

ECOLOGICAL AND ECONOMICAL PROBLEMS IN THE OIL AND GAS INDUSTRY

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Abstract. In this article the main aspects of ecological and environmental problems in the oil and gas industry are provided. There considered environmental problems arising from hydrocarbon production. The efficiency of oil and gas production from oil shale is considered. Recommendations for effective production of oil and gas with minimal impact on the environment and highest profit for economy are made.

Keywords: oil, gas, ecology, shale, industry.

Several studies prepared and regularly updated by companies, government and non-governmental agencies, even if based on somewhat different economic growth assumptions agree on two main projections for the next 20 years: growth of energy consumption by about 35 percent to 40 percent and predominance of fossil fuels in the world energy matrix, with coal, natural gas and oil accounting for approximately 80 percent of energy supply.

Currently global oil reserves and production are at 1.4 trillion barrels and 87 million b/d have been steadily growing respectively over the last decades. The main challenge will be not only to meet increasing demand, which estimations will reach about 110 million b/d by 2030, but, most importantly, to offset natural decline of current reservoir productivity. Even if a moderate decline rate of 3.5 percent per year is assumed, by 2030 production of reservoirs currently on stream will decrease to about half of today rate. In summary, production gap to be met with new field and reservoir developments is around 65 million b/d, a daunting task.[1]

In the context of globalization, problems of ecology and rational use of natural resources are becoming increasingly important. The changes taking place in environment today affect negatively not only flora and fauna, but also human health. Over the past decades, in commissioning oil and gas fields, people have not thought about the consequences of intensive extraction of these natural resources. The great danger lies in the use of oil and gas as fuel. When these products are burned in the atmosphere, large amounts of carbon dioxide, various sulfur compounds, nitric oxide, etc. are released. A decrease in the amount of oxygen and increase in carbon dioxide content, in its turn, will affect climate change. Carbon dioxide molecules allow solar short-wave radiation penetrating the Earth atmosphere and trap the infrared radiation emitted by Earth surface. Atmospheric pollution is fraught with another danger and it reduces the amount of solar radiation reaching the Earth surface.

A large role in atmospheric pollution belongs to jet aircraft, cars. A modern jet liner absorbs 35 tons of oxygen and leaves inversion traces that increase cloud cover in crossing the Atlantic Ocean. It pollutes significantly the atmosphere and cars, which now number more than 500 million. There are various projects for creation of engines operating in other fuels. A considerable contribution to poisoning of the atmosphere is made by various plants, heat and power plants. A medium-power oil-fired power plant emits 500 tons of sulfur daily into the environment in the form of sulfur dioxide, which, when combined with water, turns into sulfuric acid and falls in the form of acid rains, which have high chemical activity. Atmospheric pollution with various harmful gases and solid particles leads to the fact that the air of large cities becomes life-threatening. A particular danger has deadly mists descending on large cities.

People pollute recklessly and water basins of the planet. For one reason or another, from 2 to 10 million tons of oil is annually discharged into the World Ocean. Aerial photography from satellites recorded that almost 30% of surface of the ocean is covered with oil film. Waters of the Mediterranean Sea, the Atlantic Ocean and their shores are especially polluted.

A liter of oil deprives oxygen of 40 thousand liters of sea water. A ton of oil pollutes 12 square meters km of ocean surface. When its concentration in sea water in amount of 0.1-0.001 ml / l fish eggs die in a few days. At the presence of oil film on 1 ha of sea surface, more than 100 million fish eggs can die. There are a lot of sources of oil in the seas and oceans. These are accidents of tankers and drilling platforms, discharge of ballast and sewage water, bringing polluting components by rivers.

Swedish and English specialists propose using old newspapers, pieces of wrapping, and scraps from paper mills to clean oil from sea oil. They are able to absorb 28 times of the amount of oil compared to their own weight thrown into water and crushed. Then the fuel from them is easily extracted by pressing. It is proposed to use such strips of paper placed in large nylon string bags to collect oil at sea at the site of tanker accident. The use of dispersants, special substances that bind oil, gives good results; processing of oil films with iron powder, followed by collection of sawdust with magnet. Great expectations are placed on biological protection.

