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**ASPECTS OF RUSSIA'S ENERGY SECURITY AS THE BASIS OF  
ITS GEOPOLITICAL ROLE IN EURASIA**

**U.A. Gutorov**

RKNTC Neftyanaya Dolina

**E-mail: gutorov70@mail.ru**

**Abstract.** This paper analyzes factors affecting Russia's geopolitical role in view of its favourable geographic location in the heart of Eurasia. It has been shown that under current conditions of rapid growth of post-industrial advanced and developing economies supply of energy resources, primarily hydrocarbon resources, along with transport-communications relations is of primary importance in light of ever-increasing energy demand. This imposes higher requirements on the Russian fuel-and-energy industry.

The paper presents some data to show that the present-day fuel-and-energy sector in Russia will hardly be able to meet this energy demand in the mid-term because of serious problems related to both oil production technologies and infrastructure, and geologic exploration. To solve these problems, significant financial investments will be required, in addition to revision of exploration strategy to prospect for unconventional oil and gas reservoirs within Russia.

**Key words:** *geopolitics, Eurasia, globalization, energy supply, Russia's fuel-and-energy sector, geologic exploration, abiogenic origin of oil, geotectonics*

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**CREATION OF OIL FIELD MODELS, OF RELEVANT  
THE STUDY DEGREE OF THEIR RESERVES**

<sup>1</sup>Yu.A. Volkov, <sup>2</sup>S.V. Chernov

<sup>1</sup>The Center for Improving Oil Development Methods ltd, <sup>2</sup>TNG-Kazangeophysica

**E-mail: yua@csmr.ru**

**Abstract.** Based on the experience in the field of geological and hydrodynamic modeling of oil field development processes, it was concluded that quality of the models is unsatisfactory. The methodology of quantitative assessment of the degree of geological study of reserves was developed in The Center for Improving Oil Development Methods ltd, which could be used as a tool for management of quality of the geological and petrophysical models. In addition to the analytical and numerical modeling, it is proposed to use informational (cybernetic) modeling.

**Keywords:** *calculation of oil and gas reserves, design of oil fields development, quantitative assessment of geological study of reserves, geological and hydrodynamic modeling, cybernetic modeling.*

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**MAIN INDICATIONS OF OIL AND GAS POTENTIAL IN SOUTH  
VIETNAM OFFSHORE BASEMENT**

<sup>1</sup>V.A. Trofimov, <sup>2</sup>E.Yu. Goryunov, <sup>2</sup>M.H. Nguyen

<sup>1</sup>JSC Central Geophysical Expedition

<sup>2</sup> Sergo Ordzhonikidze Russian State Geological Prospecting University

**E-mail: vatgeo@yandex.ru**

**Abstract.** Analysis and integration of available geological and geophysical data on hydrocarbon fields found in the crystalline basement offshore South Vietnam (White Tiger, Dragon, Dai Hung fields) has revealed a number of common features and characteristics. These features can be used as criteria to predict similar hydrocarbon accumulations. Common-depth point (CDP) seismic survey on regional seismic lines in the South Vietnam offshore will allow understanding of the process of hydrocarbons generation in the crystalline basement. Seismic survey results will help to localize the area of exploration using the most optimal and efficient methods of geological prospecting.

**Keywords:** *oil and gas potential of the basement, White Tiger, shelf of Vietnam, CDP seismic survey*

УДК 519.6

**THE IDENTIFICATION OF ABSOLUTE PERMEABILITY ON THE  
DEBIT MEASUREMENTS OF SINGLE WELL UNDER  
THREE-PHASE FILTRATION IN HETEROGENEITY RESERVOIR**

**A.V. Elesin, A.Sh. Kadyirova, A.I. Nikiforov**

Institute of Mechanics and Engineering, Kazan Science Center Russian  
Academy of Sciences

**E-mail: elesin@imm.knc.ru**

**Abstract.** The identification problem of absolute permeability coefficients for three-phase flow is considered. It is believed that on the well known values of flow rate in some moments of time. The identification task is reduced to minimization of the residual function. The minimization procedure is carried out the Levenberg-Marquardt method.

**Key words:** *three-phase filtration; black oil model; identification of absolute permeability; minimization of residual function; method of Levenberg-Marquardt.*

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## SLURRIES WITH CONTROLLED EXPANSION KINETICS FOR CEMENTING OF CASING STRINGS

S.E. Chernyshov, A.A. Kunitskikh

Perm National Research Polytechnic University

E-mail: nirgnf@bk.ru

**Abstract.** Basing on the previous research, expanding cement additives with controlled kinetics of expansion have been selected. Influence of expanding cement additives on linear expansion of cement sheath has been studied. The tests were performed in air and hydraulic setting conditions at 22°C and 75°C.

