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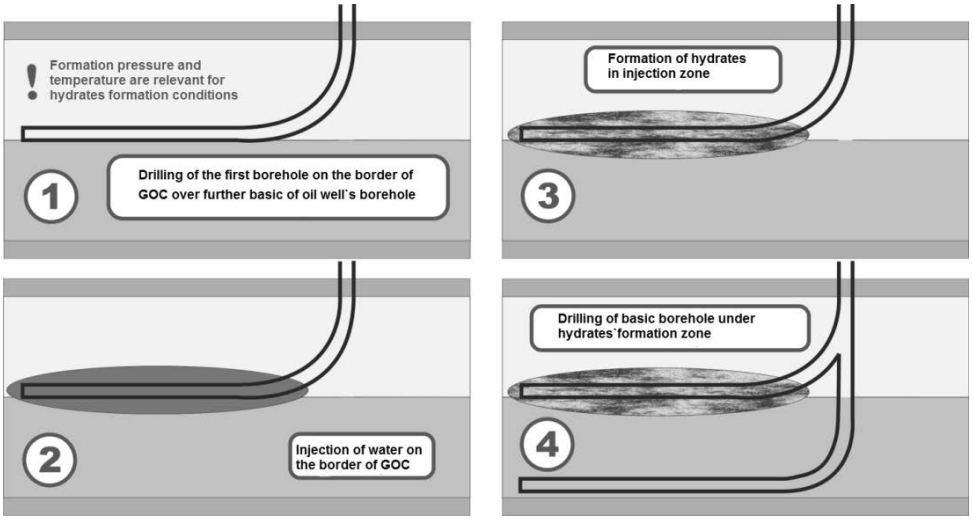

Fig. Stage-by-stage process of formation of hydrates

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PROBLEMS OF CRUDE OIL REFINING IN RUSSIA

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Russia takes up a high position in the list of the world stocks, production, and oil export. It lies in the 20th place according to the level of its deep processing. In recent years the system of oil processing has radically changed in the world. Kuwait, Saudi Arabia, Arab Emirates, China and India develop actively and put into operation new capacities for oil processing and petro-chemistry. Generally, the world tendencies are reflected in industrialized countries. Their ecological legislation has become tough, and it is directed to the decrease of irritants while fuel burning. Also, they demonstrate a continuous growth of requirements to the quality of oilproducts.

Economic crisis has affected negatively the development of oil processing in the world. A low level of demand has become a key factor, having influenced badly the development of the branch. And though a world demand is gradually restored, and world economy recovers slowly from the financial crisis, it continues to experience the crisis tendencies, such as the decrease in demand and reduction of prices on oil products, essential increase in commercial stocks, and input of new capacities in Asia. In December 2009-January 2010 the world margin of oil refining was close to a zero mark. The demand for distillates has considerably fallen, and it continues to fall. The level of oil refineries load has fallen to record-breaking low values in Europe - to 70-75%, in the USA - to 80%. Hi-tech plants and enterprises, which get profit from processing of cheap high-sulphurous oil grades to light oil of a high cost, have faced serious problems: sharp reduction of valuable differential between oil grades of different quality has had additional negative effect on productivity. Now oil processing in Russia falls significantly behind the industrially developed countries. Total rated capacity of oil processing in Russia today is 270 million tons per year. There are 27 large petroleum refinery plants in Russia. A part of oil refineries do not have a license. They are not included in the state register of dangerous production facilities. Generally, large factories in Russia have long terms of operation: the number of the enterprises, which have been put into exploitation more than sixty years ago, is maximum. The quality of oil products does not correspond to the world standards.

There are many branches of engineering all over the world, where the situation is even harder than in oil processing in Russia. At least, Russia has its own fuel, not imported. The main problems of oil processing in Russia are not connected with the output of production, but it is connected with technological backwardness of the branch. Even in primary oil processing at the technological level Russia falls behind the USA and the other countries without getting additional profit from each ton of processed raw materials, and light oil products - gasoline, kerosene, and diesel fuel. At the favorable volumes of processing about 220 million tons, Russia loses about 4-6 million tons of light oil products, which transfer to fuel oil and fuel gas, and it becomes even worse with fuel oil processing to light oil products [1].

