

Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

24 November 2014

Forty-sixth session

Geneva, 1- 9 December 2014

Item 2 (e) of the provisional agenda

**Recommendations made by the Sub-Committee on its forty-third, forty-fourth
and forty-fifth sessions and pending issues: miscellaneous pending issues**

Classification and hazard communication provisions for crude oil – An update of available information related to ST/SG/AC.10/C.3/2014/49

Transmitted by IPIECA

Introduction

1. IPIECA (the global oil and gas industry association for environmental and social issues) in this paper provides updated information on the need for amending the UN Model Regulation's provisions on classification and hazard communication as they relate to crude oil derived from advanced crude oil extraction methods (e.g., hydraulic fracturing). The question of whether amendments are needed was raised at the 45th session in document ST/SG/AC.10/C.3/2014/49 by the experts from Canada and the United States in response to rail incidents in North America that involved the transport of Bakken crude oil – a crude oil derived from advanced extraction methods. As summarized in the Sub-Committee report (see ST/SG/AC.10/C.3/90, para 62), the experts from Canada and the United States:

“Asked the Sub-Committee to consider whether the entries for crude oil were adequate in the light of the significant variations in its composition, in particular the flammable gas content, and whether factors other than the flashpoint or the boiling point should be taken into account for classification, such as the vapour pressure. They also proposed examining the relevance of other classification provisions, such as sampling quality management procedures and systems and classification tests for the substances to be transported.”

In addition, they asked whether enhanced hazard communication distinguishing more volatile crude oils would be beneficial.

2. IPIECA and its members are committed to safety and environmental protection, including as they relate to transport by rail in North America. At the 45th session, IPIECA provided two informal documents (UN/SCETDG/45/INF.17 and UN/SCETDG/45/INF.26) to inform the Sub-Committee of ongoing efforts related to the concerns raised by the experts from Canada and the United States.

3. At the conclusion of discussion at the 45th session (see ST/SG/AC.10/C.3/90, para 66), those involved were invited to report on further progress and, if appropriate, present more specific proposals on the paths that the Sub-Committee might consider in defining its programme of work for 2015–2016. In response, IPIECA provides the information below.

Completion of a Standard Providing Procedures for Classifying Crude Oil

4. At the 45th session, IPIECA noted the American Petroleum Institute (API) was developing a standard providing guidance on the classification of crude oil for purposes of rail transport. After the 45th session, the draft standard was circulated by email to Sub-Committee participants and comments were invited. The standard, entitled “Classifying and Loading of Crude Oil into Rail Tank Cars” has since been published as American National Standards Institute (ANSI)/API Recommended Practice (RP) 3000 and is available without charge.¹

5. While all studies on the properties of Bakken crude oil that have been conducted to date demonstrate considerable consistency among shipments of Bakken crude oil, an important element of RP 3000 is that it includes guidance on factors to consider when deciding whether an untested shipment may be considered substantially equivalent to a previously tested and classified shipment. The guidance approach in RP 3000 is similar to the “batching” bridging principle approach described in the GHS.

Additional Studies on the Properties of Bakken Crude Oil

6. Since the 45th session, additional studies on transport-related properties of Bakken crude oil have also been released. These are additional or supplementary to the four reports described in UN/SCETDG/45/INF.26. They include:

- Operation Safe Delivery Update.² This report by the U.S. Department of Transportation (DOT) provides testing results through May 2014 on 135 samples; and
- The North Dakota Petroleum Council (NDPC) Study on Bakken Crude Properties.³ This report provides data on 152 samples.

7. Both reports, as well as previously described studies in UN/SCETDG/45/INF.26, confirm that Bakken crude is a light sweet crude oil, properly classified as a Packing Group I or II flammable liquid assigned to UN 1267. As indicated by comparison charts on page 31 of the NDPC report, there is a high degree of consistency between the results of both of these studies. As for the presence of dissolved gases, the NDPC report noted that average vapour pressure values of samples taken were found to be 60% below the vapour pressure threshold of 300 kPa at 50°C for liquids (see 2.2.1.1 of the Model Regulations). There is no indication that this crude oil is substantially different from other light sweet crude oils produced in other parts of the world.

