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**EFFECT OF OIL STRUCTURAL-MECHANICAL CHARACTERISTICS ON EFFICIENCY OF ISOTHERMIC AND NON-ISOTHERMIC NON-STATIONARY WATER-FLOODING**

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The paper discusses issues related to the problem of displacement of heavy oil with structural-mechanical properties out of the dual-permeability reservoir using isothermal and non-isothermal cyclic water-flooding. To determine the role of non-Newtonian nature of oil flow in the oil accumulation reservoir the paper considers several variants of oil displacement by water pumped from the dual permeability reservoir as well as a series of filtration problems at different values of the dynamic pressure gradient shift (DPGS). Technological development indicators for the three options were calculated for each value of the DPGS.

**Key words**: structural-mechanical properties; non-stationary water-flooding; dual permeability reservoir; dynamic pressure gradient shift (DPGS).

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**WATER DRIVE EFFECT ON EXTRACTION OF HIGH-VISCOSO OIL RESERVES**

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The paper considers problems relating to water drive effect on efficiency of extraction of high-viscous oil reserves, based on actual operating data of one of the fields in Western Kazakhstan. Clear signs of water drive of oil reserves extraction, becoming evident through formation pressure stabilization in conditions of substantial under-compensation and pressure reduction in lower water-saturated layers are found. Water drive of a field operation with high-viscous oil is stated to account for high efficiency of oil reserves extraction, thus, in some cases, ensuring achievement of oil recovery levels, typical for light oil fields. The effectiveness of the use of water drive natural potential is determined by the dynamic equilibrium between the fluid production rate and the bottom water inflow in conditions of formation pressure stabilization.

**Key words**: water drive; high-viscous oil; formation pressure; current oil recovery factor.
STUDY OF EFFICIENCY OF APPLICATION OF POLYMER WATER-FLOODING TECHNOLOGIES AND GAS-WATER EFFECT ON DEPOSITS WITH HIGH-VISCOUS OIL WITH A SUPER-COLLECTOR (p. 17)

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The paper, taking as the ground the numerical modeling method, considers some specific features of application of different displacing agents (water, polymer solution, gas) and their combinations used for development of high-viscous oil deposits with a super-collector. Options of development and applied technologies are of different efficiency. Comparison of indicators obtained from each of development options for the accounting period was carried out. The development options and applied technologies, discussed in the article, are of different efficiency. Comparison of technologies, which collected indicators on oil withdrawal are close, should be done by other indicators usage, essentially determining cost-effectiveness of development.

Key words: polymer water-flooding; gas-water effect; alternating injection; super-collector.

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STUDY OF HIGH-VISCOUS OIL NON-ISOTHERMAL FILTRATION IN A COLLECTOR WITH HIGHLY-PERMEABLE CHANNELS (p. 26)

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The paper, taking as the ground the hydrodynamic modeling method of isothermal filtration, investigates effect of highly-permeable filtration channel on development efficiency of high-viscous oil deposits during thermal impact. It is shown that presence of a high-permeability channel in a reservoir, connecting injection and production wells, results in narrowing of oil withdrawal area providing at the same time high oil flow-rates during the initial period of a deposit development. Rapid water-flooding of highly-permeable channel leads to a sharp drop in oil production rate and water-flooding increase. Heat impact implementation, while step-by-step water-flooding of highly-permeable channel and temperature increase in the area of oil withdrawal, causes increase of water phase portion in the bottom zone of the production well (since its viscosity decreases), thus bringing greater reduction of oil production rate (as compared with isothermal water-flooding ) and water content increase. This result is reached in case of variable heating of the reservoir along the section in the area of oil withdrawal as the temperature is the highest in the water-flooded area of highly-permeable channel, while the temperature is minimal in the area of residual oil accumulation. And this difference makes 15...20 °C.

Key words: collector; high-viscous oil; highly permeable channel; non-isothermal filtration, thermal effect.

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STUDY OF EXTRACTION OF HIGH-VISCOUS OIL RESERVES OUT OF LAYER-BY-LAYER - PERMEABLY- HETEROGENEOUS RESERVOIR BY IMPLEMENTING OF POLYMER WATER-FLOODING AND THERMAL EFFECT (p. 31)

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The paper presents some specific features of various technologies application while extracting high-viscous oil out of layer-by-layer permeably-heterogeneous reservoir. Some filtration model of a deposit sector with a collector, which consists of layers with different permeability and is developed by means of water-flooding usage is considered. Mathematical model of three-phase filtration is used for carrying out the research. Success criteria of applying the technology while developing permeably-heterogeneous, saturated by high-viscous oil reservoir are given.

Key words: high-viscous oil; polymer flooding; highly permeable filtration channels; thermal effect.

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INFLUENCE OF THE TYPE OF A PRODUCTIVE LAYER GEOLOGICAL SECTION ON TECHNOLOGICAL EFFICIENCY OF APPLICATION OF THERMAL EFFECT AND POLYMER WATER-FLOODING TECHNOLOGIES (p. 40)

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The influence of the type of a productive layer section on efficiency of the applied technologies of thermal effect and polymer flooding as well as their combinations is studied. Two types of section are considered: in the first case the formation consists of isolated inter-layers of different permeability, while in the second case the formation consists of hydro-dynamically connected inter-layers of different permeability. The main specific features of development options of a deposit sector are given below: Option No 1 envisages the usual flooding, Option No 2 envisages injection of 90 °C hot water, Option No 3 is based on polymer flooding, Option No 4 means injection of a 90 °C polymer solution (thermo-polymer effect), Option No 5 is an alternate pumping of 30 °C polymer solution and 90 °C hot water. Two series of tasks, differing by the time of various technologies application are carried out.

Key words: productive layer; geological section; polymer flooding; thermo-polymer.

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EXPERIENCE OF APPLICATION OF NON-STATIONARY FLOODING TECHNOLOGY AT HIGH-VISCOUS DEPOSITS OF NORTH BUZACHI OIL FIELD (p. 46)

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At present, there exist a few examples of successful application of flooding at deposits of high-viscous oil. That’s why, the experience, obtained during application of non-stationary flooding at North Buzachi oil field appears important for oil producing companies. The paper shows that application of non-stationary flooding appears efficient in modern conditions of North Buzachi field development. However, some problems relating to usage of cyclic water pumping are revealed. This, above all, is the process of "technology aging," when during extraction of oil reserves, which are involved in the drainage as a result of the technology application, efficiency of the technology decreases. That’s why it is necessary to modify the applied technologies of non-stationary flooding.

Key words: non-stationary flooding; efficiency, high-viscous oil; oil recovery.

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APPLICATION OF DECISION TREES AS AN EFFICIENT METHOD OF ANALYSIS AND PREDICTION (p. 69)

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This paper suggests some methodical approach to solving the problem of predicting geological-technical measures (GTM) using trees of decision rules. The examples of decision trees, trained on the actual drilling data base of the main, horizontal and infill well funds are given. It is shown that decision trees application can not only effectively predict, but also to perform "work on our mistakes", restoring the rules and criteria to ensure the success of geological-technical measures (GTM).

Key words: geological and technical measures; methods of machine teaching; intelligent prediction methods; decision trees; decision forests; hierarchy of rules; main fund; infill wells; horizontal wells; sidetrack.