During extraction and transportation of "black gold" part of raw material is poured onto the earth surface and into water bodies for various reasons. It is enough to say that only in 1988, with gusts of oil pipelines at Samotlor field, about 110 thousand tons of oil fell into the lake of same name. Cases of discharge of fuel oil and crude oil into the Ob River (spawning ground of valuable fish species) and other waterways of Russia are known.

In 1992, the oil spill in Ferghana Valley (Uzbekistan), also known as oil spill in Mingbulak, became one of the largest ever known to the world. Oil

spreading through the valley burned for two months. Daily losses amounted to 35,000 - 150,000 barrels of oil, and after calculating total loss, the figure of 88 million gallons was announced.

One of the most promising ways to protect environment from pollution is creation of integrated automation of oil production, transport and storage. Careless handling of oil can turn into a big disaster. The use of oil and petroleum products should be very accurate, thoughtful and metered. Oil requires attention. This must be remembered not only to every oilman, but also to everyone who deals with petrochemicals.

Unfortunately, oil and gas industry are in a state of deep environmental crisis. If we continue the predatory exploitation of the fields, coupled with heavy losses during transportation and irrational oil refining, the future of oil industry seems very bleak. Even today, reduction in production rates is on average 12-15% per year, which is fraught with complete collapse of strategically important industry for the state. Further extensive development of oil industry is no longer possible. In this regard, we consider it appropriate to use scientific developments in the field of oil shale mining for production of oil and gas.

Oil shale has industrial importance, primarily as energy raw material with high calorific value (up to 3300 kcal / kg) due to shale oil, which is in mineral matrix of oil shale (HS) in chemically bound solid state. The main ideology for the development of oil shale, accepted to date, is to translate organic component of oil shale at the place of occurrence into liquid phase, i.e. ensuring the conversion of kerogen (solid organic matter in mineral matrix of shale) with the formation of shale oil without extracting shale ore to the surface. It is believed that such approach is beneficial for processing of oil shale. However, shale oil is also a new promising mineral raw material for chemical industry, metallurgy, medicine, agriculture and construction industry. A complex processing of shale oil with extraction, in addition to hydrocarbons, of rare and trace elements, etc., is a problem of national importance because molybdenum and vanadium can be extracted from coke after processing of shale oil, and high-sulfur fuel oil containing up to 4-6% was obtained during the chemical processing of shale oil sulfur used to lubricate engines; resin (8-12%), from which oil can be obtained for wood impregnation; electrode coke, mastic, etc. research in this direction is actively continuing [2, p. 38-41].

In producing shale gas, the method of hydraulic fracturing (fracking) is used. In 2004, the US Environmental Safety Agency (AEB) released a report stating that hydraulic fracturing technology does not pose a threat to the environment. Based on agency findings, the US Congress in 2011 decided to withdraw technology from government regulation, which in its turn gave a new impetus to the development of this technology in the United States.

What stops Russia and Uzbekistan from developing shale gas production for the need of electricity, which is 2 times cleaner than coal in terms of CO₂ emissions? Lack of modern technologies for the production of shale gas and oil. Many scholars criticize the production of shale gas and oil, pointing out that its production poses a risk of increased seismic activity in those regions where shale gas is produced by hydraulic fracturing. But before starting drilling, geological examination is always carried out to identify exact location, rock deposits, optimal for drilling. These scientists also note that production of shale gas involves injection of chemicals into shale oil during hydraulic fracturing and this poses a threat of contamination of drinking water. But these chemicals are pumped to the depth of 1500-3000 m., where shale oil is drilled, and drinking water is located at depth of up to 1000 m. [3]

Thus, we believe that Russia, like Uzbekistan, needs to reform oil and gas industry. To do this, first of all you need:

- to develop and apply scientific and technological developments in the field of shale gas and oil production;

- to review legal framework in the field of natural resource ownership, in particular, it is necessary to enable private investors to own and develop areas where there are oil shale deposits;

- to reform tax system by reducing taxes significantly on oil and gas producers from oil shale, while setting high taxes and penalties for misuse of natural resources and environmental damage.

- to restore partially centralized management of industry, arising from the structure of oil industry and having many positive aspects (rational oil pipeline system). However, it does not mean a complete return to old management model.

- to preserve a single economic space, conditions for survival of fuel and energy complex.

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