

Economic Commission for Europe

Inland Transport Committee

Working Party on the Transport of Dangerous Goods

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Item 6(a) of the provisional agenda

**Proposals for amendments to Annexes A and B of ADR:
construction and approval of vehicles**

The use of CNG and LNG fuelled Vehicles carrying dangerous goods

Transmitted by the Government of the Netherlands

Summary

Executive summary:	Since the 1960's Diesel is the predominant fuel used for the propulsion of heavy goods vehicles. The additional requirements in ADR, Part 9, for EX/II, III, FL, OX and AT vehicles carrying dangerous goods are based on this predominance. Recently gases, mixed with Diesel fuel(Dual Fuel) or Refrigerated Natural Gas(LNG) have appeared as alternative fuels for heavy goods vehicles. The additional requirements of ADR need to be seen in this new perspective.
Action to be taken:	Discussion on the topic, with presentation, proposals for future action
Related documents:	INF.6 and Report of the 94th Session (WP.15/219e), V, under B

Introduction

In the report of the WP.15, 94th session it was stated that the possibility of gaseous fuels being used had not been taken into consideration when the ADR requirements for vehicle motors and motor fuel tanks had been drawn up. It was indicated that for FL and OX vehicles, the ADR text did not explicitly prohibit the use of gaseous fuels. It was also indicated that the fuel tank requirements apparently were not suited for their use. It was concluded that, as the use of such fuels was expected to grow, the subject should be raised at a subsequent session. In this document the subject is raised again.

Since the 1940's heavy goods vehicles used petrol or diesel fuel. However since the 1960's diesel fuel has become the predominant fuel for heavy goods vehicles. The calorific value or energy density of diesel fuel and lower taxation than petrol have been the drivers for this predominance. The provisions in ADR, Part 9, seem to be based on diesel as a fuel for heavy goods vehicles. Additional safety is provided for the construction and approval of EX/II, EX/III, FL, OX, and AT-vehicles.

For environmental reasons and to widen the fuel mix or cost considerations new fuels and energizing systems have been developed in recent years. So far only the admixture of Liquefied Petroleum Gas or Liquefied Natural Gas (LNG) to Diesel (Dual Fuel) and Natural Gas (LNG and to a lesser extent CNG) have proven to be an acceptable alternative because of the relative high energy density and ease of reloading for an appropriate transport range.

The UN ECE has developed safety rules for the LPG systems in ECE Regulation No. 67 and 117 and for compressed natural gas systems in ECE Regulation No. 110. The scope of ECE Regulation No. 110 will be expanded to LNG for which the approval is expected before the end of 2013. This will enhance the international acceptance of vehicles on LNG.

The supply of LNG coming in by ship at seaports from is already a fact. As soon as sufficient supply or infrastructure for vehicles is developed the growing use can be expected of LNG, CNG and dual fuel combinations.

When vehicles are to be used for the carriage of Dangerous Goods the chapters of ADR, Part 9, concerning use and construction of vehicles give no clear prohibition for the use of a liquefied gas as fuel. Application for approval of vehicles for the transport of dangerous goods are forwarded regularly and in some cases have been rewarded.

From a principle point of view the Netherlands is of the opinion that no additional requirements should be included in ADR when WP.29 has laid down safety requirements for a particular vehicle (fuel) system. Provisions like those in subsection 9.2.4.3, 9.2.4.4 and 9.2.4.7.6 should be revisited and checked if the arguments for these additional requirements are still valid.

The Netherlands recognizes the urgency for clarity concerning the use of vehicles using CNG and LNG as a fuel for users, vehicle manufacturers and competent authorities alike. It is proposed to limit discussions to LNG and CNG only and to exclude EX/II and EX/III vehicles from the discussion for the time being. Focus should be on LNG, because of its possibilities to use this fuel for long range transport, more than CNG.

Presentation

The Netherlands will organize a one hour presentation on CNG and LNG fuel systems, by Mr. Jeffrey Seisler and Mr. Paul Dijkhof, in the afternoon of Wednesday the 6 November, after the lunch break. It will give more insight in the risks involved with CNG and LNG in comparison to the more familiar risks of Diesel Fuel. Focus however is on LNG because, due to range, over-the-road hauliers tend to use LNG and not CNG.

