ADN Emissions and Exposure Assessment". We plan to report the findings of this study to the ADN Safety Committee by the end of 2013. We expect that, based on the outcome of the study, the measures to be taken for compliance with the regulations will be reassessed.

Yours sincerely,



Chris Beddoes
Director General

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Project Outline

HFO ADN Emissions and Exposure Assessment

CONCAWE HFO Working Group

9 January 2013

Background

Changes to the hazard classification of heavy fuel oils (HFO) resulted in increased ADN requirements for the transport of these substances on European inland waters.

- Publication of CONCAWE Report No. 11/10 titled "Hazard classification and labeling of petroleum substances in the European Economic Area – 2010" resulted in changes in the dangerous goods classification specifications for heavy fuel oils (HFO). The more stringent environmental classification put HFO's under UN3082; the combination with the existing CMR classification leads to stringent barge loading controls.

- It was decided by the ADN Safety Committee that, as a consequence of the change in classification of heavy fuel oils, ADN 2013 was to be amended such that carriage of these products required tank vessels of type C or type N double-hull, closed tank vessels.

- For loading of products requiring a closed tank, it is required under ADN 7.2.4.25.5 that the gas/air mixtures shall be returned ashore through a gas recovery or compensation pipe during loading operations when a closed type vessel is required in column (7) of Table C of Chapter 3.2.

- To the best of our knowledge most terminals and refineries in the ADN signatory states are currently not equipped with the requisite vapour recovery systems and these facilities are not required by national legislations for the storage and handling of heavy fuel oils.

At the ADN Safety Committee meeting of 27-31 August 2012, a temporary derogation was agreed till 31/12/2016 on the requirement as described under ADN 7.2.4.25.5. EUROPIA had proposed that CONCAWE would develop data to better assess the emissions from HFO barge loading operations. The findings of this study are scheduled to be reported back to the ADN Safety Committee at the end of 2013 to inform a more advanced discussion of any risk associated with these barge loading operations.

Objective

To better understand the potential risk of airborne emissions, CONCAWE is developing a project to assess the nature and likelihood of airborne emissions during tank vessel loading operations with heavy fuel oil in parallel with exposure measurements in the field. The outcome of this evaluation will be used to identify whether or not there are potential health risks for personnel from emissions during loading and, if so, allow the development of appropriate measures to reduce or minimize airborne emissions. Conducting the exposure assessment and producing the report is expected to require approximately one year. Additional time is also proposed for the interpretation and implementation of any recommendations.

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HFO Working Group

CONCAWE has formed a HFO Working Group to specifically address this HFO emissions and exposures assessment to meet the 1 year deadline commitment. The HFO WG is comprised of exposure assessment experts from member companies, the chair of the Health/Toxicology Subgroup, the Technical Coordinator of the Health and the Air Quality Management Groups and an Executive Officer of EUROPIA.

Planned Research

The HFO Emissions and Exposures Assessment project is designed in a phased approach.

1. **A description of the family of products to ensure representativeness of test samples**

In order to ensure that any HFO samples tested in this study are representative for the family of products shipped on European in-land waters it is necessary to describe the main parameters relevant to the issue of vapour exposure. HFO's are produced primarily to physical-chemical properties such as viscosity. Required viscosity may be achieved by heating up the product to a temperature in the range of e.g. 50-90°C and/or adding some amount of 'cutter stock'; both aspects play a key role in any vapour composition and levels generated.
Products in the project scope meet the following requirements:

- Shipped regularly by barge on inland European waterways (including products loaded into tank barges for bunkering operations of sea going vessels)
- Classified under UN 3082
- Defined by a CAS number which is part of the CONCAWE HFO Components category (REACH)
- The storage and handling temperature is known
- A Safety Data Sheet in EU format is available

2. **Identify and obtain set of representative samples of HFO's transported via European inland waterways**

Samples of HFO meeting the requirements described above will be obtained. These samples will represent sufficient geographical coverage. Sample size will be sufficient for the experimental procedures. Sample collection procedures will be performed in compliance with European competition law regulations.