8. **Initial Boiling Point Measurement.** The greatest degree of variability was found in measurement of initial boiling point (IBP) using ASTM D86 (or ISO 3405) which is incorporated by reference in paragraph 2.3.4 of the Model Regulations. Round robin IBP testing resulted in differences of up to 8°C for the same sample. Crude oil’s inherent wide boiling point range and differences in test parameters contribute to the variability of results. Furthermore, given that ASTM D86/ISO 3405 was developed primarily for distillate petroleum products and has limited applicability to crude oil, ANSI/API RP 3000 provides an alternate best practice for determining IBP through recommending use of ASTM D7900, subject to specified technical qualifications.

9. **Sampling Methodologies.** Normal industry practice has been to collect samples for classification testing in glass bottles. Concerns that dissolved gases may escape and thus be

¹ Available at http://www.api.org/~media/Files/Publications/Whats%20New/3000_e1.pdf

² Available at

http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_8A422ABDC16B72E5F166FE34048CCCBFE D3B0500/filename/07_23_14_Operation_Safe_Delivery_Report_final_clean.pdf

³ Available at <http://www.ndoil.org/resources/bkn>

underreported by sampling with glass bottles led NDPC to evaluate sampling utilizing Floating Piston Cylinders (FPCs). Although initial comparative results are limited, they indicate that sampling with glass bottles was at least as representative as testing with FPCs when measuring vapour pressure.

10. Nevertheless, ANSI/API RP 3000 requires that, for purposes of packing group assignment, crude oil samples be obtained using the closed container (pressurized cylinder) method, **unless** the party responsible demonstrates that a closed container is not necessary (e.g. a history of test data that demonstrates that the concentration range of volatile low molecular components found does not alter the PG assignment).

11. **Hazard Communication.** While higher volatility might provide a justification for enhanced hazard communication, IPIECA is unaware of evidence indicating that crude oil assigned to Packing Group I is more volatile than other flammable liquids of Packing Group I. The wide boiling point range of crude oils, including those assigned to Packing Group I, suggests that the volatility hazard of PG I crude oil is generally less significant than that of pure substances with boiling points comparable to the initial boiling points of crude oils. A key role of hazard communication is to convey critical information in the event of an emergency. IPIECA notes emergency response guidance for flammable liquids is generally the same irrespective of Packing Group. Emergency response guidance in the North American Emergency Response Guidebook, the IMDG Code Emergency Response Procedures for Ships Carrying Dangerous Goods, and the ICAO Emergency Response Guidance for Aircraft Incidents Involving Dangerous Goods all provide the same guidance for UN 1267, irrespective of Packing Group. The ADR/RID assign the same hazard identification number (i.e., the number “3” as defined in 5.3.2.3.1) to all three packing groups (33 for PG I and II, 30 for PG III).

Ongoing Efforts

12. IPIECA member API has formed the Crude Oil Physical Properties Ad-hoc Group (COPP AHG), made up of industry and government experts from Canada and the United States to determine if Bakken crude oil is “materially different” from other Class 3 hydrocarbons transported by rail.

13. Using a model known as Analysis of Fire Effects on Rail Cars (AFFTAC), the COPP AHG has shown that vapour pressure is a poor indicator of the degree of hazard of crude oil under pool fire conditions. In addition, AFFTAC modelling of pool fires has demonstrated little difference in results among a variety of crude oils and ethanol. The Group’s effort continues with a view toward recommending improved risk assessment practices for various crude oils through ongoing work modelling vaporization of different crude oils of different light end compositions and other petroleum products under rail transport accidental release conditions.

14. IPIECA appreciates the Sub-Committee’s consideration of the information provided, as well as that previously provided in IPIECA’s informal document UN/SCETDG/45/INF.26, in any discussions relating to the programme of work for 2015–2016 as it might relate to crude oil classification and hazard communication.
