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Safety of gas pipelines and the problem of environmental protection

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Abstract

The paper focuses on the problems of environmental protection that seem to be among the most urgent ones around the world. There is no such a sphere of productive activity of an individual which would not influence the environment without changing its condition, which is likely to lead to destruction of its dynamic balance. Recent studies show that the main oil and gas pipeline service is regarded as a potential source of environmental pollution by oil products. Accidents on main gas pipelines cause enormous damage, leading to massive pollution of water reservoirs and onshore. The key reasons for it are pipeline long run life, depreciation and, as a result, a steady tendency of increase in the number of accidents with serious social, ecological and economic consequences [4]. The scientific and methodological base of quantitative risk emergency assessment is necessary for the choice of adequate measures aimed at prevention of catastrophic crashes and accidents. In case of the successful solution to this problem it seems vital that interests of environment protection be integrated into the area of adoption of the engineering decisions making it possible to minimize the consequences of negative impacts in the most rational (least costly) ways. In these conditions the analysis of environmental risks of main gas pipelines becomes especially urgent.

Keywords: environmental pollution, engineering decisions, main gas pipelines, pipeline endurance trial, check for pressure integrity

1. Introduction

The range of Gazprom's activity is undoubtedly of strategic importance for the development of Russia's national economy; moreover, it exerts influence on social, economic, political and environmental interests of a huge number of people in both Russia and abroad. Being the largest gas company of the world and one of the largest energy companies which are engaged in geological exploration, production, transportation, storage, conversion, sale of gas and other hydrocarbons and electricity generation, Gazprom bears social responsibility for creation of safe working conditions and ensuring industrial safety [5]. Recently environmental problems have been put in the forefront in all industries and branches of economy. It is noteworthy that JSC Gazprom is not an exception since the priorities of ecological policy of the largest entity involve use of ecologically effective technologies in gas industry and preservation of the environment in the area of extensive gas production and transportation. It is obvious that implementation of important industrial projects is unlikely to be possible without providing strict requirements of environmental safety. Today, with the development of gas and gas-condensate fields in the Far North, special emphasis is placed on environmental issues, which is caused by harsh climatic conditions in northern parts of Russia and high risk of technogenic impacts [5]. Thus, one of the most topical issues is connected with

possible environmental risks in case of transportation of such gas production chemical reagents as methanol on industrial objects.

2. Discussion

The energy strategy for the period till 2030 (ES-2030) is approved by the order of the Government of the Russian Federation of November 13, 2009 No. 1715-r. The purpose of energy policy of Russia is the most effective use of natural energy resources and potential of the energy sector for a strong growth of economy, improvement of life quality and assistance to strengthening of its external economic course. Besides, constant change and tightened requirements to reliability, safety and environmental protection connected with the operation of gas-distributing plants become tougher [1].

Considering the problem of serviceability and reliability of pipelines, we should take into account their unique characteristics and intensity of interaction with a surrounding environment. Special emphasis should be placed on laying in various climatic and hydrogeological conditions, a surface area of contact with soil, mass of the transported product, its heat content and amount of the heat (cold) entering soil, crossing of natural and simulated barriers [2, 3]. The uniqueness of any pipeline consists in the fact that all parts of pipelines (especially those with large diameters) tend to constantly experience considerable internal stresses that are quite similar to metal normative durability characteristics. Therefore, even slight deviations of the real conditions from those accepted for initial in calculations may bring the system to the state of the limiting condition.

Pipeline structural reliability implies its capacity to keep potential ability to perform the given functions during the required period of time. The specified ability, in turn, can be revealed through the system of objective criteria of the pipeline quality specifying its normative serviceability in the mode of active influencing of operational factors including environmental factors. From this point of view, structural reliability as a property of a pipeline structure, has to meet ecological criteria as the complete or partial loss of its serviceability by the pipeline is inevitably followed by the negative impact on the environment [3].

For the purpose of ensuring uninterrupted supply of gas to consumers, the replacement of processing equipment at Yurga gas distribution station was performed in compliance with the requirements of regulating documents of JSC Gazprom Transgaz Tomsk. Pipeline endurance trial and tubing joints leak check were made after complete readiness of pipeline sections (filling, provision of executive documentation on the tested object) following the requirements provided by the Construction Norms and Regulations 2.05.06-85 * and BCH 011-88. The accepted working pressure of the gas pipeline was 5,4 MPas.

The accepted working pressure of the gas pipeline was 5,4 MPa. Hydraulic testing of the gas pipeline was performed in warm season at the above-zero temperature; the water used for hydraulic testing had the temperature not lower than 5°C above zero and not higher than 40°C above zero. The main works on hydraulic testing included preparation for testing; washing; increasing the pressure to the testing limit; endurance trial; dumping of pressure to the project operating level; and the check for pressure integrity. After filling of the pipeline interior with water, the gas pipeline was subjected to hydrostatic test and leak check.

Conclusion

In order to achieve the stated objectives of gas pipelines security, it is necessary to carry out the identification, assessment and reduction of risks in the field of occupational health and safety. No

less important for industrial safety is the implementation of scientific research, technology and labor protection management; recruitment of staff capable of active participation in labor protection activities, creation of infrastructure and working conditions, including the development of motivation methods in which all employees are aware of the responsibility for their own safety and the safety of other members of the team. To sum up, it is essential to constantly improve the level of knowledge and competence in the field of occupational health and safety, as well as to monitor the overall compliance with the requirements established by the RF legislation.

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