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APPLICATION OF LIQUEFIED NATURAL GAS IN MOBILE SYSTEMS

KEYWORDS: exhaust emission, liquefied natural gas, mobile systems, transportation


In the paper, it systematized the possibilities for the application of liquefied natural gas in mobile systems for transportation on longer distances. For calculation of energy consumption and greenhouse gas production, when applied different fuels it is proposed the use of the European Standard EN 16258:2012.


In countries like the Republic of Serbia in particular (with a large river port, a big international airport, many tourist centers and the transportation of goods by trucks due to the connection with international companies, etc.), the demand for alternative fuels which are suitable for long distance applications is expected to remain high. Natural gas is a high-quality fuel for propulsion systems. Available reserves equal the known oil reserves; negative influence upon environment is less than with fuels derived from oil, as well as the price. Due to that, natural gas as a fuel has been having a growing application in motor vehicles.

The growing number of vehicles powered by natural gas has required in parallel new regulations and rulebooks regulating this field to be adopted. The requirements related to the aspect of safety and functionality of installation of gas devices and equipment have been defined under regulations UN ECE 110R and UN ECE 115R. Laws and bylaws applicable in the Republic of Serbia are: Road traffic safety law, Rulebook on the Classification of Motor Vehicles and Trailers and Technical Conditions for Vehicles in Road Traffic and vehicle testing rulebook.


Cryogenic fuels such as LNG (liquefied natural gas) and liquid hydrogen are attractive alternatives due to their high specific energy density, but they are at a disadvantage compared to other fuels in terms of their volumetric energy density, meaning that they require greater storage volume, a critical aspect for aviation as example. Another way to increase the energy of stored natural gas on vehicles is under higher pressure of 20 MPa onboard in cylinders as CNG (compressed natural gas). In the Republic of Serbia, natural gas was used for the first time in serially produced MAZ-BIK buses for the needs of city traffic in Kragujevac.


Figure 1 shows the parts of the installation for supplying the engine with natural gas, in the case when the gas is stored under high pressure in a gaseous state CNG or in a liquid state in a cryogenic tank LNG.


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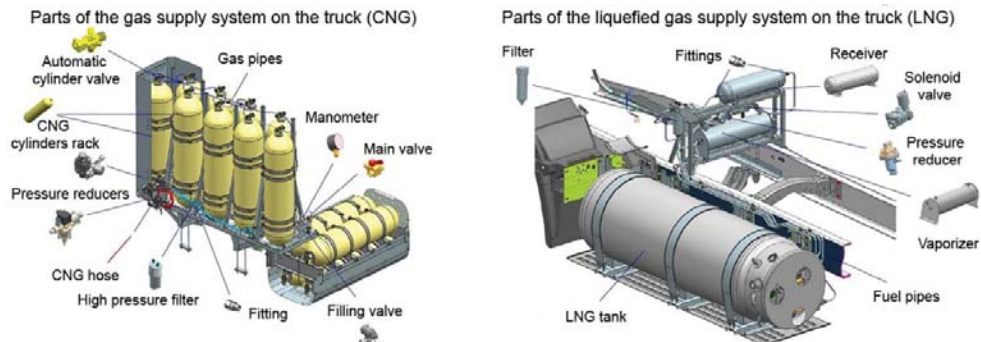


Figure 1. Gas engine power supply system - dedicated (CNG and LNG).

Liquefied natural gas is predominantly methane (92-98%), that has been liquefied by condensation at cryogenic temperatures. At atmospheric pressure, the condensation temperature of natural gas is about ($-162\text{ }^{\circ}\text{C}$). In the process of liquefying natural gas, its volume decreases by approx. 600 times.

When using different types of fuel, it is necessary to systematize the methods for calculating fuel consumption and emissions for comparison. The EN 16258 European Standard establishes a common methodology for the calculation and declaration of energy consumption and greenhouse gas (GHG) emissions related to any transport service.

Periodical Technical Inspection of gas powered vehicles means a periodical administrative uniform procedure by which the authorized technical Inspection Centers responsible for conducting the inspection tests declare, after carrying out the required verifications, that the wheeled vehicle submitted conforms to the requirements.

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