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**MOBILE DIRECT-PROSPECTING METHODS APPLICATION AT
VARIOUS STAGES OF THE GEOLOGIC-GEOPHYSICAL
EXPLORATION FOR OIL AND GAS**

¹ S.P. Levashov,¹ N.A. Yakymchuk,² I.N. Korchagin, ¹D.N. Bozhezha

¹Institute of Applied Problems of Ecology, Geophysics and Geochemistry,
Kyiv, Ukraine,

²Institute of Geophysics of Ukraine National Academy of Science,
Kyiv, Ukraine

E-mail: korchagin@karbon.com.ua

Abstract. The results of testing and practical application of mobile direct-prospecting technology of oil and gas accumulations prospecting and exploration are analyzed. The used technology includes the frequency-resonance method of remote sensing data processing and decoding and ground-based geoelectric methods of forming the short-pulsed electromagnetic field (FSPEMF) and vertical electric-resonance sounding (VERS). Mobile methods are developed on the principles of “substance” paradigm of geophysical research, the essence of which lies in "direct" searching for the desired in each case substance – oil, gas, gold, uranium, water (mineral, drinking, geothermal), etc.

Some methods of direct-prospecting technology can be used at various stages of prospecting operations – reconnaissance (assessment of petroleum potential of major prospecting blocks), detailing (assessment of prognosis oil and gas resources within the individual anomalous zones, detected at the reconnaissance stage), field works (ground-based field studies by the geoelectric methods FSPEMF and VERS for the prognosis oil and gas resources clarifying and the choice of optimal locations for exploration wells laying).

The features and volumes of additional information that can be obtained at various stages of exploration works with the mobile technology using are described in detail. The technology efficiency is demonstrated by the results of its application within the major prospecting blocks in the eastern and western Africa. The results of additional testing in the 2015-2016 of advanced modifications of direct-prospecting methods in different regions of the world are characterized. It is recommended to use the direct-prospecting technology in combination with traditional geophysical methods (seismic, primarily). Its use can bring significant effect during the commercial hydrocarbon accumulations searching in unconventional reservoirs (including the shale sediments, rocks of the Bazhenov formation, coal-bearing formations, and crystalline rocks). Mobile technology can also be successfully used during prospecting within the poorly studied areas and blocks within the known oil and gas-bearing basins.

Key words. *Mobile technology, anomaly of deposit type, oil, gas, detailing, field work, geoelectric methods, shelf, fault zone, satellite data, direct searching, RS data processing, interpretation.*

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**EFFICIENCY OF FORCED FLUID RECOVERY AT THE LATE STAGE
OF DEVELOPMENT (case studies from Tatneft's fields)**

¹R.S. Khisamov, ²A.V. Nasybullin, ²N.R. Nurtdinov

¹PJSC TATNEFT

²TatNIPleft Institute

E-mail: arslan@tatnipi.ru

Abstract. The paper reviews the efficiency of forced fluid recovery method under conditions encountered at late stages of reservoir development. The theoretical framework is presented. Well performance analysis has been conducted before and during forced fluid recovery at Tatneft's fields. Changes in production behavior and effects on ultimate oil recovery have been considered.

Key words: *forced fluid recovery, oil fields development, well, production, oil recovery, oil flow rate*

**OPTIMIZATION OF WATER INJECTION SCHEDULE IN
ROMASHKINSKOYE OILFIELD, EAST-LENINOGORSKAYA AREA**

¹ L.G. Rakhmaev, ² R.Kh. Nizaev, ³ Yu.A. Gutorov

¹ NGDU Aznakaevskneft

² TatNIPIneft Institute

³ R&D Center Neftyanaya Dolina

E-mail: azn09sg@tatneft.ru

Abstract. This paper analyzes productive reservoir performance in the East-Leninogorskaya Area of the Romashkinskoye oil field. The effect of well injectivity on deliverability of producing wells has been examined, as well as the effect of fluid flow direction and behind-the-casing flow on flood pattern efficiency.

