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LNG PRODUCTION TECHNOLOGY AND ITS APPLICATION POSSIBILITIES

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Annatatsiya

Neft va gaz mahsulotlariga bo‘lgan talabning yildan-yilga oshib borishi hamda atrof muhitning muhofazasi bo‘yicha olib borilayotgan muommolarning yechimi topish masalasi dolzarbligicha qolmoqda. Maqolada mash’alaga beriladigan va neftning tarkibidagi yo‘ldosh gazlarni qayta ishlash asosida suyultirilgan tabiiy gazni olish bo‘yicha respublikamizda olib borilayotgan ishlar to‘g‘risidagi ma’lumotlar keltirilgan.

Аннотация

Спрос на продукцию нефтегазовой отрасли увеличивается с каждым годом, а вопрос поиска решений проблем охраны окружающей среды остается актуальным. В статье представлена информация о проводимых в нашей республике работах по производству сжиженного природного газа на основе переработки попутных газов, содержащихся в нефти и сжигаемых на факелах.

Abstract

The demand for oil and gas products is increasing year by year, and the issue of finding solutions to environmental protection issues remains relevant. The article presents information on the work being carried out in our republic to obtain liquefied natural gas based on the processing of associated gases contained in oil, which are flared.

Kalitli so‘zlar: suyultirilgan gaz, texnologiya, parnik effekti, bug‘lantirish, utilizatsiya, kondensatsiyalash, drosellash.

Ключевые слова: сжиженный газ, технология, парниковый эффект, испарение, утилизация, конденсация, дросселирование.

Keywords: liquefied gas, technology, greenhouse effect, evaporation, utilization, condensation, throttling.

INTRODUCTION. At the modern stages of development of the world economy, clear reforms and new directions in the development of the overall structure of energy resources are emerging. Gas occupies the third place in the world energy balance and, according to optimistic forecasts, by the beginning of 2000 it will not be fully utilized for production. According to press reports, gas demand in European countries is expected to grow by up to 3% annually, and with the United States being the largest importer of gas, gaps in gas production are expected to arise in the Middle East, Africa, and Australia. All of this overestimation seems to be exaggerated today. Over the past 15 years, the share of gas demand has increased by about 1.5%, with gas's share in the world market falling by 24.1%, oil's share by 32.5%, and coal's share by 30.4% [5]. The development of the world gas economy and marketing has shown an increase in gas reserves by about 1.7 times, while production and consumption have increased by 75%, and the sale of natural gas in liquefied form through pipelines has increased by 30%, of which 10% of the gas produced is sold globally in liquid form. Table 1 below shows that more than 30% of gas is consumed outside the country, and overall gas production has increased by 1.5-2 times [1].

RESULT: Liquefied natural gas (LNG) production organizations are conducting promising work to ensure the consumption of petroleum products in the fuel and energy balance of countries with alternative fuels. In addition, when using natural gas as a fuel, it is necessary to focus on solving two environmental protection problems: first, reducing atmospheric pollution and second, reducing the greenhouse effect. A quarter of the gas produced in the world is liquefied and sold in liquid form to gas-consuming countries using special tankers.

General status of gas networks in the world energy balance

Table 1

Namespace	1990	1995	2000	2005	2010	2015
Reserves, trln.m^3	116	140	154	152	165	191
Extraction, trln.m^3	2	2,1	2,4	2,8	3,2	3,7
Consumption, trln.m^3	2	2,1	2,4	2,8	3,2	3,6
Export sales, mln.m^3	308	506	651	848	982	1122
Gas pipelines, bn.m^3	236	413	508	659	686	721
Liquefied natural gas, bn.m^3	72	93	142	189	296	401

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STG (LNG) is the basis for the efficient use of natural gas.

An analysis of scientific and methodological data on the development of the gas industry in leading foreign countries shows that the production and use of LNG produced from gas is economically and technologically feasible in countries that do not have sufficient natural resources [2].

Two known methods are used in practice to obtain liquefied natural gas:

condensation (conversion into a liquid) of gas under constant high pressure;

The use of refrigerants in refrigeration heat exchange and heat exchange technology with turboexpanders or throttling are currently widely used in our gas fields.

In particular, in the "Shurtan Oil and Gas Production Department" and the "Mubarak Oil and Gas Production Department", SCS are used in fields with reduced pressure and to maintain formation pressure. In this case, the process occurs as a result of the sharp expansion of gas at the lowest temperature.

