Procedia on Economic Scientific Research

Procedia on Digital Economics and Financial Research

ISSN: 2795-5648 Available: https://procedia.online/index.php/economic

Use of Interactive Methods in Teaching the Subject of Natural Gas Processing in Higher Education

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Abstract: This article contains valuable information about the use of interactive methods in teaching the subject of natural gas processing in higher education. Also, the unique methods of extraction and processing of gases from gas fields were discussed.

Keywords: modern pedagogical technologies, tectonic structure, gas deposits, natural gas, helium, argon, natural fuel, isopentane.

The use of interactive methods in teaching the subject of natural gas processing in higher education, the use of innovative educational methods in teaching the subject effectively helps in clearly explaining this subject to students. The topic of the article is based on today's requirements, the organization of lessons in the process of vocational education on the basis of modern pedagogical technologies, along with the quick understanding of the given material through their effective use, as well as the current issue of increasing the quality and efficiency of the educational process. focused on solving. The educational methods used in the course of the lesson help the students to master the given educational material, increase their thinking activity, and make them eager to know everything. Understanding – shrewd helps to educate personal qualities such as resourcefulness, striving for independent creativity. If developmental teaching methods are applied to lessons organized on the basis of advanced methods of education, the lesson becomes more effective and understandable, and significantly increases the activity of students during the lesson.

When covering the scientific part of the topic, we should pay special attention to gas fields. Gas fields are piles of natural gas located in a specific tectonic structure in a certain part of the earth's crust. Natural gas is found as a separate gas field or together with oil (oil and gas fields). Gas deposits are divided into multi-layered deposits. In the cross-section of multi-layered gas deposits, there are several gas piles located on top of each other at different depths in one area. Various gas accumulations are found at different distances of the cross-section of gas fields. Gas fields are grouped in spatially generalized gas accumulation zones and gas or gas-oil platforms (domed mounds, platform internal depressions, etc.), geosynclinal 9 intermountain valleys, intermediate massifs), transition (foothill depression) are divided into types. Multi-layered gas fields are extracted from individual wells or from one well that crosses all layers. In addition to hydrocarbons, gases from gas fields also contain carbon dioxide (CO_2), nitrogen (N), hydrogen sulfide (H_2S), rare gases helium, argon. Gas fields are divided into pure (or dry gas) and oil gas fields. Pure gas field gases consist of methane (94-98%) and a small amount of ethane. In addition to methane and ethane, a certain amount of propane (C_3H_8), butane, isobutane (C_4H_{10}) and pentane (C_5H_{12}) can be found in oil gas fields. Every year, 1.5*1012m3 of

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natural gas is extracted worldwide. The pressure of natural gas under the ground reaches 25-30 MPA. Therefore, dissolved liquids, i.e. hydrocarbons, normally have a large molecular mass.

Natural gas exhibits the power of methane and hydrocarbons. Gases from some mines contain acidic components (hydrogen sulfide, carbon dioxide, nitrogen, oxygen, rare gases - helium and argon (H_2S, CO_2, N_2, O_2 , He, Ar), stable, all natural gases are permanent. accompanied by water vapor.

Hydrocarbons included in natural gas can be conditionally divided into three groups:

- Group I includes methane and ethane, which are considered dry gases, and their content in gases ranges from 60 to 95% under normal conditions.
- Group II includes propane, isobutane and n-butane. These hydrocarbons are in the form of gas under normal conditions, and at increased pressure they change to a liquid state.
- Group III includes isopentane, n-pentane, hexane and slightly higher molecular weight hydrocarbons. They are in a liquid state under normal conditions and are part of gasoline.

The main component of natural gas (92-99%) is methane CH_4, and the rest is carbon (II) oxide (CO), flammable hydrogen, nitrogen, carbon dioxide, water vapor, hydrogen sulfide, ammonia (H_2 ,N_2 ,H_2O , H_2S,NH_3) and others.

Artificial gases are obtained during the processing of solid and liquid fuels, including industrial gas (blast gas, coke, lighting, sewage gases), generator gas (during the conversion of solid fuels into gas), etc. Their composition and properties, including heat of combustion, vary widely. Usually, they consist of a mixture of flammable and inert gases with different odors. They include combustible gases: methane, propane, butane, other hydrocarbons with the formula C n H m (CH_4 , C_2H_6 , C_3H_8 ,C_4H_{10} , H_2 , CO), hydrogen, carbon dioxide, as well as inert gases and pollutants (carbon dioxide , nitrogen (CO_2, N_2), moisture, resinous substances, mechanical particles, sulfur compounds, etc.).

Oil and gas industry enterprises use various schemes and methods of gas drying and extraction. In the fight against the formation of gas hydrates, the inhibition method (the introduction of an inhibitor into the gas flow) is widely used. The essence of this method is that the inhibitor introduced into the wet gas flow dissolves freely in water, and as a result, the pressure of water vapor and the temperature of formation of hydrates are reduced. Decreasing the temperature of formation of hydrates due to inhibition can be determined using the Gamerschmidt equation:

$$\Delta t = 0{,}556\ K/M \cdot w/100 - w$$

where: Δt is the temperature of decrease of formation of hydrates at a certain pressure, 0C; w- mass percentage of inhibitor, %; K-constant (K=2335 for methanol; K=4000 for glycols); M- inhibitor molecular mass.

Glycols are widely used in the drying of methanol and gases as inhibitors against the formation of hydrates. Methanol (CH_3OH) is a methyl alcohol that, when introduced into the gas stream, absorbs water vapors and transfers them to an aqueous alcohol solution at a low freezing temperature. Glycols are also separated in separators after being saturated with water vapor and then regenerated. Calcium chloride ($CaCl_2$) solution and lithium chloride are also widely used as inhibitors. A more effective way to prevent the formation of hydrates is to dry the gases, in which the moisture content is drastically reduced. There are common methods of drying gas and compressed hydrocarbons in industry:

- ✓ liquid absorbents - glycols (mono, di, tri ethylene glycols)
- ✓ Solid absorbents – (activated aluminum oxide, silica gel, bauxites) synthetic zeolites, etc.

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Gas drying using liquid absorbers is widely used in the gas industry. The use of glycols in the gas drying device is in two forms: spraying glycol into the gas flow and absorption. It is known that the composition of the gas coming out of the mine includes water vapor, N_2, CO_2, H_2S mechanical additives. The cleaning of gas from such additives leads to a number of negative situations when it is transferred to GQIZ.

In conclusion, it should be noted that natural gas consists of a mixture of gaseous hydrocarbons in the methane range with a mixture of inorganic gases (hydrogen sulfide, carbon (IV) oxide, nitrogen, helium, etc.) as an additive. Natural gas is mainly composed of methane, and petroleum gases contain many of its homologues (C_2 to C_5) in addition to methane. Gas condensate deposits are also found. (When gas is released from natural gas deposits, the pressure decreases and liquid hydrocarbon condensate is released from it). The deeper it is underground, the more condensate it contains.

The rapid development of the gas industry is due to the fact that gas is an excellent fuel. When it burns, it burns completely, it does not produce smoke and toxic substances, ash, it is convenient and economically cheap, it can be stored in compressed and liquefied form, and it is very cheap to extract. 55% of the total gas used in our country is used in industry, 26% is burned in power stations, 15% is used for household purposes, and 4% is used in various sectors of the economy. Currently, 90% of steel, 85% of cast iron, 60% of cement and 85% of fertilizer are produced using gas. All components of natural gas are widely used in the chemical industry.

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