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THE MAIN CHARACTERISTICS OF NATURAL GAS AND CLEANING METHODS

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Abstract

The article presents an analysis of the main characteristics of natural gas, the density of natural gas in the gaseous state and its composition, methods of natural gas purification and gas drying by absorption.

Keywords: gas, drying, method, absorption, Ethane, Propane, Butane, Carbon dioxide, Helium, Hydrogen sulfide, Ethylene.

Аннотация

В статье представлен анализ основные характеристики природного газа, плотность природного газа в газообразном состоянии и его состав, способы очистки природного газа и осушка газа методом абсорбции.

ключевые слова: газ, Осушка , метод, абсорбции, Этан ,Пропан, Бутан, Углекислый газ, Гелий, Сероводород, Этилен.

Annotatsiya

Maqolada tabiiy gazning asosiy xususiyatlari, gaz holatida tabiiy gazning zichligi va uning tarkibi,tabiiy gazni tozalash usullari va changni yutish usuli bilan gazni quritish usullari tahlil qilinadi

kalit so'zlar: gaz, namlik, usul, emilim, etan, propan, Butan, karbonat angidrid, geliy, vodorod sulfidi, etilen.

Locally sourced natural gas is not a pure product in terms of the opinions that can be reflected in the operation of gas pumping plants and pipelines.

Impurities are different. This can be, for example, mechanical particles contained in the produced natural gas. Getting into various mechanisms (for example, gas pumping units on a transport highway, compressors, etc.), they radically increase their wear. This leads to a sharp increase in costs, a drop in the economic efficiency of production.

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However, mechanical particles are far from the only impurity that can damage technological processes. Ordinary water is no less dangerous. Therefore, the problem of gas drying is quite acute for modern engineers.

Main Characteristics of Natural Gas

Natural gas is a mixture of such gases that were formed in the earth's interior during the decomposition of various organic substances. Natural gas is one of the most important minerals that are actively used in industry and in everyday life. In the conditions of occurrence (or, as gas specialists say, in reservoir conditions), natural gas is exclusively in a gaseous state or in the form of a so-called **"gas caps"** in common oil and gas fields, either in the form of gas deposits (that is, separate accumulations), or in dissolved form — in water or in oil. However, under certain conditions, natural gas can be not only in a gaseous state, but also in a solid state in the form of crystals.

Up to 98% of natural gas is methane, and it also includes methane homologues-ethane, propane and butane. Sometimes carbon dioxide, hydrogen sulfide and helium may be present. Methane (CH4) is a colorless, odorless gas, lighter than air. It is flammable, but it can still be stored with sufficient ease.

Ethane (C2H6) is a colorless, odorless and colorless gas, slightly heavier than air. It is also combustible, but is not used as fuel. Propane (C3H8) is a colorless, odorless, toxic gas. It has a useful property: propane is liquefied at a low pressure, which makes it easy to separate it from impurities and transport it. Butane (C4H10) is similar in properties to propane, but has a higher density.

Twice as heavy as air. Carbon dioxide (CO2) is a colorless, odorless gas, but with a sour taste.

Unlike other components of natural gas (with the exception of helium), carbon dioxide does not burn. Carbon dioxide is one of the most low-toxic gases.

Helium (He) is a colorless, very light (the second of the lightest gases,

after hydrogen) without color and smell. It is extremely inert; under normal conditions it does not react with any of the substances. It doesn't burn. It is not toxic, but at high pressure it can cause anesthesia, like other inert gases. Hydrogen sulfide (H2S) is a colorless heavy gas with the smell of rotten eggs.

It is very poisonous, even at a very small concentration it causes paralysis of the olfactory nerve.

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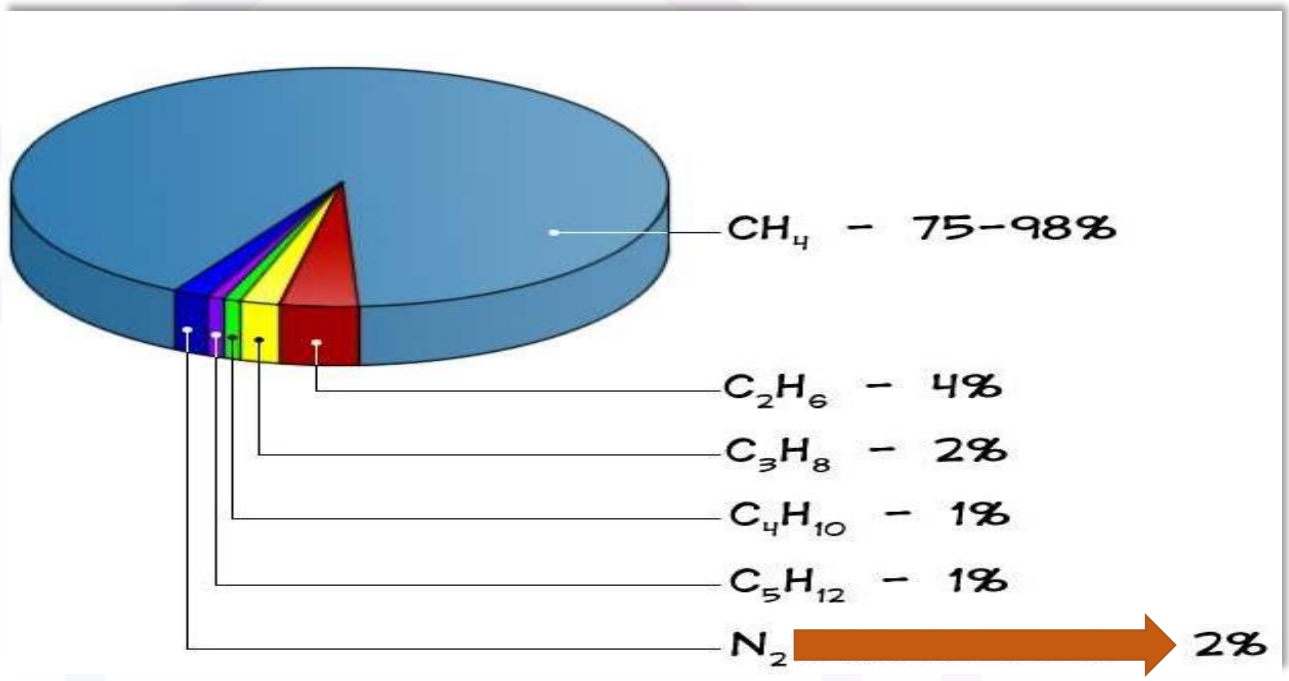
Properties of some other gases that are not part of natural gas, but have applications close to the use of natural gas Ethylene (C2H4) is a colorless gas with a pleasant smell. It is close to ethane in properties, but differs from it in lower density and combustibility. Acetylene (C2H2) is an extremely flammable and explosive colorless gas. Under strong compression, it is capable of exploding. It is not used in everyday life because of the very high risk of fire or explosion.The main application is in welding works.