The concentration of expanding additive was changed from 3 % to 8 % of the Portland cement mass. The carried out tests showed that:

- the relationship between expansion and the amount of additive is direct,
- the relationship between expansion and the temperature is inverse, and
- linear expansion is lower at air setting, vs. setting in water.

At air setting with the ambient temperature 22°C, the expanding additive CaO/Atren Light showed the best results. At 8 % concentration, expansion of the cement sheath made 4.3%.

In water at 22°C, all additives in 3-4 % concentration showed comparable, rather good, results, however at minimum concentration of 3 % the best performance was demonstrated by CaO/Atren Light expanding additive. Again, the same additive showed the best results at 75°C in water – concentration of 8 % resulted in 5.5 % linear expansion.

Based on the results of the carried out tests it is fair to say that expanding cement additives CaO/Atren Light and CaO/SWL(condensed sulfite waste liquor)-2M added in concentrated from 3 % to 8 % to cement slurries can improve quality of cementing of oil and gas wells.

Cement slurries with controlled kinetics of expansion for cementing of casing strings of oil wells in conditions of normal and moderate temperatures have been designed.

**Key words:** *expanding cement slurry, expanding kinetics, casing string cementing quality, cement sheath, oil well, perforating.*

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## FRICITION BEARINGS TO IMPROVE CENTRIFUGAL PUMP DURABILITY

<sup>1</sup>R.R. Yakhin, <sup>2</sup>S.G. Zubairov, <sup>3</sup>A.A. Bagmanov

<sup>1</sup>ООО RN-UfaNIPIneft

<sup>2</sup>Ufa State Petroleum Technical University

<sup>3</sup>ООО NPP Inzhenerenergograpp

**E-mail: YahinRR@ufanipi.ru**

**Abstract.** This paper describes a method to increase multistage centrifugal pump life due to alternating its design by replacing a rolling bearing in the outboard bearing assembly with a friction type bearing. In this case, distance between pump support assemblies reduces, which results in enhanced pump rotor stability and improved pump leak integrity and safety. A review of the existing advanced materials that are used for manufacturing of friction bearing liners is presented in this paper. Particular attention is given to a friction bearing with a rubber liner, in which case pump rotor vibrations are damped to a greater extent. Based on the analysis of vibration velocity versus oscillation frequency relationships for rubber compositions with varying carbon content, some guidelines are provided for selecting rubber composition in terms of the required pump speed.

**Key words:** multistage centrifugal pump, friction type bearing, operating life, vibration, friction bearing liner material, rubber composition, vibration velocity

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**PREDICTING ROCK-FRACTURE ZONE DEVELOPMENT  
BASED ON ORIENTED CORE ANALYSIS**

**A.N. Mingazutdinov, O.V. Semenova**

TatNIPIneft Institute

**E-mail: MingazutdinovAN@tatnipi.ru**

**Abstract.** Since most of the Tatarstan's oil fields are mature, hydrocarbon production increase and sustainability are of key importance. One of the ways to improve hydrocarbon production is to analyze reservoir rock fracturing and apply horizontal drilling technology. Recently, there has been an upsurge of interest in research activities that improve reliability of predicting fractured-zone development and make it possible to select optimal location of planned horizontal wells. Visual core analysis gives the most complete information on fracture parameters. This paper discusses the importance of fracture orientation data when selecting optimal formation stimulation technique, by the example of directional well No. 2917 in Bavlinsky area.

**Key words:** *oriented core, fracture parameters, rock fracturing model, hydraulic fracturing*



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## APPLICATION OF VOLUMETRICS PROCEDURE TO HEAVY OIL RESERVOIRS

S.A. Panina, R.R. Abusalimova, A.A. Kostina

TatNIPIneft Institute

E-mail: ssofia@tatnipi.ru

**Abstract.** Limited volume of active oil reserves and high rates of hydrocarbon production and consumption resulted in the necessity of prospecting and developing unconventional reserves. Share of unconventional oil reserves in PJSC TATNEFT's assets is over 80%. Over the last five years, extension additions were made mostly due to heavy oil reserves.

Appraisal drilling which has been widely used in recent years, poses a lot of new questions and problems. The major issue that geologists should address is to define cutoff values that allow differentiating between reservoir and non-reservoir rocks.

