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HYDROCARBON FIELD DEVELOPMENT AND ITS ENVIRONMENTAL IMPACT

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West Siberian region as one of the rapidly developing industrial areas is more and more facing environmental risks. A number of cities in Western Siberia can be considered to be the zones of ecological disasters.

The main reason for that is imbalance between the degree of anthropogenic impact on the environment and measures aimed at its preservation, recovery and protection. In particular, it is reflected in a growing number of areas and volumes of oil and gas extraction with more than 50% of depleted fields, use of obsolete technology, presence of hazardous chemical and nuclear facilities. What is more, insufficient attention is paid to the stability of natural landscapes regarding the anthropogenic impacts, which is associated with the peculiarities of zones where multi-year frozen grounds are spread, as well as with climatic conditions of pollutants dispersion in the atmosphere. [1] To understand the peculiarities of the environmental situation, we need to know what type of hydrocarbon it is and how it affects the environment.

Hydrocarbons are organic compounds molecules of which consist only of carbon and hydrogen atoms. The simplest representative is methane CH₄. Raw hydrocarbons are naturally occurring hydrocarbons and products which have undergone the recycling. Raw materials comprise the following substances:

- oil,
- natural gas,
- gas condensate.

Oil is a combustible oily fluid, found in sedimentary layers of the Earth; an important mineral. It is a complex mixture of alkanes, some of cyclanes and arenes, as well as oxygen, sulfur and nitrogen compounds. Gasoline, jet fuel, kerosene, diesel fuel, fuel oil are produced by oil refining. [2]

Oil recovery and its products, their processing and transportation have negative influence on the health and fertility of the Earth soil cover. Along with oil recovery, tonnes and tonnes of different rocks are being extracted and dumped.

One of the main properties of raw (unprocessed) oil is its density which depends on the content of heavy hydrocarbons: paraffins, resins and others. Higher molecular-weight methane hydrocarbons (C₁₂-S) consisting of normal alkanes and isoalkanes play an important role in light -fraction oil. The content of solid methane HC (paraffins) in oil is an important characteristic when studying oil surface spills. Paraffins are non-toxic for living organisms and become solid on the earth surface, depriving the oil mobility. Alkanes are assimilated by many microorganisms (yeasts, fungi, bacteria). Paraffin wax is very difficult to destroy and oxidize in the air. It can “seal” the pores of the soil cover for a

long time, and prevent soil from respiration and free vapour exchange. This leads to the total degradation of biocenosis.

Aromatic hydrocarbons are the most toxic components of oil. At a concentration of only 1% in water, they kill all aquatic plants. The oil containing from 30 to 40 % aromatic hydrocarbons significantly inhibits the growth of higher plants. Aromatic hydrocarbons are difficult to destroy.

Oil pollution creates new environmental conditions leading to the profound change in all segments of biotic communities or their complete transformation. Mass destruction of soil mesofauna occurs: three days after an accident, most soil animal species completely disappear or are not more than 1% of control. Light oil fractions are the most toxic for them. The activity of most soil enzymes in contaminated soils reduces. Economically irregular increase in oil, gas and other energy resources volume and rate leads to dangerous degradation processes in the lithosphere (landslides, local earthquakes, sinkholes, etc). One of the reasons for frequent earthquakes is the increase in tension of the earth crust under the influence of the injected well water at high pressure. The oil industry is one of the main sources of forest fires in the area of open boreal woodlands, when up to 20-40% of trees disappear. Forest vegetation changes in burnt areas, for example, coniferous trees are replaced by small-leaved ones.

Thus, during the oil fields development, especially in permafrost conditions, negative processes occur. At the same time, negative impact of oil production can be minimized under certain conditions. During exploitation of oil structure facilities, one should use the heat losses from the pipelines and increased flooding of territories close to the embankments. For efficient use of heat losses in open boreal woodland and areas of meadow vegetation along a pipeline, one should choose places with higher concentration of animals and plants. In these zones, it is possible to reduce the insulation of pipes so that heat flows reach the surface and raise the temperature, lengthening the vegetation period. The warm water discharge into the water bodies and streams in the cold period of the year may contribute to the formation of quasi-stationary wormwood which under certain circumstances can ensure the existence of aquatic birds. [3]

It is obvious now that saving the environment for future is a vital condition of human activity. In order to lower negative effects of pollution on the environment, a scientifically grounded ecological policy is necessary in exploration, production and transportation of hydrocarbons. Actions must be taken to reduce the anthropogenic loads on natural ecosystems, to reveal and analyze the factors of anthropogenic impact on vegetation changes. The approach to the solution of problems related to ecological hazards must be based on deep understanding of natural complexes functioning in a certain area.

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