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Economic Commission for Europe**Inland Transport Committee****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)****Thirty-fourth session**

Geneva, 21–25 January 2019

Item 6 of the provisional agenda

Reports of informal working groups**Report of the informal working group on membrane tanks****Transmitted by the governments of Belgium, France, Germany and the Netherlands *****Summary*

Executive summary:	The document contains the report of the third meeting of the informal working group on membrane tanks. According to its mandate, the informal working group discussed recent developments on the liquified natural gas (LNG) market, the list of substances suitable for carriage in membrane tanks and prepared a first approach to regulate the membrane tanks in the Regulations annexed to ADN.
Action to be taken:	The Safety Committee is invited to discuss the report of the informal working group and to provide feedback and input on the approach chosen by the informal working group.
Related documents:	Informal document INF.6 of the twenty-seventh session ECE/TRANS/WP.15/AC.2/56 (Paragraphs 9 - 12)

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** In accordance with the programme of work of the Inland Transport Committee for 2018–2019, (ECE/TRANS/2018/21/Add.1 (9.3)).

ECE/ADN/33 (Paragraph 12 and Annex II)
Informal document INF.26 of the thirty-first session
ECE/TRANS/WP.15/AC.2/64 (Paragraph 62)
ECE/TRANS/WP.15/AC.2/2018/35
Informal document INF.25 of the thirty-third session
ECE/TRANS/WP.15/AC.2/68 (Paragraphs 68-70)

Introduction

1. On 11-12 October 2018 the informal working group on membrane tanks held its third meeting at the premises of the Ministry of Infrastructure and Water Management in The Hague, the Netherlands. The meeting was attended by delegates from Belgium, France, Germany and the Netherlands and by representatives from Bureau Veritas, industry and the Development Centre for Ship Technology and Transport Systems. Unfortunately, representatives of the shipping industry had to cancel their envisaged participation at short notice.
2. At the beginning of the meeting, the representative of France summarized the presentation and discussion on membrane tanks at the last meeting of the ADN Safety Committee (ECE/TRANS/WP.15/AC.2/2018/35 and informal document INF.25). The working group took note of paragraphs 68-70 of the report of the ADN Safety Committee on its thirty-third session (ECE/TRANS/WP.15/AC.2/68) and concluded that this provides a clear mandate to continue its work.
3. The participants agreed as well that this third meeting of the working group should be considered as an in-between meeting: the aim of the meeting is to conclude on the approach how to amend the Regulations annexed to ADN in order to facilitate the carriage of certain substances in membrane tanks and to have a clearer view on which substances would be suitable to be carried in membrane tanks on inland vessels. Only at the next meeting, the working group will start to draft actual amendments to ADN 2019.

Market developments

4. Regarding the request of the ADN Safety Committee to provide relevant information on the evolution of LNG and membrane tank market, the participants agreed in principle that it is the primary task of the ADN Safety Committee to ensure the safe carriage of dangerous goods. Questions on the economic desirability of possible carriage in membrane tanks will be answered by the market itself. The working group reiterates that in 2017, the European Barge Union (EBU) has already requested the ADN Safety Committee to allow the use of membrane tanks for the carriage of certain substances.
5. The representative of France stated that LNG is one of the only few viable alternatives to reduce the sulphur emission of the maritime industry (see Directive (EU) 2016/802). Because it is widely available, LNG plays a vital role to achieve alternative energy aims.
6. However, since the use of membrane tanks could trigger a growth in the carriage of certain substances by tank vessels which could have an impact on the risk levels on European inland waterways, the working group examined some public accessible documents/leaflets from some major oil companies which provide information on the evolution and foreseeable trends regarding the carriage of LNG and the use of membrane

tanks¹. According to these leaflets, a steady growth of the demand for LNG can be expected especially for the generation of energy for households and industry.

7. The participants agreed that the examined figures do not require the ADN Safety Committee to adopt amendments at its next meetings but nevertheless present a certain push and justification to adjust the Regulations annexed to ADN with the membrane tank technology to facilitate the expected growing trade in LNG and similar products.

8. Lastly, the participants were requested to collect additional information regarding the developments of LNG and membrane tanks from a more nautical or environmentally point of view and, if desired, present this information during the next meeting of the working group.

List of substances suitable for carriage in membrane tanks

9. The working group very extensively discussed a proper method to determine the list of substances suitable for carriage in membrane tanks. After a long discussion it was decided to use the International Code for the Construction and Equipment of Ships carrying Liquefied Gases in Bulk (IGC Code) as a source to determine which substances in Table C of ADN are suitable for carriage in membrane tanks. This decision was taken because the IGC code provides in Chapter 19 a list of substances of which most are suitable for carriage in membrane tanks. This list has been established by a public international authority and has at the same time been proven to be suitable by the maritime industry: for many years these products have been carried safely in membrane tanks on sea going vessels.