Liquefied natural gas (LNG) is liquefied by artificial refrigeration - it is a product of high energy and environmental properties and is delivered to any country through smooth commercial systems to facilities located far from main gas pipelines, where it is impossible or economically expensive to transport gas. STG is used as an alternative fuel for cars or other energy-consuming devices. During the initial gas preparation, a gas stream purified from water, sulfur dioxide, carbon monoxide, and other types of pollutants is fed to a liquefaction device. STG is an odorless and colorless liquid, with a density half that of water, and is chemically non-toxic. STG consists of 95% methane, and the remaining 5% is ethane, propane, butane, nitrogen, etc., with a boiling point ranging from minus -158^{0}C to -163^{0}C, depending on its composition. Its lower combustion limit is -33494 kDj/m^3 (50116 kDj/kg), specific heat of combustion is -12000 kcal/kg, when vapors burn, carbon dioxide and water vapor are formed, and its combustion products contain 10 times less carbon monoxide and 2 times less nitrogen oxide than gasoline [3]. The most important advantage of this technology is that when converted to a liquid, its volume is reduced by 600 times compared to gas, which makes it easier to store and transport than natural gas. For use in private networks, STG is converted into a gaseous state at special degassing terminals, where it evaporates without the presence of air. Pure STG does not burn, does not spontaneously ignite, and does not explode.

It returns to a gaseous state at normal temperatures in the open air and quickly dissolves (reacts) in air [4]. When natural gas vaporizes, a fire occurs when it comes into contact with a flame source. It can be noted that for normal combustion, its vaporized concentration in the air must be between 5% and 15% of the gas, while if the concentration in the air is up to 5%, it is not enough to burn, and if it is above 15%, there is not enough oxygen in the environment for the oxidation process to occur.

In industry, natural gas is burned to obtain the final product of STG, and in the liquefaction process, low-temperature fractionation of the companion and natural gases is carried out together, resulting in the separation of ethane, butane, propane, and gasoline. These gases are used as raw materials in the production processes of the petrochemical industry [6].

In most technologies for STG production, the raw purified gas supplied to the satellite or field natural gas unit is cleaned of mechanical impurities using filters, and after passing through plug traps to prevent pulsating discharge of liquids, gas, gas condensate, and formation water separators, it enters. The liquid that enters the trap is pumped out using pumps to separate it into condensate and water, and then the gaseous condensate is pumped to a collection tank (reservoir) in the cargo hold. The formation water is transferred to the degassing tank by the pressure in the separator at the three-phase inlet, where the dissolved gas contained in the water is vented and discharged to the flare, while the residual water is pumped to the collection tank. After that, the gas pressure is stabilized in the reducer, the flow of purified gas is measured and cooled between stages, and the separated gas is compressed under a pressure of 50-70 kg/cm^2. The compressed gas is directed to the amine cleaning unit, where the gas feedstock is cleaned of sour components (hydrogen sulfide, carbon dioxide), and then fed to the STG unit for corrosion. The sour gases are vented and fed to the flare. The purified gas is then directed to a zeolite drying unit, where it is stripped of water vapor to prevent ice and condensation. To do this, the gas temperature is brought to minus 90^{0}C and the dew point is prevented from forming. The unit includes equipment for drying and heating the gas, cooling, separation, and regeneration by filtering the gases. Simple synthetic zeolites (also called molecular sieves) are used as adsorbents in the drying columns.

The dried gas is directed to the natural gas liquefaction unit, where it is cryogenically cooled to minus -162^{0}C to convert the gas into STG. In this case, the gas enters the main heat exchange cooling chamber, where a refrigerant mixed with nitrogen (N_2) and hydrocarbons (C_1-C_5) is used, and the circulation flow in the system is carried out using a compressor unit. As a result, the gas is cooled to the required temperature in the heat exchanger, during which the liquefied hydrocarbons are separated in separators and directed to a designated reservoir for storage. The same method is used to extract helium from natural helium-like and associated gases during the liquefaction process. The finished liquefied methane gas (CH_4) is fed to a storage tank for STG. From there, it is loaded into tanker trucks using special equipment and shipped to consumers.

Natural gas and refrigerant

Table 2

№	Component	Natural gas	Refrigerant
1	Helium	0,2	Traces
2	Nitrogen	5,8	10,6
3	Methane	83,2	35,6
4	Ethane	7,1	28,2
5	Propane	2,35	3,4
6	Isobutane	0,4	8
7	n-butane	0,6	2,1
8	Isopentane	0,12	11,4
9	n-pentane	0,15	0,7
10	Hexane	0,1	Traces
11	C_7 and above	0,08	Traces

CONCLUSION: Thus, any STG production device will include the following main blocks and structures: a block that pre-cleans natural and associated gases from mechanical particles and formation water; raw gas inlet metering units and reduction unit; raw gas compression unit; gas purification unit; raw gas drying unit; fuel gas preparation unit; diethylene glycol (DEG) regeneration unit; natural gas liquefaction unit; artificial refrigerant unit; refining unit; tanks for storing natural gas fractions and STG; devices for loading STG and delivering it to the consumer.

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