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The Role of Reliable Absorbents Based on Local Raw Materials for Natural Gas Purification

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Abstract:

This article highlights the role of the gas industry in the economy of our Republic, classification and description of methods for natural gas purification using local raw materials.

Keywords: Oil and gas, chemistry, composite absorbents, industry, raw materials, processing, economy, purification.

Natural gas extraction rate puts the Republic of Uzbekistan in 14th place among the world's leading countries, and the gas industry is one of the important sectors of our economy, playing a significant role in the fuel and energy supply. Its share in the primary energy resources in our country reaches 80%.

In recent years, significant progress has been made in Uzbekistan in the field of reprocessing natural and associated gases at the gas processing plants, as well as in the creation and improvement of technologies for the reprocessing of gases using new high-performance composite absorbents. The issue of rational use of components separated from natural gas in various sectors of the national economy is now one of the main current issues. In this regard, various natural and synthetic absorbents are used in the purification of nitrogen gases separated from natural gas. It is known that

the use of local absorbents in the purification of nitrogen gases separated from natural gas is one of the unresolved problems in finding a solution.

In recent years, the use of methyldiethanolamine in the separation of hydrogen sulfide from gases has gained considerable importance. Methyldiethanolamine differs from diethanolamine in several respects. Instead of using diethanolamine, which is widely used in the gas processing industry, it is proposed to produce methyldiethanolamine, and this method of purification also includes the use of methyldiethanolamine in combination with hexamethylenediamine. The technology for obtaining methyldiethanolamine for the industry is based on the ethylene oxide and methyl amine. The process is formed by chemical synthesis.

In the purification of gases from hydrogen sulfide, the absorption processes based on monoethanolamine and diethanolamine have been replaced by quite efficient processes based on primary and secondary amines over the past ten years. According to the practical reaction between H2S and amines, methyldiethanolamine selectively separates not only hydrogen sulfide but also carbon dioxide gas. The use of methyldiethanolamine as an absorbent in order to obtain selective benefits from hydrogen sulfide has led to the use of technological and analog schemes in the purification of amines. The economic indicators of the process show that when using methyldiethanolamine, there is a significant decrease in the concentration of monoethanolamine and diethanolamine by about 35-40%.

Various absorbers are used to utilize aggressive components in the natural gas composition at all stages of the process. One of the coolants is considered to be ethanolamine. Ethanolamine is a colorless viscous liquid, hygroscopic. It mixes with water and low alcohols in different proportions. Due to the presence of hydrogen bonding in ethanolamine, it is moderately associated and therefore does not melt in solid absorbers. Various absorbents are used to separate various components in natural gas composition. They can be solid or in solution. Understanding the physical properties of ethanolamine in aqueous solution, calculating the absorption and desorption processes, as well as determining the cyclic movement of the absorber and various technological parameters, contribute to the development of new technologies for the separation of various components in natural gas composition.

Due to its alkaline nature, ethanolamine is used to selectively separate additional acidic components in the natural gas composition. It is possible to conclude that in the world practice of gas purification, various methods are used in the purification of gases from various impurities.

In physico-chemical absorption processes, a combination of absorbers - a combination of physical and chemical absorbers is used. These absorbers are characterized by the volatility of the interval values of the gas's minor components. These absorbers not only allow the gas to be cleaned from hydrogen sulfide and carbonate anhydride, but also enable the rare purification of mercury-organic compounds. In the industry, the "Sulfinol" absorbent is widely used, which consists of diisopropanolamine (30-45%), sulfolane (tetrahydrofuran dioxide 40-60%), and water (5-15%).

Monoethanolamine has several advantages over other absorbents, including its low molecular weight, high boiling point at average concentrations (by weight), high alkalinity, and relatively easy removal from spent solutions. The most serious of these is the formation of reaction products that return with a significant amount of CO_2 and CS2, which can lead to additional chemical losses. In addition, monoethanolamine solutions, especially those with an amine concentration of more than 20% and loaded with acid gases, are significantly aggressive compared to other amine solutions. This property limits the possibilities of using monoethanolamine solutions in cases where acid gases significantly increase the vapor pressure loads. According to world practice, it has been found that replacing dietenolamine with methyldiethanolamine as a more efficient absorbent yields better results. Methyldiethanolamine has a lower heat of reaction with H2S than diethanolamine, which requires less energy in the absorption process. Regeneration of the spent absorbent is not difficult.

In industrial production, the concentration of amines in aqueous solutions prepared for absorption ranges up to 20% for monoethanolamine and up to 30% for diethanolamine. Chemically purified or distilled water is used to prepare amine solutions. In some cases, aqueous condensates are used. When the pH of the methyldiethanolamine composition exceeds 10, the amount of water in the absorbent is 30%, and the absorbent's compatibility is sufficiently high.

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Conclusion

The change in the standard requirements for the quality of natural gas delivered to consumers necessitates further purification of its technological natural gas parameters and composition. The purification of hydrocarbon gases by removing acidic components using amines is of interest worldwide. To reprocess natural gas and gases associated with natural gas and oil for further use, it is necessary to first remove hydrogen sulfide and carbon dioxide by absorbing them into alkaline components. If these substances are not minimized, aggressive substances are formed in pipelines and on pipeline surfaces, leading to corrosion and rendering equipment unfit for use. Additionally, hydrogen sulfide gas requires strong catalytic treatment for reprocessing and oil-chemical processes. Gases containing hydrogen sulfide, which produces hydrogen sulfide dioxide upon combustion, cause significant harm to the environment after being released into the atmosphere.

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