In oil processing in order to characterize a technological level of production “Nelson Complexity Index” is applied, which considers the quality and structure of products. In Russian oil processing the value of this index fluctuates from 2,5 (Khabarovsk oil refinery).

Let us consider arising local deficiencies on the market of certain regions. They are provoked by non-uniform capacities of oil processing on the territory of Russia. There are different data about oil processing: the main weakness is the place of Russian oil processing factories: the capacities of catalytic cracking and hydrocracking are not enough; raw materials are fuel oil, but the main production is connected with a high-quality motor fuel.

Omsk Refinery can be use as an example. The first settings were put into exploitation in the middle of the 1950-ies, and now it is not exploited. In 2001 a new alkylation setting for production of motor gasoline has been put into operation. Despite all complexity of the situation around Russian oil processing, scientific research and project work have considerable resources that allow avoiding a serious fuel crisis in the country. Thus, oil policy of the state has become one of the main reasons for a pre-crisis situation in the Russian oil processing to arise.

Concentrating on the problem of the European quality standards of fuel, it should be noted that this idea is actively supported by the "Lukoil" company. "Lukoil" is considerably ahead in modernization of the plants in Russia, in comparison with the other Russian companies, and its transfer to the new standards gives it certain competitive advantages [2].

"Lukoil" studies the possibility of oil refineries construction in Tver region. The weakness of state regulation and the lack of accurate reference points are the main reasons why the oil companies plan and carry out the actions for oil processing development guided by their own interests [3]. Reconstruction of the operating plants with application of modern technologies of oil refining catalytic and hydrocracking, hydro-treating and others automatically allows to produce "Euro four"-class products.

Many interests of the companies are in contradiction with each other. Consequently, it causes the known discrepancy of the recommended measures. Someone suggests to lower the rates of export duties on oil products in order to develop oil processing and export high-quality products, but not crude oil. Some say, on the contrary, that it is necessary to raise them to the level of a domestic market.

It is possible to allocate a number of measures [4]:

1. Reduction of rates for oil products;
2. Strengthening of the state control above the integrated oil companies and petro-trades;
3. Cancellation of duties on import of the equipment for oil processing industry;
4. Creating the exchange of petroleum and oil products.

Today the hopes for developing a competitive market of oil and oil products in Russia seem to be almost impossible. So, to solve of these serious problems it is necessary to build modern plants and create new, well-equipped companies.

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FTIR-SPECTROSCOPY FOR INVESTIGATING PIPELINE COATING COMPOSITION AND PROPERTIES

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Transporting oil, gas, and petroleum products for great distances *through pipelines* is the most effective method of *transportation*. Corrosion protection is the key factor to ensure pipeline durability and accident-free operation. Anticorrosion coatings have to provide a primary protection preventing the interaction of corrosion agents, such as water and aerial oxygen, with the metal [2]. To efficiently perform its function, the anticorrosion coating quality should meet the general requirements for corrosion protection [3]. Therefore, it is necessary to investigate the chemical and mechanical properties of insulating coatings, including resistance to the corrosive and physical impacts caused by external environmental factors. FTIR spectroscopy identifies the functional groups and determines the degree of mechanical and chemical degradation on the fractured surface of polyethylene [1].

The aim of this work is to study the composition and mechanical and chemical properties of anticorrosion coatings for oil and gas pipelines via FTIR - spectroscopy. This aim determines the following objectives:

- to analyze the samples of oil and gas pipeline anticorrosion coating via FTIR spectroscopy;
- to identify functional groups in the IR-spectra of the test samples;
- to determine the composition and mechanical and chemical properties of anticorrosion coating on the basis of the data from supporting documents and FTIR spectrum analyses.

Two samples of each of four anticorrosion coating types were investigated via FTIR-spectrometer. The first type of anticorrosion coating was anticorrosive polymeric-asmol coating tape "LIAM-3" meeting the requirements of GOST R 52602-2006. [3] The second type was primer asmol coating made in accordance with the requirements of GOST 51164-98 and GOST 9.602-2005 [4, 5]. The third type of samples was heat shrink insulation joint THERMO – STMP meeting the requirements of GOST 51164-98 and GOST 9.602-2005 [4, 5]. The fourth type was heat shrink double-layer radiation-modified anticorrosion material DONRAD-R [3]. Samples for IR-spectrometer were thin slices of anticorrosion