Dr. Jeffrey M. Seisler, representing NGV Global (the International Association for Natural Gas Vehicles) will provide a comprehensive overview of the current use of CNG and LNG trucks on a global basis, demonstrating the growth of this important sector within the overall natural gas vehicle (NGV) market. Dr. Seisler is a co-secretariat to the LNG Task Force. Mr. Paul Dijkhof, the Chairman of the LNG Task Force, is a specialist in natural gas standards, regulations and testing. He leads the effort to draft the LNG truck amendments to ECE R. 110.

The LNG Task Force, which recently completed amendments to ECE Regulation 110 for LNG trucks, is a subgroup within the Informal Group on Gaseous Fuel Vehicles (within WP.29, Group of Experts on Pollution and Energy/Group of Experts on General Safety) .

The presentation will contain the following topics:

- General introduction to CNG and LNG as motor fuel and the use of LNG trucks worldwide
- Technical safety requirements for LNG vehicles
- Technical safety requirements and testing for fuel containers/tanks for LNG

As part of this footage will be shown of bonfire tests comparing LNG tanks and diesel tanks.

Proposals

To make the use of CNG or LNG possible the following amendments are proposed.

Proposal 1. Amend Subsection 9.2.4.3 (a) (new text in italic, replaced text stricken through) to read:

(a) In the event of any leakage *in the normal operating conditions of the vehicle*, the fuel shall *not come into contact with hot parts [above the auto ignition temperature of the fuel] of the vehicle or with the load.*

Justification proposal 1:

Subsection 9.2.4.3 (a) requires that leaking fuel “shall drain to the ground”. This is not possible for fuels in gaseous form that are lighter than air. In this interpretation this requirement prevent the use of gaseous fuels .

It cannot be prevented that leaking fuel will contact hot vehicle parts or the load in any position, (e.g when on its side or completely overturned, nose-up/nose-down). For this the wording “normal operating conditions” in plural are included. It means the vehicle shall be on its wheels, either with the engine running or not, level or sideways banked/uphill/downhill etc.

However the basic performance requirement that leaking fuel shall not come into contact with hot parts of the engine, exhaust or load could be applicable to all fuels. Additional the auto ignition point of the particular fuel may be taken into consideration.

Proposal 2. Amend Subsection 9.2.4.3 by adding a new paragraph (c) to read:

(c) Fuel containers (CNG) or fuel tanks (LNG) shall comply with the provisions of ECE Regulation No. 110. The discharge of the (emergency) pressure relief device shall be so directed to avoid any danger to the load through heating or ignition.

Justification proposal 2:

New subsection 9.2.4.3 (c) gives the basis requirement for CNG fuel containers or LNG tanks to comply with. The wording fuel container and fuel tank are the terminology used in the relevant regulations. For new vehicles the reference to the Regulations may be superfluous but it may be useful for retrofitting existing vehicles.

The second sentence contains a basic provision that the discharge of gas by the safety valve should not endanger the load by heating or ignition. LNG systems have two pressure relief valves, one for the boil down and another for emergencies. A possible option would be to bring a discharge pipe of the pressure relief valve to the top of the drivers cabin away from the tank or other superstructure, other satisfactory solutions should be possible.

Proposal 3. Amend Subsection 9.2.4.4 (new text in *italic*) to read:

The engine propelling the vehicle shall be so equipped and situated to avoid any danger to the load through heating or ignition. In the case of EX/II and EX/III vehicles the engine shall be of compression-ignition construction *using only fuels with a flashpoint above 55 °C.*

Justification proposal 3:

An amendment is proposed to remain in keeping with the original intention of this subsection. Dual fuel systems on the market today, combining diesel and a gas with a compression ignition engine may otherwise be used. The gas is only added under certain

engine running conditions. The flashpoint of LPG or natural gas is significantly lower than the flashpoint of diesel.

Combustion heaters

Combustion heaters shall comply with ECE Regulation No. 122. In this regulation LPG and CNG are included as gaseous fuels. However where additional safety regulations are included for LPG (annex 8) no specific regulations are included for CNG. The use of gaseous fuels in 9.2.4.7.6 is at present prohibited for EX/II and EX/III vehicles only, and excluded from gaseous fuels in this document anyway. The conclusion can be drawn that safety regulations for CNG/LNG combustion heaters should be added to ECE Regulation No.122 with the adoption and amendment of ECE Regulation No. 110.
