

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

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Item 6 (c) of the provisional agenda

Miscellaneous proposals for amendments to the Model Regulations on the Transport of Dangerous Goods: portable tanks

Comments on ST/SG/AC.10/C.3/2017/40 - (Russian Federation): Fibre-reinforced plastics portable tanks

Transmitted by the Government of Finland

Introduction

1. Finland supports the proposal of the Russian Federation to develop regulations on fibre-reinforced plastics (FRP) portable tanks. We agree with most of the arguments and the advantages presented in the proposal. It is important to open the discussion on requirements for design, construction, testing and approval of portable tanks with FRP shells. We will also send some detailed comments, clarifications and suggestions directly to Russian Federation.

2. FRP structures have been used for decades in industry, especially in corrosive objects where conventional steel structures may not withstand the corrosion of the substance. Compared to coated steel structures, FRP is considerably safer because in the structure there is no metal which could cause hazardous reactions with some chemicals. In addition, FRP can withstand the fatiguing load much better than metal. Properly designed, manufactured and used tank is extremely strong and long-lived (+ 20 years).

3. Generally, the use of FRP structures has increased especially in mobile equipment such as aircraft, trains, boats, cars and high pressure tanks for CNG or hydrogen. The reason for this is the advantages of FRP materials and the development of manufacturing techniques.

4. In Finland, FRP tanks have been manufactured for road transport for more than 15 years. Manufacturing covers various types of containers and materials such as vehicle models, trailers, bulkheads and 20ft ISO tank containers. Experiences have been good. FRP tanks have been involved in some accidents and they have survived at least as well as the metal ones. The requirements for FRP tanks and tank-containers included in ADR Chapter 6.9 for road transport have been found to be sufficient and adequate.

5. This paragraph contains some comments on the proposed new text of Model Regulations Chapter 6.9:

6.9.2.1 Definitions

Instead of "Mate", we would prefer the term Mat or CSM mat.

Filament winding means a CNC-controlled process (CNC = computerized numerical control). We would like to add the term CNC to ensure that manufacturing of the shell shall be made by machine.

Our opinion is that in paragraph 6.9.3.2.2. the word rigid is not needed. Instead of that we would prefer “safe and proven connection”. It is not clear enough what “rigid” means in this context. Any connection which is tested and proven to be safe could be used.

Our expert is of the opinion that contrary to what is proposed in paragraph 6.9.3.2.3, it is possible to use heating elements. If heating elements are used, the temperature of the heating elements shall at no point exceed the value resin HDT-20°C.

With regard to 6.9.3.2.5.1, last paragraph, we are of the opinion that durable bonding means that bonding strength should not be less than 2,5 N/mm² (DIN53766-1). It might be preferable to assign an exact value for “durable”.

Concerning 6.9.4.1, traditionally circular cross section has been used. FRP materials provide more possibilities for design etc. The opinion of our expert is that especially FRP tanks with low operating pressure, e.g. UN tank codes T1 and T2, can easily be manufactured also in non-circular shape. If the tank meets all the requirements, it might be asked if it is necessary to limit the shape of the tank at all.

With regard to 6.9.4.3, typically maximum strain of the resin is 3-6%. That is clearly greater than the maximum strain of the laminate. Our proposal: at the specified test pressure, the maximum strain in the shell shall not be greater than 0,5%.

Concerning 6.9.4.4, stress along the fibres is the most important issue. Stress across the fibres is not as important, and it can also be noted that the results of the material test are more conservative with regard to direction across the fibres. The presented way by the Russian Federation is good, modern way. We would like to propose an addition: value of the safety factor K could be different depending on the direction. Along the fibres minimum K = 6, across the fibres K = 1,2. Alternatively, measures in ADR 6.9.2.5 can be used.

With regard to 6.9.5.2, in case of low pressure tanks, T1–T10 (1,5-4bar), the minimum thickness of structural layer 6 mm is too conservative, in our opinion. Our proposal: “The minimum thickness of FRP shell is 6 mm (liner+structural)” or “The minimum thickness of FRP shell structural layers shall be at least 3 mm.”

Proposal

6. Finland would like to draw the attention of the Sub-Committee to the proposed corrections presented in paragraph 5 above. The Sub-Committee is invited to consider these proposed changes to the text.
