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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-third session**

Geneva, 27–31 August 2018

Item 5 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 and the Netherlands^{*,**}***Summary*

Executive summary:	The document contains a summary of the first meetings of the informal working group on Membrane Tanks. The informal working group supports the introduction of membrane tanks on inland vessels, since it improves the safe and efficient carriage of liquefied natural gas (LNG) and other liquefied gases by inland vessels.
Action to be taken:	The Safety Committee is invited to discuss the report and to decide which of the options described in paragraph 15 it prefers regarding the introduction of membrane tanks in the Regulations annexed to ADN.
Related documents:	Informal document INF.6 of the twenty-seventh session ECE/TRANS/WP.15/AC.2/56 (Paragraphs 9 - 12) 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)

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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, cluster 9.3).

Introduction

1. On 7-8 March 2018 the first meeting of the informal working group on Membrane Tanks took place at the Ministry for an Ecological and Solidary Transition in Paris, France. The meeting was attended by delegates of Belgium, France and the Netherlands and by Bureau Veritas and industry representatives.
2. After discussing the terms of reference of the informal working group, as described in informal document INF.26 of the thirty-first session, the industry representative delivered a presentation on the technique and the historical and current use of membrane tanks in maritime transport. Following the presentation, the participants held an extensive discussion on the use of membrane tanks in inland shipping while maintaining the high level of safety within the inland navigation sector.
3. The participants of the informal working group expressed a common desire to support the further developments of techniques and innovations which contribute to the inland navigation sector in general, provided of course that the innovation supports as well the ambition of the ADN Safety Committee to continuously improve the safe transport of dangerous goods.
4. In the particular case of membrane tanks, which are designed for the carriage of LNG especially, the participants of the informal working group felt the urgency to support this innovation in order to contribute to the implementation of Directive 2014/94/EU on the deployment of alternative fuels infrastructure.
5. Furthermore, the informal working group concluded that the introduction of membrane tanks for the carriage of LNG contributes substantially to the efficiency and to the safety of the carriage of LNG by inland vessels.
6. It was noticed as well that establishing the informal working group is a positive response to the request from the European Barge Union (EBU) in June 2017 to the ADN Safety Committee “to adopt membrane tanks process for transport of LNG as soon as possible”.
7. On 2 May 2018, the attendees of the meeting in Paris met again, at the premises of the Flemish government in Antwerp, Belgium. During this meeting the participants identified several options to introduce the technique of the membrane tanks in the Regulations annexed to ADN.

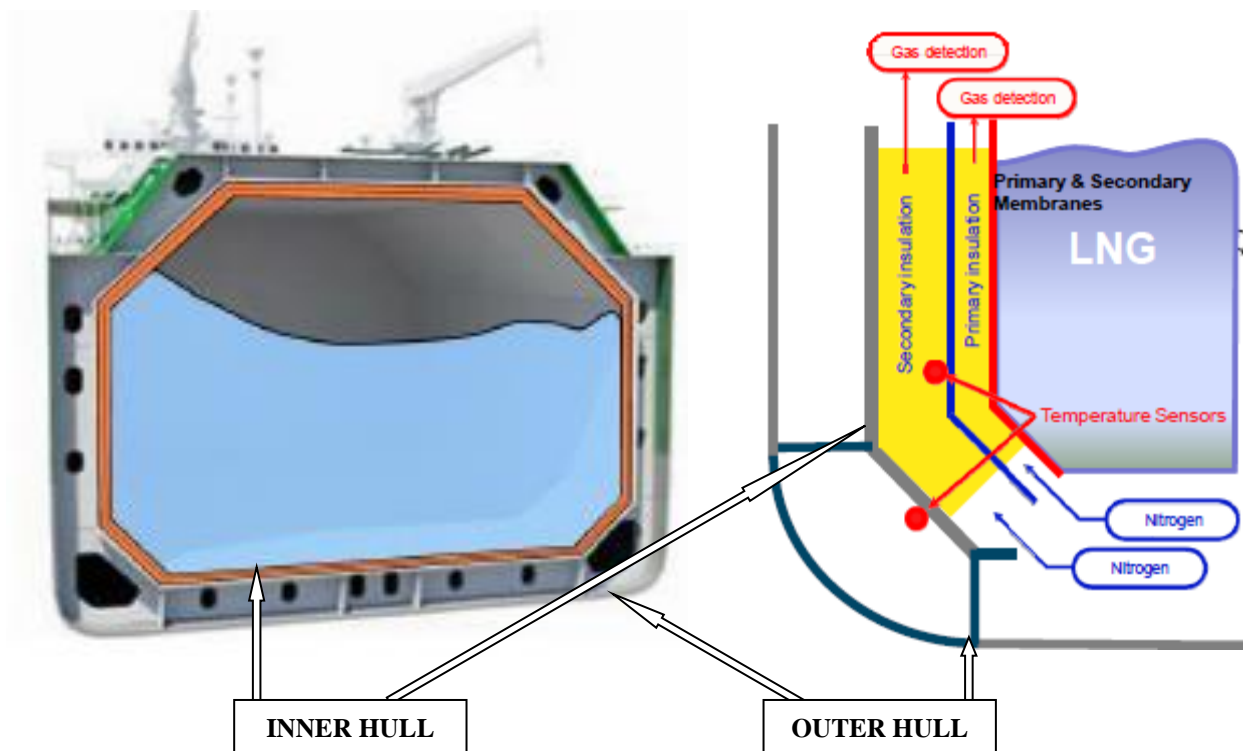
Membrane tank technology (see picture 1)

