

**PETROLEUM PRODUCTS: technology, innovation, market**

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**Laboratory assessment of non-additive changes of crude oil and condensate mixes properties**

*Keywords:* crude oil, gascondensate, non-linear changes of properties, associates.

*Abstract.* Based on example of crude oil and gas condensate samples were studied influence of their content to main physico-chemical properties, distillation characteristic and other parameters of their mixes. It is shown that there is a misalignment between actual and predicted values of main properties, that has systematic behavior and reflects structural changes inside the system. Lab study can serve to make some proposals for optimization of oil refining processes. Complexity of obtained correlations and lack of universal mathematical models suitable for calculation of oil disperse system properties limit utilization of lab results in refining industry for improvement of distillation process. For the complete solution of this problem analysis of big data and additional research with advanced instrumental and commutative methods is requested.

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**Influence of an anti-turbulent additive on the quality of diesel fuel**

*Keywords:* diesel fuel, anti-turbulent additives, filter driving, filterability coefficient, fuel quality control

*Abstract.* The use of anti-turbulent additives is the cheapest way to increase the throughput of oil pipelines for pumping oil and oil products through pipelines.

Currently, anti-turbulent additives are a suspension polymer product and are a high molecular weight polymer suspended in an organic carrier. As the studies have shown, anti-turbulent additives can reduce the effectiveness of the depressant-dispersant additive, lead to the clogging of coarse and fine filters, and also reduce the spray capacity of the injectors. Poorly dissolved anti-turbulent additives significantly increase the viscosity of the fuel, worsen its rheological properties - the fuel "drags on", does not drip, becomes sticky.

Recently, this problem arose when fuel was pumped to Tajikistan with the LTPC Petropavlovsk. As a result of the conducted studies, it was found that the reason for the clogging of filters is the presence in the fuel of an anti-turbulent additive added during transportation of fuel. Restore the quality of fuel can be by "breaking" the additive, passing fuel with additives through pumps.

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**Possibility of receiving diesel fuels of different brands from commodity oil of the talakan oil-gas condensate field**

*Keywords:* Talakan oil-gas condensate field, diesel fuel, fractions, compounding, physical and chemical properties of diesel fuel.

*Abstract.* Results of probes of diesel fractions for the purpose of receiving diesel fuels of different brands from oil of the Talakan oil-gas condensate field are presented in article. Schematic diagrams of receiving diesel fuel winter, summer and Arctic are also given in installation of primary oil refining with production of bitumen (UPPN and PB) NGDU «Talakanneft» of JSC «Surgutneftegas» and calculated the possible output.

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**The substitution of imported polyglycolic oils for screw compressors, pumping hydrocarbons and natural gas, domestic analogue MVKs**

*Keywords:* industrial oils, oil for screw compressors, polyoxyalkylene polyols, import substitution, comparative tests.

*Abstract.* Currently, Russian oil and gas companies operate modern compressor equipment mainly imported. For reliable operation of the equipment used its producers recommend the use of consumables based on PAG, relevant operating requirements. At the moment the Russian software industry lubricants polyglycolic based mainly depends on foreign companies, so that there is an urgent need to develop the domestic counterpart, not inferior to the basic characteristics of Western oil for screw compressors.

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### **Synthesis and microstructure of urea greases**

**Keywords:** urea greases, synthesis diurea, microstructure, thermal stability, mechanical stability.

**Abstract.** Based on high-molecular product reaction of isocyanates with amines, containing in its composition some urea groups, obtained lubricating composition - urea greases, suitable for use in extreme conditions.

By reacting 4,4'-diphenylmethane diisocyanate with octadecylamine, and adding to this system benzylamine, the authors synthesized diurea - thickener of urea greases. Formation diurea is confirmed by IR spectroscopy. On the spectrum of urea grease absorption bands, which are corresponding to the valent vibrations of primary amine and isocyanate group, or absent altogether, or their intensity significantly decreases. About formation of diurea are attested characteristic absorption bands related to the valent vibrations of the amide group.

Lack of an aromatic amine of oleophilic group with a long hydrocarbon chain does not allow synthesizing urea thixotropic system based on diurea, consisting of isocyanate and benzylamine.

It is found that with increasing temperature of heat treatment improves the thermal and mechanical stability of the urea grease based on isocyanate and octadecylamine, but simultaneously deteriorates the colloidal stability and rheological properties. This grease composition is characterized by high mechanical stability. Grease on three-component diurea (with the addition of benzylamine) exceeds by two component on thermal stability and thickening efficiency of the dispersive phase. However, researches have shown its instability to mechanical failure. Low mechanical stability requires a certain caution in predicting the operation of such grease in friction modern machinery.

Application of scanning electronic microscopy to study the microstructure of the dispersive phase allows analyzing differences in the features of formation of the structural frame of diurea thickener, depending on its composition, temperature mode of obtaining and long-term mechanical degradation. The results showed that the high dispersion and anisometric of structural frame elements of the dispersed phase, increasing the thermal stability and thickening ability, does not guarantee high mechanical stability of greases.

The detected temperature pattern of the dispersed phase of structure can be used for choice of rational modes of synthesis of these grease compositions.

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### **Preparation of the condensation product of formaldehyde with alkylphenol**

**Keywords:** condensation product, Low SAPS, condensation of alkyl phenol and formaldehyde.

**Abstract.** The first step in the synthesis of alkyl phenol additive, which doesn't contain sulfur, is to obtain a condensation product of an alkyl phenol with formaldehyde. The reaction of condensation depends on many factors, the effect of each factor was reviewed in this article. Analysis of the properties of the resulting products revealed the most favorable conditions for obtaining the condensed product.

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## **MATHEMATICAL SIMULATION**

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### **Prediction of main properties and characteristics affecting the stability of heavy oil emulsions**

**Keywords:** properties prediction, stability of emulsions of heavy oils, natural emulsifiers, sulfur content.

**Abstract**

As the depletion of light and medium oil reserves, high-viscosity oils are becoming an important source of raw materials. The preparation of such oils for processing on electric desalting plants (ELOU) at refineries, requires the use of special technological solutions for the destruction of persistent water-oil emulsions. The main reason for high stability of emulsions of heavy high-viscosity oils is rigid film formed around water droplets as a result of the adsorption of natural emulsifiers (asphaltenes, resins, paraffin microcrystals and other colloid-soluble substances) on the interphase surface. The destruction of emulsions of such oils on ELOU plants at refineries is also complicated by the small difference between the density of formation water and oil, the high viscosity of the continuous oil phase and the high content of mechanical impurities. In the present study, basic principles of prediction of main properties and characteristics, which have the greatest effect on the stability of water emulsions of heavy high-viscosity oils were illustrated. Properties of 150 different oils were studied and statistical models were obtained to predict these main factors. It was found that the density and sulfur content in crude oil are accurate indicators for predicting main properties and characteristics using nonlinear statistics. It was revealed that the density is the main indicator in predicting the resin content and viscosity, and the sulfur content plays main role in predicting the asphaltene content.

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