

Liquefied natural gas as an alternative fuel of the XXI century. The novell technologies of production

Belostotsky Yu.Gr., Koshelev A.M.

ELCO Technology SPb, Ltd, Russia

It is known that natural gas which generally consists of methane, is one of the most ecologically pure fuels. Only carbonic acid and water vapour remain after its full combustion. Besides, among all hydro-carbons methane is the most available in Nature, and now it is one of the cheapest fuels. Methane is delivered to consumers mainly via pipelines, since in order to transform it into liquid, a pressure of about 1000 atm. is required. Therefore consumption of natural gas is limited by the very problem with its delivery.

However, there are technologies of production of liquefied natural gas (LNG) by means of its deep freezing. With this purpose, a throttle or a gas expansion machines are used. But all of them have a number of drawbacks: the throttle liquefiers have a very low efficiency, and the gas expansion machines although having quite high output, are very complicated and unreliable in exploitation.

We propose new technologies and new devices for production of LNG where the so called Vortex tubes are used as cooling elements. The Vortex tube is a short piece of a cone metal tube with one inlet and two outlet sockets. In between these sockets a so called snail is located – a gas guide made by Archimed's spiral.

When gas is being introduced to this spiral, it, untwisting, is subjected to powerful centrifugal accelerations achieving several thousands of g value, resulting in appearance of powerful inertia forces. As a result, an intensive separation of gas molecules by temperature starts, and two streams of gas with significantly different temperatures are outgoing from the tube: hot molecules under intensive untwisting are being thrown off to the periphery of circulation, and the cold ones are concentrated in the center. Exactly there the outlet sockets are located: to collect hot gas in the periphery, to collect cold gas – in the center of circulation.

The liquefier made on the basis of the Vortex tube has a number of advantages before gas expansion machine:

- it is less sensitive to changes in gas composition;
- it is less sensitive to appearance of liquid drops (gas expansion machine can be broken down due to it);
- it requires very short start period (a few seconds to achieve a required temperature);

a simplicity of its construction allows the liquefier to work for a long period of time in autonomous mode without skilled personnel service;

- it does not require external load devices (electric generator, etc.);
- its durability is proved by absence of moving parts and is limited only by wear-resistance of applied material and a level of gas cleaning from abrasive particles;
- it allows to make more flexible tuning of the system under changes in inlet pressure, gas composition, etc.
- its cost price is rather low, close to the cost of throttle liquefier;

And since a part of gas discharged from the liquefier is heated, its use allows to simply solve an old problem existing at all gas-distribution stations - to protect gas equipment from freezing.

Availability of demonstration samples:

Working drawings have been made; several types of the Vortex tubes showing improved characteristics have been manufactured and tested. The samples will be demonstrated at the exhibition during the Seminar.

All necessary calculations for creation of the system for LNG production have been completed.

Demand:

In Russia, approximately 4000 gas-distribution stations are functioning within its gas network, where such Vortex systems for LNG production can be installed.

Such systems can also be an alternative to the existing throttle and gas expansion machines for LNG production which are widely used abroad. The proposed system is much cheaper and more reliable.

Authors: Yuri G.Belostotsky and oth.

Protected by: RF Patents ? : 2143650, 21255216, 2149324, and oth.

Patent owner: Yuri G.Belostotsky

Owners of rights: ELCO Technology SPb; Yuri G.Belostotsky.