To improve water-flooding pattern used for reservoir pressure maintenance in mature fields, the following issues need to be addressed:

- study of Devonian reservoir characteristics and parameters in the Romashkinskoye oilfield;
- evaluation of water-flooding pattern efficiency used in the East-Leninogorskaya Area;
- analyzing the effect of water injection schedule on deliverability of producers;
- drawing up guidelines for water injection control to enhance sweep efficiency;
- analyzing the effect of behind-the-casing flow on injection well operation.

Drawing up guidelines for prevention of behind-the-casing flow.

Key words: *reservoir pressure maintenance, fluid flow, well injectivity, productive formation, behind-the-casing flow, oil recovery, water injection efficiency, water use ratio, anisotropy*

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IMPROVEMENTS IN RESERVOIR MANAGEMENT TECHNOLOGIES

O.G. Antonov, A.V. Nasybullin, A.V. Lifantyeve

TatNIPIneft Institute

E-mail: oga@tatnipi.ru

Abstract. The paper presents the progress made in optimization of oil reservoir management systems using geological and reservoir models. The research was conducted on a real-time reservoir model of the 3rd Block of the Berezovskaya area (Romashkinskoye oil field).

In the course of project, well operations were automatically adjusted based on desired conditions for forecast period with the aim to optimize the development system. Software programs were created for managing well operations in simulation modeling.

For planning of new wells, an efficient method was proposed to determine optimal locations of new wellbores and horizontal sidetracks within the reservoir. The method enables spudding of design wells, including horizontals ones, drilling of sidetracks from existing wells and identifying effective perforation intervals.

To optimize the existing waterflood pattern, a method was proposed based on changing the directions of injected fluid flow and producing bypassed residual oil reserves. The primary objective is to alter the pressure gradient through optimal redistribution of the injected fluid volume between the injection wells.

The task of identifying uneconomic injection wells was also solved with the aim to reduce the operating expenses. New methods for estimation of oil losses due to injection well shut-in were developed.

Key words: *optimization, development system, waterflooding, real-time geological and reservoir simulation model, forecast estimates, wellbore design*

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**ON DETERMINATION OF HYDRAULIC FRACTURE AZIMUTH
BASED ON PRESSURE TRANSIENT TESTS DATA**

¹ V.G. Salimov, ² O. V. Salimov, ² A.V. Nasybullin, ³ V.A. Taipova

¹ Volga-Kama Regional Branch of the Russian Academy of Natural Sciences

² TatNIPIneft Institute,

³ AZNAKAEVSKNEFT NGDU

E-mail: sov@tatnipi.ru

Abstract. Techniques to determine hydraulic fracture azimuth based on the analysis of pressure behavior in surrounding observation wells were analyzed. Requirements to pressure transient tests were determined. Case study is presented.

Key words: *hydraulic fracture, pressure interference test, fracture azimuth, master chart, reference curves, graphical interface*

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PRESENT STATE OF HEAVY OIL RECOVERY WITH SOLVENTS

M.R. YAKUBOV, M.I. AMERKhanov

¹ A.E. Arbuzov Institute of Organic and Physical Chemistry Kazan Research
Center of the Russian Academy of Sciences

²PJSC TATNEFT

E-mail: yakubovmr@mail.ru, yakubov@iopc.ru

Abstract. Well-known technology of solvent-based recovery of heavy (extra-viscous) oils and bitumens has a number of indisputable advantages. They include the possibility of development of thin oil reservoirs, reduced or zero water consumption, significant decrease in the capital and operating expenditures, and reduction of the overall power consumption up to 85%. The results of the current pilot projects show that this technology is competitive even in conditions of low oil prices. It was established that application of the composite solvent based on the light saturate hydrocarbons only leads to deposition of asphaltenes in the pore space. Various synthetic and natural amphiphilic substances behaving as inhibitors of asphaltene deposition process can be used in the composite solvent.

