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**CONTEMPORARY RUSSIA NEEDS A NEW STRATEGY FOR OIL
FIELDS DEVELOPMENT– OPTIMIZING PRODUCTION AND
MAXIMIZING RECOVERIES**

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Abstract. The paper presents a review of Russian fuel-energy resources in the context of global oil-and-gas production trends. Consistent deterioration in the quality of energy assets resulting in declining competitiveness of Russian fuel and energy sector is demonstrated. Classification of hard-to-recover conventional oil reservoirs and unconventional hydrocarbon sources is established. Large opportunities for enhancing Russian energy resource potential in the nearest future are revealed together with long-term prospects. Urgent need for further research of such resources is demonstrated, appropriate research strategies are provided. Special attention is given to innovative field development planning relying on innovative methods and technologies, extensive application of enhanced oil recovery (EOR) techniques to improve production performance and enhance oil recovery under various geological and physical conditions of complex reservoirs. A new resource-innovation development strategy for Russia is discussed.

Key words: *oil and gas sector, reserves replacement, hard-to-recover oil reservoirs, unconventional reservoirs, heavy oil, ultraviscous oil and natural bitumen, tight rocks, shale deposits, enhanced oil recovery (EOR) and bottom hole treatment techniques, oil recovery, well logging, well production testing, Republic of Tatarstan, petroleum province, reasonable field development, petroleum production tax incentives, test sites*

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**PROSPECTS FOR OIL ACCUMULATIONS IN AREAS WITH HIGH
EXPLOTATION MATURITY IN TURNAISIAN CARBONATE
FORMATIONS**

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Abstract. Given high exploration maturity, further growth of oil production is only possible provided there are ample explored reserves, and underexplored areas of the geological cross-section in operating fields hold much promise in this regard. Replacement of reserves will delay oil decline rates however sustainable oil and gas production levels can be maintained provided that exploration and search for new oil prospects are underway.

Key words: *oil field, trough, fault system, carbonate reservoir.*

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GEOLOGICAL AND PRODUCTION ASPECTS OF EXTENSIVELY FRACTURED CARBONATE RESERVOIRS

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Abstract. Carbonate reservoirs of the Deposits 301-303 present specific development challenges due to a well-developed system of vertical and horizontal fractures and presence of deconsolidation zones. During pilot testing of various production practices, horizontal and directional drilling proved most efficient although many water production problems in horizontal wells remain unresolved.

Key words: *fracture porosity, carbonate reservoir, water cut, forced production, horizontal wells, production performance, improved development efficiency*

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**APPLICATION OF HORIZONTAL DRILLING AND HYDRAULIC
FRACTURING TO ENHANCE LOW-PERMEABILITY CARBONATE
RESERVOIR PERFORMANCE**

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Abstract. Carbonate reservoir performance can be improved through an optimum program of production enhancement operations based on screening criteria considering specific reservoir conditions of selected fields.

One of the most efficient ways to maintain commercial oil production from poor quality reservoirs is drilling of multilateral horizontal wells and application of hydraulic fracturing or acid fracturing techniques.

Key words: *oil field, reservoir, oil production rate, oil accumulation, horizontal well, hydraulic fracturing.*

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**PRODUCTION RATE OF MULTILATERAL HORIZONTAL WELL
FOR FIVE- AND SEVEN-SPOT INJECTION SYSTEMS**

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Abstract. The paper presents an analytical solution for calculation of production rates of multilateral horizontal wells for five- and seven-spot injection systems. The equations are used for mature fields. The equations were derived to estimate production rates and to place horizontal wells most effectively for five- and seven-spot dispersed injection systems. In particular, the equations can be used for five-spot injection systems to select an optimal length of a horizontal wellbore section in the net pay, and to determine the number of laterals in mathematical equations providing for substitution of a horizontal well for a vertical well.

Key words: *by-passed oil, sand lenses, steady flow, horizontal well, length of horizontal section, well drainage radius, heterogeneity, dispersed waterflooding, selection of development system.*

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ALTERNATIVE METHODS TO DETERMINE FRACTURE CLOSURE PRESSURE

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Abstract. Methods to determine or to specify fracture closure pressure from minifrac have been analyzed. These include methods of pulse injection while pressure decline and determination of hydraulic impedance. Potential and practical application of the methods have been demonstrated. These methods may prove useful for hydrofrac treatments of shale rocks, where common minifrac interpretation procedures are ineffective because of the long period of pressure decline. They are also worth considering when common methods fail to identify fracture closure pressure.

Key words: *hydrofrac, minifrac, fracture closure pressure, pulse injection, hydraulic impedance.*

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CAUSES FOR DEFECTS IN PRESSURE DECLINE CURVE

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Abstract. In the Republic of Tatarstan, minifrac pressure curves have some commonly occurring defects, including local humps in the pressure decline curves, absence of hydraulic hammer, flatness and high values of surface pressure decline curves. Root causes for these defects have been identified and illustrated by case studies. It is recommended to carry out breakdown tests before main hydrofrac treatment in shale formations until conspicuous hydraulic hammer and ISIP are recorded in minifrac pressure curves, otherwise there is no other alternative but screenout.

Key words: *minifrac, pressure decline curve, fracture closure time, pressure curve local hump, flat curves, hydraulic hammer.*

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**CALIBRATION OF FRICTION PRESSURE LOSSES DURING
HYDROFRAC**

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Abstract. The paper considers the method of fracture fluid pulse injection to allow for calibration of friction pressure losses. A case study is analyzed; recommended practice is presented.

Key words: *hydrofrac, pipe friction, pulse injection.*

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**DEVELOPMENT AND TESTING OF HEAVY OIL
VISCOSITY REDUCER**

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Abstract. This paper presents analysis of promising techniques to improve heavy oil rheology, more specifically, application of chemical additives. An additive has been developed which reduces oil dynamic viscosity. A petrochemical by-product – high-density low-molecular-weight polyethylene – is used as one of the additive synthesis components.

Key words: oil, rheology, viscosity reduction, additive, Reynolds number.

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**CATHODIC PROTECTION AGAINST CASING
EXTERNAL CORROSION**

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Abstract. Analysis of published data on potential causes of the outer casing wall corrosion in oil wells has been performed. This paper presents calculation of the required current intensity for casing corrosion prevention based on estimation of electrode potential shift in the wellbore and resistivity of the borehole/ground system. Protection potential time-lapse data is presented.

Key words: *casing string, external corrosion, cathodic protection*