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Products from Methane Hydrocarbons and its Quality Requirements

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ANNOTATION: At present, natural gas is processed in the fields after being extracted from the ground and converted into commercial gas, which produces ethane, propane, butane, isobutane, sulfur, mercaptans, gas condensate, and even motor fuels. The gas comes out of the ground under pressure and the pressure decreases as it exits. As a result, the liquid part of the gas condenses.

KEYWORDS: gas, which produces ethane, propane, butane, isobutane, sulfur, mercaptans, gas condensate.

I. INTRODUCTION

Large-scale demand for natural gas and gas condensate products The rapid development of petrochemical, gas and oil and gas refining in the country, especially the radical change in the structure of the oil and gas industry as a result of improving market relations in the transition to a market economy.

About 70% of the country's underground gases are used as fuel and raw materials in industry, and about 20% are used as fuel for electricity generation. At present, natural gas is processed in fields after being extracted from the ground and converted into commercial gas, which is used to produce ethane, propane, butane, isobutane, sulfur, mercaptans, gas condensate, and even motor fuels. The gas comes out of the ground under pressure, and the pressure drops as it exits. As a result, the liquid part of the gas condenses and separates, which is called gas condensate. The condensate gas also contains some toxic waste. Natural gas consists of C_nH_{2n+2} saturated hydrocarbons. Chemical composition: mainly methane gas is 96-99%. There are small amounts of C_2-C_4 gases. In addition, n-pentane, isopentane, hexane, heptane and other heavy hydrocarbons are also added. In addition, nitrogen, CO_2 , H_2S , inert gases (Ar, Ne, Kr, Xe, Ne) are also present. Nitrogen and CO_2 are present in 10%, sometimes more, of all gases. These are unnecessary gases. H_2S gas, on the other hand, is toxic and combines with water to corrode metal parts. It is therefore purified to 2 g of H_2S in 100 m³ of gas. Helium is less than 1%. Natural gas is usually transported over long distances through pipes. Natural gas is usually transported over long distances through pipes. Due to the different climatic conditions on the gas route, it is important to purify the gas from the water it contains. Moisture in the gas, liquid hydrocarbons, toxic and other wastes reduce the efficiency of gas pipes, increase corrosion, increase the energy consumed by compressors, clogged monitoring and inspection devices in the pipes. These complicate the operation of technology devices, which can lead to an emergency situation. Therefore, the following requirements are set for commercial gas:

- In our conditions, water condensate cannot be formed from the gas at temperatures above 6⁰C in winter (X-IV) and 6⁰C in summer (V-IX).
- Mechanical waste should not exceed 0.1 g per 100 m³ of gas.
- Oxygen content should not exceed 1%.
- Absence of liquid CH in gases at $\pm O^0S$ in winter and summer.

Even after the natural gas is cooled in special devices and separated from the gas condensate and water, very small particles of liquid remain in the volume of the gas. The particle size ranges from 0.1-20 μm to 1000 μm . As the gas moves inside the tubes, the liquid particles can coalesce and enlarge the particle, and conversely, if the gas moves at high speeds, the particle size can disintegrate. 300-350 mg of liquid may remain in 1 m³ of branded gas. The rest is separated in special separators. Separators are of several types depending on the method of operation:

- Fluid particles are separated by their own weight.
- Particles are separated by inertial forces.
- The particles separate due to the force moving away from the center.

- The filter is floating.

