

Evaluation of Gas Hydrates Storage Efficiency for Arctic Territories

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ABSTRACT

A new method of natural gas storing in gas hydrate form has been presented. The technological ability to create gas hydrate storages in the Arctic regions, using low-temperature of the environment was considered. The possibility of gas hydrates storage at atmospheric pressure in the form of pulps or capsules was estimated. The reservoirs structures that provide storage of gas hydrates in arctic conditions were observed. The advantages of the gas storage method in the form of gas hydrate were presented.

KEY WORDS: Natural gas; pipelines; gas hydrates; gas storage facilities.

INTRODUCTION

Russian Federation currently operates 25 stations of the underground gas storages. The storage facilities quantity is going to be decrease with opening new areas of gas pipelines and development of existing pipe systems "Ukhta - Torzhok", "NTR - Torzhok" and "Sakhalin - Khabarovsk - Vladivostok". At the present time there are works on finding the optimal locations of natural gas storages and stores designs.

It is difficult to operate the underground gas storages due to the effect of external and internal factors: i) the heterogeneity of litho logical structures and physical properties of the reservoirs, which effect on water replacement of the gas characters, ii) gas extraction surface unevenness, iii) the presence of fossil water and entrained solids in hydrocarbons, extracted from well, iv) formation of hydrates in gas pipelines and local obstacles (pressure reducer, armature), and so on.

STORAGE OF GAS HYDRATES

In addition to the well-known methods of natural gas storing, there is relatively new one – to keep natural gas as gas hydrates. The method is

widely applied in Japan, Norway and the United Kingdom. In order to use gas hydrates for the natural gas storage, the structures have to be able to stay in stable condition. The surfactants are used to increase the capacity and speed of hydrates formation. This method allows storing the larger volumes of natural gas than with standard methods of storage. On the other hand, gas hydrates can remain in a stable condition even at atmospheric pressure, but at the temperature below the melting point of ice, which is typical for the Arctic regions of Russia. As a result, new storage facilities can be planned for the creation of gas hydrates in Arctic instead of the traditional methods of storage.

As the hydrates remain in stable condition at the temperature below the melting point of ice, and most of the pipelines are located in this kind of climatic features (in the repositories), than gas hydrate storage method can be especially advantageous. Consequently, the measures can be minimized to ensure the storage conditions of hydrates.

At present, the problem of gas flaring is acute. A large amount of gas flared annually. These cause considerable damage to the environment. In addition, the potential profit is lost because of the associated gas using (as high energy and cleaner fuels). According to the amendment "of the measures to stimulate the reduction of air pollution products of burning associated gas flares" (from the Government of the Russian Federation on January 8, 2009 № 7). The target is "no more than five per cent of associated produced gas can be flared".

Major losses of associated gas are formed at the small remote fields, since the existing gas utilization schemes are too costly for such mines. Nevertheless, there is a solution for the gas utilization at small fields. The solution can be used on plants to make gas hydrates associate with temporary storage. Taking into account the experience of neighboring countries with similar climatic conditions, such installations can be placed directly on the production platforms.