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METHODS OF BIOGAS PURIFICATION

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Using of biogas technologies is one of the perspective directions in renewable energy production now. Those technologies permit to minimize modern energy and ecological problems. Biogas is the mix of methane, carbon dioxide, hydrogen sulfide, hydrogen and other substances. Content of biogas depends on initial biomass materials used in process of anaerobic digestion and the production technologies. In this regard purification and up-grading of biogas is relevant approach to increase efficiency of it using as the energy resource. At the same time purified and up-grading biogas permits to reduce the environmental impacts quite effective.

Traditional methods for biogas purification can be used. They include chemical cleaning, absorption and adsorption. At the same time modern ways may be quite actual so. They are membrane division, cryogenic division and biological technologies of purification.

The membrane technology belongs to rather new methods in the sphere of preparation and up-grading of biogas. Division of methane and other components is provided due to different speeds of diffusion of molecules of various gases. Methane passes through the majority of membranes quicker, than carbon dioxide or hydrogen sulfide. At the same time purity of the received gas depends on a type of a membrane, its surface, flow rate and quantity of steps of division.

Following types of membranes can be used for purification of biogas: inorganic, polymeric and with the mixed matrix. Inorganic membranes involve dense and porous phases. Despite high thermal and chemical stability, inorganic membranes have limited application because of high costs of their commercially production. Polymeric membranes generally consist of cellulose acetate, polycarbonate, compound ether, polysulphone, polyamide, etc. In this type of membranes coefficient of diffusion

and solubility of CO_2 is higher that results in higher permeability. Gas, rich with CH_4 remains on the party of a membrane with more high pressure while CO_2 and H_2S extend on the party with lower pressure. Membranes with the mixed matrix are created by mixing of inorganic material and an organic polymeric matrix for achievement of higher permeability and selectivity. The combination of these two materials leads to change of permeability, working as a barrier of a molecular sieve without breaking structure of a matrix.

Biological technologies of completion of biogas are based on application of the microorganisms consuming CO_2 and H_2S. One of such technologies is based on transformation of carbon dioxide to methane by the acetophilous bacteria using hydrogen for this process. Such bacteria and hydrogen are added to a bioreactor. Created aggressive medium in bioreactor allows to increase methane releasing in biogas, at the same time there are no emissions to the atmosphere and waste formation in environment.

Cryogenic division is based on the principle of different temperature of compression of gases. At all ecological advantages of this technology its essential shortcoming is the high energy consumption. It leads to it limited application.

It is possible to overcome main shortcomings of above-mentioned technologies of biogas purification by their association in the combined technologies. So, the combination of membrane division with water absorption, chemical purification and cryogenic division is more effective than these methods used separately. Main advantages of this action consist in low operating costs, high extent of absorption of CO_2 and HS_2, high levels of purity of methane and smaller consumption of electric and heat energy.

References

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