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The evaluation of the thearmoacoustic cooler application for LNG vapor recondensation

Karagusov V.I.[a], Karagusov I.V.[a] *

[a]*Omsk State Technical University, 11, Mira Pr., Omsk 64405, Russian Federation*

Abstract

The objective of the research is the evaluation of the thermoacoustic cooler application for LNG vapor recondensation. The analytical and calculation study results are presented in the paper, engineering solutions are proposed. The obtained solutions allow to conclude about the possibility of thermoacoustic cooling application for the natural gas recondensation.

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Keywords: thermoacoustic; coolers; recondensation; units; systems; LNG

1. Introduction

The natural gas storing in stationary facilities and in transport can be implemented in two ways: by the compressed natural gas (CNG) or liquified natural gas (LNG) appliance depending on the region infrastructure. For instance, city buses run on CNG which quantity in tanks is sufficient for en route traffic. At the rout terminals a bus is filled from the stationary or mobile CNG source.

On the inter-city routes the natural gas applying is problematic as a result of the natural gas fuel stations chain absence on most of the routs outside the major population centers. This is particularly true for Siberia where a large area coincides with low population density.

The natural gas applying problem is even more acute for river vessels travelling down the Russian rivers in low populated territories or in some cases even unpopulated ones over many hundreds of kilometers. Even in natural gas rich Siberia, river vessels are required to cover hundreds and often thousands of kilometers to be filled with it.

* Corresponding author. Tel.: +7-913-971-3715.
E-mail address: karvi@mail.ru

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2. The study subject

For such long distances covering, CNG becomes unprofitable and sometimes impossible because of the tanks large volume and weight. However, LNG should be stored on board the transport at cryogenic temperatures, this results in expensive superinsuated or powder and vacuum thermal insulated tanks (Fig. 1) [1].

Fig. 1. The superinsulated cryogenic tank for LNG.

In some cases consumers installations cannot fully extract the evaporative LNG amount on account of the geographical and meteorological conditions, forced stops or large LNG reserve. This results in the natural gas loss which is unprofitable, fire dangerous and environmentally harmful.

There are two reasonable solutions possible.

The first one: in recent years a number of nonvacuum polymer thermal insulated cryogenic tanks for LNG was developed (Fig. 2) [2].

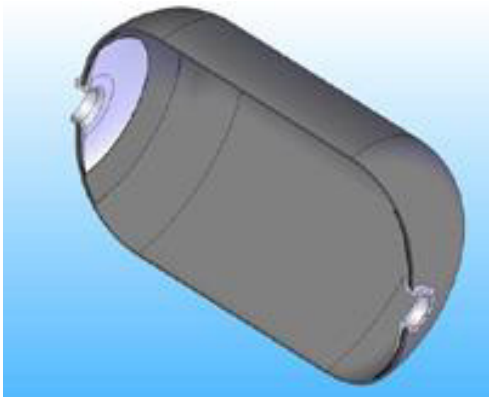

Fig. 2. The polymer thermal insulated cryogenic tank for LNG.