Key words: *heavy oil recovery, solvent injection process, asphaltene deposits.*

**SYSTEM DIPHENYL – *n*-HEPTADECANE: PHASE DIAGRAM AND
PROPERTIES OF THE EUTECTIC COMPOSITION**

I.K. Garkushin, A.V. Kolyado, I.G. Yakovlev

Samara State Technical University

E-mail: yakovlev.ivan.g@gmail.com

Abstract. Experimental investigations of phase equilibria in binary organic system diphenyl – *n*-heptadecane are shown. Investigations were accomplished for new experimental data generation about phase reactions in organic system, including polycyclic aromatic compounds. Investigation results may be used for new effective and eco-friendly heat transfer development. There isn't information about experimental studied of diphenyl – *n*-alkane systems in literature references. Consequently, forecasting methods (UNIFAC, ASOG) can't used in analogue system. In this article experimental studied of phase equilibria was accomplished using differential thermal analysis. On based of experimental data was build phase diagram and determined physicochemical characteristics of eutectic alloy: boiling temperature, open-cup-flash-point, density. Temperature dependence of kinematic viscosity was studied in temperature range 298,15 – 323,5 K and refractive index in temperature range 298,15 – 313,15 K; empirics equations on based experimental data was determined. By the results of investigations it was concluded that eutectic alloy can be used as heat transfer.

Key words: *diphenyl, n-heptadecane, differential thermal analysis, density, boiling temperature.*

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ANALYSIS OF LUBRICATING PROPERTIES OF DRILLING AND WELL-SERVICING FLUIDS ADDITIVES

S.E. Chernyshov, A.A. Melekhin, E.P. Ryabokon

Perm National Research Polytechnic University

E-mail: nirgnf@bk.ru

Abstract. Construction and servicing of directional wells, including horizontal wells, is challenged by a discrepancy between the real and design weight on bit, as well as the excessive metal wear on drill, casing and tubing strings during drilling operations and trips.

This paper presents the results of drilling mud lubricants testing. Several devices were used for testing, including Fann EP/Lubricity Tester Model 212, KTK-2 mud cake tester, Fann 35SA rotary viscometer, and Crison GLP 21 pH indicator.

A number of chemicals were used in the tests, including Lubristeel, FRW A, FRW B, FRW, Lubrital, PolyMudLiquid, and ASP 820. Drilling mud mixing was rather smooth, with no foaming observed. The added chemicals do not alter pH value of the drilling mud, and introduction of a lubricant does not affect drilling mud rheology. Based on the analysis of friction reduction in various media, the optimum percentage of FRW lubricant is approximately 0.05% - 2.5%.

Key words: *well drilling and servicing, producing well, lubricants, well drilling and servicing fluids, friction factor, energy efficiency improvement*

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**PRODUCED-WATER-BASED PRODUCTS USED IN OIL
PRODUCTION, LIVESTOCK SECTOR AND FOOD INDUSTRY**

I.F. Galiullina, R.R. Kadyrov

Oktyabrsky Branch of Ufa State Oil Technical University

E-mail: ramzis.k@mail.ru

Abstract. This paper reviews feasibility and practicability of using produced and waste waters from mature and abandoned oil fields for the following purposes:

- in oil production: preparation of well-killing and cement mixing fluids;
- in livestock sector: animal feed supplementation
- in food industry: production of food-quality sodium salt

Key words: *produced water, well-killing fluid, cement mixing fluid, sodium salt, feed supplements*

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**CURRENT TRENDS AND PROSPECTS FOR SERVICE
MANAGEMENT IN OIL AND GAS SECTOR**

Yu.A. Gutorov

R&D Center Neftyanaya Dolina, Oktyabrsky

E-mail: gutorov70@mail.ru

Abstract. This paper analyzes evolution of oil-field service management in Russian oil patch over the last 20 years. It is shown that restructuring of oil service companies which lasted 10-15 years has been replaced with their irreversible consolidation associated with the protracted world recession. However, the newly established service holding companies are trying to handle their current economic problems in a highly competitive environment, though they don't have enough financial assets to upgrade technical and technological bases, which is critically needed today to produce heavy and unconventional oils. To successfully solve this problem, on-line adaptive production control centers are suggested to be set up as part of service companies having appropriate facilities.

Key words: *restructuring, diversification, service companies, prime cost, communication control*