This paper reviews some methods to obtain cutoff values. These include a statistical method correlating total porosity with dynamic porosity; plotting cumulative curves of reservoir and non-reservoir rock distribution over the porosity intervals with permeability cutoff. Based on the studies performed, it has been assumed that the most probable current porosity cutoff is 20%. However, various methods give different porosity cutoffs, which requires further research.

**Key words:** heavy oil, cutoff value, Sheshminsky horizon, porosity

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**SHESHMINSKAYA FORMATION CROSS-SECTION TYPES AS A  
CRITERION TO FORECAST HYDROCARBON POTENTIAL AND  
RESERVOIR PROPERTIES**

**A.A. Syurin, R.R. Biglov**, scientific consultant: **A.T. Zaripov**

TatNIPIneft Institute

**E-mail: anton@tatnipi.ru**

**Abstract.** At present, the Company's priority exploration and development targets are the Sheshminskaya heavy oil deposits found in the south west of the Republic of Tatarstan. Lithofacies analysis of the Sheshminskaya formation sediments has been carried out. Well logging data and core description allowed to reconstruct the ancient environments of sedimentation. The method of electrometric models of facies was used for reconstruction of facies' sedimentation environment. Paleographic maps and maps of cross-section types were constructed. It was found that the Sheshminskaya facies were deposited in the marginal-marine and shallow marine environment, in particular, in the offshore bar sedimentation conditions.

**Key words:** *lithofacies analysis, well logging, core, reservoir, impermeable layer, marginal-marine sedimentation environment*

**УДК 622.276.72**

**IDENTIFICATION OF SOURCES OF RADIOBARYTE DEPOSITION  
ON DOWNHOLE EQUIPMENT (BY EXAMPLE OF BOOSTER  
PUMPING STATION AND OIL GATHERING STATION IN NGDU  
ELKHOVNEFT)**

**R.R. Nafikova, L.S. Ivanova**

Scientific consultants: **A.F. Khisamutdinov, A.S. Khaliullina**

TatNIPIneft Institute

**E-mail: Railya0991@mail.ru**

**Abstract.** One of the problems of mature fields development is deposition of inorganic salts on downhole equipment of producing wells. The NGDU ELKHOVNEFT oil and gas production department faced the problem of deteriorated performance of 273-mm in-site oil lines transporting the Devonian crude oil to Booster Pumping Station-11, and plugging of filters at Gathering Station-14. These problems might be rooted in mixing of formation and injected water incompatible by their characteristics, casing leakages, crossflows between layers resulting in mixing of water rich in sulfates of the overlying formations with the Devonian formation water.

To address the problem of scaling deposition and scale control, a number of studies were performed, including chemical analysis of scale samples from the inner surface of downhole equipment, spectrometric scale analysis for radionuclides content, model studies to determine compatibility of the injected and the produced formation water. Mixing of produced and injected water in different ratios were simulated, and the possible amount of radiobaryte deposition was calculated.

The sources of scale were determined. These are the produced water with high sulfates content from Wells Nos. 3067, 7371, 886, 3107 and barium found in formation and injected water.

To minimize radiobaryte deposition, water shut off operations shall be carried out to isolate the source of high-sulfate water; also, scale inhibitor to prevent radiobaryte deposition in in-site systems shall be applied.

***Key words:*** *radiobaryte, radioactive deposition, vessels, sulfate water, incompatible water, scale inhibitor.*

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**OPTIMIZATION OF HYDROGEN SULFIDE STRIPPING PROCESS BY  
EXAMPLE OF UPGRADING OF AKTASH SULFUROUS CRUDE OIL  
TREATMENT PLANT**

**V.V. Solovyev, D.N. Morunova**, scientific consultant: **A.A. Anufriev**

TatNIPIneft Institute

**E-mail: svv@tatnipi.ru**

**Abstract.** Increase of oil production by NGDU ELKHOVNEFT brought out the problem of upgrading of the Aktash sulfurous crude oil treatment plant.

Mathematical modeling showed that insignificant decrease of pressure in the stripping column results in much less demand of fuel gas. Pressure can be effectively decreased by a liquid ring pump. With a view to enhance the performance of hydrogen sulfide stripping process, we have also considered the scenario involving change of oil composition through return of associated petroleum gas from the outlet of the compressor station to the first stage separator supply pipeline.

Application of these methods enabled to reduce fuel gas demand, to decrease the associated gas in the gas gathering system, to control gas condensate in gas lines, and to increase the amount of stock tank oil.

**Key words:** hydrogen sulfide, oil, upgrading, gas, recycling, liquid ring pump.