10. The substances listed in Chapter 19 of the IGC code (and suitable for carriage in membrane tanks according to the IGC code) were compared to Table A and C of ADN. Only those substances that are allowed to be carried in tank vessels according to Table A and that should be carried in type G.1.1 tank vessels according to Table C were chosen to be included on the list of substances suitable for carriage in membrane tanks. This last criterion was chosen because the working group agreed on the principal point that the closed membrane tank should be considered as an alternative to the independent pressurized tank and certainly, not as a replacement:

- UN 1005 AMMONIA, ANHYDROUS
- UN 1010 BUTADIENES (four entries)
- UN 1011 BUTANE (two entries)
- UN 1012 1-BUTYLENE
- UN 1020 CHLOROPENTAFLUOROETHANE (REFRIGERANT GAS R 115)
- UN 1030 1.1-DIFLUOROETHANE (REFRIGERANT GAS R 152a)
- UN 1033 DIMETHYL ETHER
- UN 1038 ETHYLENE, REFRIGERATED LIQUID
- UN 1055 ISOBUTYLENE

¹ https://www.shell.com/energy-and-innovation/natural-gas/liquefied-natural-gas-lng/lng-outlook/_jcr_content/par/textimage_864093748.stream/1519731114519/890e687a18cdc644e5b80609a8280bc474b0b8806046b6f3ee89bf231f00fa8f/shell-lng-outlook-2018-infographic-download-final.pdf and https://cdn.exxonmobil.com/~/_media/global/files/outlook-for-energy/2017/2017-outlook-for-energy.pdf

- UN 1063 METHYL CHLORIDE (REFRIGERANT GAS R-40)
- UN 1077 PROPYLENE
- UN 1086 VINYL CHLORIDE, STABILIZED
- UN 1965 HYDROCARBONS GAS MIXTURE, LIQUEFIED, N.O.S. (nine entries)
- UN 1972 METHANE, REFRIGERATED LIQUID or NATURAL GAS, REFRIGERATED LIQUID, with high methane content
- UN 1978 PROPANE
- UN 2187 CARBON DIOXIDE, REFRIGERATED LIQUID

11. Other gases, listed in Chapter 19 of the IGC Code and suitable for carriage in membrane tanks, in relation to Table C:

IGC Code Chapter 19	ADN		
	<i>UN Number</i>	<i>Name and Description</i>	<i>Comments</i>
Acetaldehyde	1089	ACETALDEHYDE (ethanal)	Carriage in Type C tank vessels
Butane-propane mixture	-	-	Not listed in ADN Tables A or C To be treated under ADN Chapter 2.1
Diethyl ether	1155	DIETHYL ETHER	Carriage in Type C tank vessels
Dimethylamine	1160	DIMETHYLAMINE AQUEOUS SOLUTION	Carriage in Type C tank vessels
Ethane	1035	ETHANE	Not allowed in tank vessels in ADN
Ethyl Chloride	1037	ETHYL CHLORIDE	Not allowed in tank vessels in ADN
Ethylene oxide-propylene oxide mixtures with ethylene oxide content of not more than 30% by weight	2983	ETHYLENE OXIDE AND PROPYLENE OXIDE MIXTURE, not more than 30% ethylene oxide	Carriage in Type C tank vessels
Isoprene (all isomers)	1218	ISOPRENE, STABILIZED	Carriage in Type N tank vessels
Isoprene (part refined)	1218	ISOPRENE, STABILIZED	Carriage in Type N tank vessels
Isopropylamine	1221	ISOPROPYLAMINE	Carriage in Type C tank vessels

IGC Code Chapter 19	ADN		
	<i>UN Number</i>	<i>Name and Description</i>	<i>Comments</i>
Methyl acetylene-propadiene mixtures	1060	METHYLACETYLENE AND PROPADIENE MIXTURE, STABILIZED such as mixture P1 or mixture P2	Not allowed in tank vessels in ADN
Mixed C4 Cargoes	-	-	Not listed in ADN Table A or Table C May be to be treated under ADN Chapter 2.1 Referred to in IMO documents BLG 15/10/3 and BLG.1/Circ.32
Monoethylamine	1036	ETHYLAMINE	Monoethylamine is listed in ADN Table B as a synonym Not allowed in tank vessels in ADN
Nitrogen	1977	NITROGEN, REFRIGERATED LIQUID	Not allowed in tank vessels in ADN
Pentane (all isomers)	1265	PENTANES, liquid	5 entries in ADN Table C Carriage in Type N tank vessels, or Flowchart (ADN 3.2.3.3)
Pentene (all isomers)	1108	1-PENTENE (n-AMYLENE)	Carriage in Type N tank vessels
Propylene oxide	1280	PROPYLENE OXIDE	Carriage in Type C tank vessels
Refrigerant gases	1009	BROMOTRIFLUOROMETHANE (REFRIGERANT GAS R 13B1)	Not allowed in tank vessels in ADN
Refrigerant gases	1018	CHLORODIFLUOROMETHANE (REFRIGERANT GAS R 22)	Not allowed in tank vessels in ADN
Refrigerant gases	1021	1-CHLORO-1,2,2,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 124)	Not allowed in tank vessels in ADN
Refrigerant gases	1022	CHLOROTRIFLUOROMETHANE (REFRIGERANT GAS R 13)	Not allowed in tank vessels in ADN
Refrigerant gases	1028	DICHLORODIFLUORO-	Not allowed in tank vessels in

