



Geohazards Related with Engineering of Gas Pipelines in Gas Hydrate Fields of the Barents Sea

Inna Balanyuk (2), Anatoly Dmitrievsky (1), Boris Baranov (2), and Olga Chaikina (2)

(1) Institute of Oil and Gas problems Russian Academy of Sciences, Gubkina 3, Moscow, Russian Federation, (2) P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow, Russian Federation (iebalanyuk@yandex.ru)

Norway-Greenland Basin (NGB) occupying the area down the geo-traverse of the gas pipeline Shtokman field – Murmansk is a component of the Arctic mega-basin and is located between spreading structures of the North Atlantic in the South and the Eurasian basin in the North. An extended field acoustic data collected in the Barents Sea helped to recognize gas hydrate fields and geohazards related with engineering of gas pipelines in these areas. The order of the day is execution of engineering works in non-consolidated sediment and investigation of underwater slopes instability. The problem of reliable operational behavior of underwater constructions poses completely new tasks for engineers and developers.

Wide spread of gas hydrates in bottom sediments is not only the possibility of hydrocarbon reserves increase but, in the same time, is a serious industrial and ecological problem. One of the most complicated engineering problems under the condition of instability of gas hydrate deposits on the sea bed is operation of the sea fields, oil platforms construction and pipelining. The constructors faced the similar problem while designing the "Russia-Turkey" gas pipeline.

Because of instability and specificity of gas hydrates bedding their production is very problematic and is related mostly to the future technologies. Nevertheless, they attract more and more attention due to limited hydrocarbon reserves all over the world. On a quarter of the land and on nine tenth of the World Ocean thermodynamic conditions are favorable to accumulation and deposition of natural gas hydrates. Sufficiently high pressure and low temperature necessary for gas hydrates formation are observed usually on the sea bed at depths more than 1000 m. Mean water temperature in the World Ocean at depths 1 km don't exceeds 5°, and at depths 2 km and more - 2°. In sub-polar zones the mean water temperature is close to 0° for the whole year. In the tropic regions gas hydrates are able to form and accumulate from the depth of 300 m and in the polar regions – from the depth of only 100 m. Being warmed up, gas hydrate melts and dissociated into free gas and water. Drilling of the gas hydrate deposits is very dangerous because the heat produced by the bore can melt gas hydrate and release huge amount of energy and gas that leads to explosion.

Seismic acoustic records show processes of cryolite genesis (permafrost, themokarst, glades, paleo-riverbeds and so on) and hydrocarbons migration (gas hydrates, gas saturated sediments, gas seepage, etc.) which are the main components of geo-risks for oil and gas fields development in Arctic Seas.

These conclusions will enable the further progress in understanding of the main problems on gas hydrate formation in the Barents Sea, including the mapping of geohazard fields.