8. At the meeting in Paris, the informal working group took note of the presentation by the industry representative regarding the technical details of membrane tanks and its use. This technique is used in sea transport for over 50 years. Currently approximately 380 sea vessels are equipped with around 1500 membrane tanks, in compliance with the specific requirements for membrane tanks in seagoing vessels set in Chapter 4.24 of the IMO International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code). In this 50 year period no serious incidents have taken place with membrane tanks in seagoing vessels.
9. A vessel with membrane tanks is constructed with a complete double hull (outer hull + inner hull), with a crashworthy side structure (according to the Regulations annexed to ADN this has to be proven according section 9.3.4 if the capacity of a cargo tank exceeds 380 m²). Within the inner hull a membrane tank is constructed. Membrane tanks consist of a thin liquid and gastight layer (membrane) supported through insulation by the adjacent hull structure. For example, the Mark III membrane system (constructed in around 200 sea

vessels) starts from the outside first with the secondary insulation which is constructed within the inner hull, followed by the secondary barrier (membrane) which consists of 0.7 mm flexible triple membrane layer. Within that the primary insulation is constructed followed by the primary barrier (membrane) which consists of 1.2 mm stainless steel (corrugated SUS 304L). The design and technique presented by the industry representatives to the informal working group is comparable to the technique and design of the inland vessel Argos GL for which the ADN Administrative Committee issued a derogation in August 2015¹. Unfortunately that granted derogation has never resulted in an actual inland vessel due to economic circumstances.

10. Both the primary and secondary insulation spaces are inerted with nitrogen. With active monitoring systems the composition of the gas, the pressure and the temperature can get monitored for each insulation space. Sudden changes in the composition of the gas, increase of the pressure or decrease of temperature could indicate a leakage in the primary barrier. The presence of nitrogen in the insulation spaces ensures that no explosive atmosphere could appear in these spaces, due to the absence of oxygen.

Picture 1



11. It is however unlikely that leakage might occur in the primary barrier during carriage, due to the used specialized construction materials. In cooperation with the Hamburg University and DNV-GL the membrane tanks have been tested and appeared to be capable to withstand 100.000 tons with a speed of 9 knots without loss of tightness.

12. Finally, the informal working group took note of the fact that in the United States a relatively small coaster with membrane tanks has been constructed recently under

¹ ECE/ADN/33 (Paragraph 12 and Annex II)

classification surveillance of ABS (2,200 m³ capacity). It was noted as well that membrane tanks are suitable to carry Butane (UN 1011), Ethane (UN 1961), Propane (UN 1978), Propylene (UN 1077) besides LNG (UN 1972).

Related paragraphs in ADN

13. The informal working group identified several paragraphs in the Regulations annexed to ADN which could be related to the construction of membrane tanks on inland vessels. Several of them have already been identified by the ADN Safety Committee and the ADN Administrative Committee during the discussion on and acceptance of the derogation of the inland vessel Argos GL.

14. The majority of the concerned paragraphs in the Regulations annexed to ADN are related to the carriage requirements in Table C of the carried substance and/or to the definitions of cargo tanks and type G tank vessels.

Possible ways forward

15. In order to permit membrane tanks on board of inland vessels carrying dangerous goods, the participants of the informal working group considered several options to adjust the Regulations annexed to ADN:

(a) A new section could be added to Chapter 9.3 setting the technical requirements for a new type of tank vessels (type M), comparable with the requirements set for tank vessels type G, type C and type N. This option implies many consequential amendments in all the other Chapters of the Regulations annexed to ADN.

(b) It is another option to add to Column 20 of Table C for certain substances a reference to a new special provision (to be developed) which sets requirements for the use of membrane tanks or refers to other applicable legislation.

(c) The definition of cargo tank design could be supplemented with membrane tanks. Such a new cargo tank design could subsequently be introduced in Table C for certain substances. In addition, 7.2.1.21 could be amended as well to ensure that these substances are allowed to be carried in regular independent pressure cargo tanks as well.

(d) Lastly, the definition of cargo tank type could be supplemented with the membrane tank type. This new cargo tank could subsequently be introduced in Table C for certain substances. In addition, 7.2.1.21 could be amended as well to ensure that these substances are allowed to be carried in regular independent pressure cargo tank as well.

16. At their meeting in Antwerp on 2 May 2018, the participants of the informal working group expressed their preference for the last option in paragraph 15. According to the informal working group this is the option which reflects reality most. Membrane tanks are intended for the carriage of gases (liquefied) and therefore the carrying vessel should be considered as a type G tank vessel. The membrane tank is designed as a closed cargo tank and should be equipped with devices to control the pressure in the cargo tanks. Furthermore the option/approach suggested by the informal working group is in line with the IMO IGC Code where membrane tanks are considered as alternatives for independent and integral cargo tanks.

Request to ADN Safety Committee

17. The informal working group invites the ADN Safety Committee to discuss this report and to decide which of the options described in paragraph 15 it prefers regarding the introduction of membrane tanks on inland vessels. The outcome could serve as an updated mandate for the informal working group, to continue its business and to draft actual amendments to the ADN 2019 version, which would enter into force on 1 January 2021.