IGC Code Chapter 19	ADN		
	<i>UN Number</i>	<i>Name and Description</i>	<i>Comments</i>
		METHANE (REFRIGERANT GAS R 12)	ADN
Refrigerant gases	1029	DICHLOROFLUORO- METHANE (REFRIGERANT GAS R 21)	Not allowed in tank vessels in ADN
Refrigerant gases	1078	REFRIGERANT GAS, N.O.S., such as mixture F1, mixture F2 or mixture F3	Not allowed in tank vessels in ADN
Vinyl ethyl ether	1302	VINYL ETHYL ETHER, STABILIZED	Not allowed in tank vessels in ADN
Vinylidene chloride	1303	VINYLLIDENE CHLORIDE, STABILIZED	Not allowed in tank vessels in ADN

12. The participants however concluded that the list of substances in paragraph 10 requires additional evaluation, primary to check whether other prescribed carriage conditions in Table C and the remarks in Column 20 of Table C and the special requirements in Column i of Chapter 19 of the IGC code, do not contain provisions which block the use of membrane tanks for the carriage of these substances. Among others, the question was raised in how far substances, which in accordance with ADN shall be carried stabilized and not just under temperature control, are suitable for membrane tanks as experienced by seagoing vessels. This evaluation will take place during the next meeting of the working group. The working group agreed to request the informal working group on Substances to verify the provisional list of substances, suitable for carriage in membrane tanks.

Amendments for ADN 2019

13. After determining the provisional list of substances suitable for carriage in membrane tanks, the working group discussed the preferable approach to regulate membrane tanks in the Regulations annexed to ADN. The participants supported a proposal made by the delegate from France to add lines to Table C with alternative carriage requirements (membrane tanks) for the identified relevant substances. This approach makes it very clear that carriage in membrane tank is for some substances an alternative to carriage in independent pressure tanks.

14. If the ADN Safety Committee supports the approach described in paragraph 13, the working group identified in a preliminary inventory the following articles requiring further research and possible amendment:

<i>Article</i>	<i>Subject</i>	<i>Additional comments</i>
1.2.1	Definition of membrane tank as fourth <i>Cargo tank type</i>	See IGC Code 4.1.5, 4.24.1.1, 4.24.1.3, 4.24.1.4 and 4.24.1.7
1.2.1	Definition of IGC Code	IGC Code means the International Code for the Construction and Equipment of

<i>Article</i>	<i>Subject</i>	<i>Additional comments</i>
		Ships carrying Liquefied Gases in Bulk, published by the International Maritime Organization (IMO)
1.2.1	Add G.2.4 as alternative <i>Type of vessel, Type G</i>	Add Drawing of Type G, Cargo tank design 2, Type of cargo tank 4 (membrane tank)
3.2	Add additional lines to certain UN numbers in Table C	
7.2 (general)	Check which requirements concerning loading, carriage, unloading and handling of the cargo apply to the carriage in membrane tanks and/or have to be adjustment	For example filling conditions
7.2.1.21	State that membrane tanks are only an alternative for certain substances which are currently carried in G.1.1 tank vessels	
7.2.4.16.16	Measures to be taken before loading refrigerated liquefied gases	
7.2.4.16.17	Determination of holding time	
8.2.2.3.3.1	Add knowledge of membrane tanks to the objectives of the specialized course on gases	
9.3.1 (general)	Check which requirements concerning construction require amendment for the introduction of membrane tanks	For example stability, boil off, sloshing
9.3.1.0	Materials of construction	Check whether all materials in membrane tanks are in conformity with ADN
9.3.1.21	Safety and control installations	Check whether all safety equipment in membrane tanks are prescribed

15. The ADN Safety Committee is requested to comment on this preliminary inventory and to add articles/subjects it deems relevant. This input and comments will guide the informal working group into the next phase of the work i.e.: drafting actual amendments to the ADN 2019.

Other

16. The next meeting of the informal working group is scheduled for Wednesday 24 and Thursday 25 April in Paris, France. All other interested parties are cordially invited to participate.