The quality of branded gas is constantly checked using automated devices. In addition, the improvement of equipment used to solve problems such as the diversity of products and the necessary requirements to improve their quality, the development of more efficient methods of hydrocarbon separation systems, the production of technologically and technologically new modern versions of heat exchangers and couplings has become inextricably linked with factors such as application to the process. The chemical composition and properties of natural and petroleum gases are very important in terms of interpreting their formation in rock layers, preparation of gas in mining conditions, transportation of commercial gas through main pipelines, extraction of necessary light and heavy hydrocarbons, as well as processing to obtain various products. important. Hydrocarbon gases can be divided into two groups depending on their origin: natural gas, ie gases formed in the underground rock layer, and artificial gases derived from solid or liquid fuels. The composition of natural gas extracted from gas fields in the region consists mainly of paraffinic (methane) hydrocarbons: methane CH_4 , ethane C_2H_6 , propane C_3H_8 , butane and isobutane C_4H_{10} . Vapors of light liquid hydrocarbons are also found in natural petroleum gases. Ordinary paraffinic (methane) hydrocarbons: CH_4 , C_2H_6 , C_3H_8 , C_4H_{10} are gaseous under normal atmospheric conditions at a temperature of 0°C and a pressure of 0.1 MPa. Butane and isobutane have the same chemical formula, i.e. they consist of 4 carbon atoms and 10 hydrogen atoms attached to them. The difference between butane and isobutane is in their structure, butane has a straight-line chain structure, while isobutane has a branched-chain structure. Mining products contain isobutane and isopentanes of various molecular structures. Methane hydrocarbons are more chemically stable and belong to saturated hydrocarbons. Methane hydrocarbons CH_4 - C_4H_{10} are in the gaseous state, C_5H_{12} - $\text{C}_{16}\text{H}_{34}$ are in the liquid state and $\text{C}_{17}\text{H}_{36}$ and above are in the solid state (methane, paraffin). In addition to hydrocarbons, the natural gases in the sedimentary rock layer contain CO_2 , H_2S , N_2 , H_2 , He, Ar and other types of additives, albeit in small amounts. The raw materials of some deposits contain hydrogen and mercury. Carbon dioxide CO_2 can often be as high as 3% and sometimes as high as 10-15%. The amount of helium is 0.001-0.01% and the amount of H_2S is up to 6%.

For example, the gases of the Ortubalak and Mubarek fields contain 3-4.9% of H_2S . At high temperatures and pressures in the subsurface natural gas at high temperatures and pressures C_5H_{12} and higher methane hydrocarbons are in the gaseous state. The amount of condensate in the gas, ie the liquid hydrocarbon phase, is up to $350 \text{ g} / \text{m}^3$. Gas condensate is a valuable raw material for the petrochemical industry, and in some respects, it contains less mineral salts, water and heavy fractions (fuel oil and tar) than oil. Helium and hydrogen sulfide are very valuable hydrocarbon fractions of natural gas. However, the presence of CO_2 , H_2S separately and together in the composition of natural gas dramatically increases the internal corrosion of the equipment used. In particular, the presence of water vapor in the gas accelerates the internal electrochemical corrosion of the equipment, making it impossible to transport it through the main pipes. Hydrocarbon gases are sufficiently inert at normal temperatures due to their chemical composition. One of the important properties that has led to their widespread use in practice is their ability to burn together with air. Gas smokeless and dry combustion, no ash after combustion, cheap and easy delivery to the consumer, as well as storage in liquefied and compressed form, no harmful substances, ease of control of combustion and combustion processes are distinguished by the large efficiency of fuel-consuming devices. Gas production is much cheaper than other types of fuels. For example, if we assume that the cost of coal mining is 100% per 1 ton of conventional fuel, the cost of gas extraction is 10%. The difference between gas and all types of energy carriers is that when it burns, a large amount of heat is released. The combustion temperature of the best grade coal is 31 MJ / kg, the combustion heat of gasoline is 42 MJ / kg, ethane, propane and butane are 64.5, respectively; 93.4 and 124 MJ / m^3 respectively.

Hydrocarbon gases differ sharply in boiling point. Methane can liquefy at very low temperatures. Liquid methane boils at minus 161°C and gases. The critical point of methane is minus 82°C , so methane does not pass into the liquid at any pressure because the temperature in the subsurface rock layers is higher than 0°C . Ethane boils at minus 88°C , its critical temperature is below 32°C and at high pressures ethane can liquefy. Propane, butane and isobutene rapidly liquefy. For example, if it is necessary to liquefy these hydrocarbon gases at room temperature, a pressure of 7-8 atm for propane, around 3 atm for isobutane and around 2 atm for butane is sufficient.

Nitrogen is released as a satellite gas during the separation of helium. Natural gas extracted from mining wells can be in the form of gaseous, liquid and their mixtures under certain thermodynamic conditions. Their phase changes in terrestrial communications result in the separation of gas and liquid phases. For example, the presence of water in the gas prevents the formation of hydrates or the movement of gas that accumulates as a result of condensation in various parts of the pipes, hydrogen sulfide strongly dissolves the equipment. Gas production in mining conditions is carried out in the initial preparation or complex devices. In the preparation of gas, the water in their composition is mainly



separated, ie dried, and the inorganic gases in the gas are separated from the gas content up to the allowable value using special chemical and chemical-technological methods. Absorption and adsorption methods are used in various devices and equipment.

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