COMPOSITION OF NATURAL GAS

The density of natural gas in the gaseous state is on average 0.75 kg per cubic meter. In the crystalline state, the density reaches 400 kg per m3. Natural gas ignites itself only at a very high temperature-about 650 degrees Celsius. At a certain concentration of natural gas in the air (about 5-15%), explosions can occur. The specific heat of combustion of natural gas is also known, which is on average 35 MJ/m. The water vapor content in the natural gas of Siberia is approximately 4.9 g per cubic meter, so W=0.65%

The natural gas produced at the fields is not a pure product, it contains many impurities that can have a bad effect on the operation of gas pumping plants and pipelines.

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Impurities are different. We can talk, for example, about mechanical particles contained in the extracted natural gas. Getting into various mechanisms (for example, gas pumping units on a transport highway, compressors, etc.), they radically increase their wear. This leads to a sharp increase in costs, a drop in the economic efficiency of production.

However, mechanical particles are far from the only impurity that can damage technological processes. No less dangerous is ordinary water. This problem is particularly acute in the production of natural gas. The specific concentration of water vapor in this case strongly depends on the natural and geological conditions at the field. However, they are always present in one or another volume.

What is the danger of water? The most obvious reason is corrosion. After all, the pipes that make up gas pipelines, and many units are based on iron alloys.

The" main measure "of the degree of gas dehumidification is the"dew point", which is well known to everyone from school physics textbooks. The dew point is the temperature to which the air must cool down so that the water vapor contained in it reaches a saturation state and begins to condense into dew. The lower it is, the better. In general, for gas that has already been processed, the dew point should not be higher than the minimum ambient temperature in which the gas will pass during transportation. We can talk about figures in -60 degrees Celsius and below. If this requirement is not met, then additional drying is required.

There are many methods of dehumidifying gas. However, their practical significance is different, and not all of them are applicable for production purposes. In addition, when choosing them, it is necessary to take into account the conditions of a specific area (for example, the value of the "dew point" depends on this), as well as the economic side of the project.

So, in laboratory conditions, methods based on chemical principles are usually used for these purposes. In fact, there are enough substances that can provide almost complete drying of the gas.

However, it is impossible to reproduce these processes on an industrial scale – the substances are then almost impossible to restore. I.e., the process turns out to be "one-time". And this, given the volume of the gas industry, is simply expensive.

The mention of solid moisture absorbers did not appear by chance. Another common gas drying technology, the adsorption method, is based on their use.

The adsorption method has a number of indisputable advantages. In particular, it allows you to achieve a much lower "dew point": -90 degrees Celsius.

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However, the possibility of choosing this method, as well as a specific adsorbent, strongly depends on the composition of the drained gas. As already noted above, it may contain components that negatively affect the solid reagents of the installation.

In addition, there are also technical and economic difficulties. The adsorption process is much more difficult to automate than absorption. And the choice of this method means the need to incur significant additional capital costs.

Silica gels In modern industry and science, a special place among sorbents belongs to silica gel, which is a dried gel silicic acid. Chemical inertia, high temperature resistance, ease of regulating the porous structure - all this complex of properties makes it possible to prepare sorbents, catalysts and carriers with a high specific surface area on the basis of silica gel with optimal porosity of the structure.

One of the most practically important silicon compounds is silicon dioxide SiO2. A distinctive feature of silicon dioxide is the tendency to give colloidal solutions and form gels with water, called silica gels.

Conclusion

I have studied the characteristics of natural gas, its drying methods. I also studied silica gels and their properties. I got acquainted with the installation for drying natural gas. Now I am faced with the task of developing a device for cleaning gas from moisture by adsorption using silica gels. Required capacity: 1000m / h. Required degree of purification: 99.99%.

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