Task performed by: Member companies

3. **Potential for emissions during barge loading operations**

Using measured vapour pressure data and other relevant physical-chemical properties of the submitted HFO samples at their normal handling and storage temperature a first estimate of vapour exposure ranges will be made based on a suitable modeling approach (and recognising that elevated product temperature and handling characteristics are likely to result in some aerosol formation in addition to vapour).
The measured vapour pressure data and other relevant physical-chemical properties will also be used to delineate the typical boundaries for these parameters of the products in the project scope and form the basis for selection of representative products (a limited number, e.g., 3) which will undergo further in-depth analysis of their emissions.

Task performed by: Contract laboratory/consultant in agreement with HFO WG

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4. **Assess the biological relevance of emissions of HFO**

A previous study of worker exposure to HFO focused on dermal exposure for which the full product composition is relevant [ref. 1]. Though highly variable, concentrations of some carcinogenic polycyclic aromatic hydrocarbons (PAHs) in 8 product samples were reported in this study. The study did not produce data for inhalation exposures. The petroleum industry has developed several short-term predictive assays for the carcinogenic potential of petroleum streams of which the Modified Ames test – with the result expressed as Mutagenicity Index (MI) – was the most promising [ref. 2, 3]. This approach has also been applied to study the health relevance of the emissions to air from hot bitumens which had been collected in the form of a condensate [ref. 4].
In order to implement this part of the project the following steps are required:

- Selected HFO samples are characterized using an appropriate chemical analysis, e.g. Grimmer PACs, boiling point distribution, PIONA analysis (paraffinic, isoparaffinic, olefinic, naphthenic and aromatic compounds), carbon number / hydrocarbon type and ultraviolet fluorescence; individual PACs, e.g., naphthalene and other constituents with assigned Occupational Exposure Limits (OEL).
- Selected HFO samples are heated to their normal handling temperature and the emissions are collected in the form of a condensate; to obtain a fume condensate that is representative of workplace exposure; care will be taken not to deplete the bulk sample of potentially health-relevant constituents. The condensate samples are then analyzed using similar chemical analysis as applied to the bulk samples.
- Condensates are submitted for Modified Ames testing

Task performed by: contract laboratory/facility

5. **Industrial Hygiene Assessment**

In this step, using information from shipping facilities of HFO, a workplace assessment review will be conducted to identify the target population-at-risk and appropriate type of monitoring (area vs. personal). Typical information about the HFO barge loading scenario will be obtained from member companies (how many workers in the area, duration and frequency of loading, etc.).
In parallel with the emission assessment, industrial hygiene measurements will be done in the field in order to identify the potential exposure of operators during loading. Appropriate regulatory OELs values will be taken into account. Sufficient measurements will be obtained to satisfy current national regulatory requirements for statistical representativeness regarding occupational health protection.

The sample collection method will ensure that exposure to emissions in the form of combined vapour and aerosol is monitored, e.g. using the method developed in the recent CONCAWE study for gas oil mist and vapour [ref. 5].

Task performed by: consultants in consultation with HFO WG

6. **Develop analytical methodology to quantify HFO air concentrations**

The air sample analytical approach will mirror the experimental procedure for the condensate of Step 4 and in addition identify the appropriate metrics for comparison with applicable workplace OELs and/or ambient air quality limits.

Task performed by: consultants in consultation with HFO WG

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7. **Prepare Risk Assessment Report on HFO Emissions**

Using the field assessment data, compare and confirm potential worker exposures are within appropriate limits for safe operations of barge loading and unloading of HFO.

Task performed by: HFO Working Group, and/or consultant

Timeline:
December 2013

References

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2. Blackburn et al., Cell Biology and Toxicology, Vol.2(1), pp. 63-84 (1986)
3. Blackburn et al., Polycyclic Aromatic Compounds, Vol. 11, pp. 201-210 (1996)
4. Kriech et al., Journal of Occupational and Environmental Hygiene, Vol.4, Suppl.1, pp. 6-19 (2007)
5. Fraunhofer ITEM, Monitoring method for inhalation exposure to gas oil vapour and aerosol, Report to CONCAWE, October 2012