STUDY CHANGES POROUS FORMATION PERMEABILITY MEDIUM UNDER CYCLIC LOADS

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The article studies the effect of cyclic loads on the strength characteristics and filtration in a porous medium, fatigue processes in the rock skeleton, and the prospects for developing technologies for active stimulation of formations in order to clean the bottom-hole zone and intensify oil and gas production. The issues of formation and growth of fatigue cracks in the rock under the influence of the pulse generator GKP-1 are also considered.

We studied the filtration processes in a porous medium during the action of cyclic loads with different frequencies and amplitudes. To obtain reliable results in the absence of oscillation interference (which are present when using installations for studying the permeability of core samples of the UIPK type), in IFNTUOG, together with the scientific and production company INTEX, a facility was developed for studying the permeability of a porous medium in the process of hydraulic impulse loads on the core UDC-2 [1].

The volume of the filtrate, which is filtered through the core over time, directly indicates the state of spatial permeability, which varies depending on the conditions under which the filtration occurs. Since, during filtration and simultaneous cyclic influence, the fluid moves in the pores and microcracks of the core, changes in its rheological properties, the movement of uncemented particles (pollutant or parent rock) [2], electrokinetic processes, opening, closing, development of new microcracks, the amount of filtrate per unit time can vary within certain limits. In this case, it is necessary to investigate what kind of the filtrate volume will be before, during, and after the treatment with pressure hydroimpulses, and evaluate the changes in comparison with the initial results. It is also necessary to determine the characteristics of materials removed during core filtration by applying the methods of lithological-petrographic analysis.

As it is seen from Figure 1, the processing of natural and artificial core mainly caused an increase in the filtrate volume during filtration for the same period of time. The highest growth was observed for artificial cores 2,4 during processing and is equal to 36-38%. After processing, this figure drops to 30-32%. However, for artificial cores 7,11,15, despite the increase in the filtrate volume during processing by 24%,
19.8% and 7%, respectively, when the effect is removed, it decreases to the initial and even lower. For other artificial cores the filtrate volume increases on average by 20% during processing, and after processing this figure decreases by about 4 times. For sample 1, there was a slight increase in the filtrate volume by 6% during processing, and a further increase of the rate to 29.5% under filtration conditions after treatment. Only for sample 18, treatment with pressure hydroimpulses did not give statistically significant results, since the change in volume was only 1-2%. Dispersion for the obtained results is in the range of 8-15%, depending on the specific core. The situation is similar for natural cores. The maximum increase in filtrate volume was observed for cores 2,12,16 by 30-32% during processing and 17-42% after processing respectively. For natural cores 5,10,14 negative results were obtained - the filtrate volume decreased by 8-26%.

The analysis of fluid samples showed that, when filtering without core cyclic loads, the samples mainly show the presence of lumpy oxidized clay mass, as well as dusty clay particles and very small grains of quartz are present in an insignificant amount. Hydro-pressure pulses during filtration caused a significant increase in the samples of brownish clay mass and quartz grains coated with a clay film, and with further filtration without the action of hydraulic pulses, a gradual increase in rock cement particles is observed compared to the number of particles removed from the core before processing (by an average of 50%). The change in the filtrate volume for an artificial core is in the range of 5-30%, and natural 10-42%. The indicated indicates the appearance of additional fracturing of the rock. As for a natural core, processing is effective due to the presence of microfailures and microcracks in the samples that are not present in the artificial core, which is confirmed by the results of lithological and petrographic analysis. During filtration under the conditions of hydroimpulse exposure, core clay material, quartz particles are removed, and, consequently, the internal specific surface of the porous medium changes.
Conclusions. This result makes it relevant to develop new technologies for exposing the formation used in the development of oil and gas wells, intensifying the production of shale gas and oil, coal beds degassing and before hydraulic fracture operations.

Further development and improvement of technologies for wells stimulation with low permeable or colmatage formations will occur in the direction of combining cyclic hydro-pulse wave action and hydraulic fracturing, as phased components of a basic technology for intensifying oil and gas recovery.

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ВДОСКОНАЛЕННЯ МЕТОДУ ВАНТАЖОПЕРЕРОБКИ НЕГАБАРИТНИХ ВАНТАЖІВ З УРАХУВАННЯМ МАСИ ВАНТАЖНОГО МІСЦЯ

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Технологія перевантажувальних робіт має значний вплив на величину вартості перевезення негабаритних вантажів у вигляді таких факторів як габаритні розміри, вага вантажу та спосіб виконання вантажних операцій у портах відправлення та призначення. Специфіку формування транспортних тарифів на перевезення негабаритних вантажів також складають такі чинники як пакування вантажу, вимоги до кріплення, обсяг та рівень складності вантажно-розвантажувальних операцій, вимоги до способу укладки та умовам перевезення [1]. До переліку процесів з організації перевезень негабаритних і великовагових вантажів потрібно долучити вивчення комплексу заходів, що включають не тільки вибір судна [5,6,7,8], що відповідає заданим критеріям в числі яких наявність вантажних приміщень, перевантажувальних засобів, достатньої міцності суднових конструкцій, але і опрацювання транспортного ланцюга доставки вантажу до транспортного вузлу [2,3].

Розглянемо п’ять варіантів вантажообробки негабаритного вантажу в залежності від маси вантажного місця (Р) від 25 т до понад 100 т, та способу його обробки за допомогою різних перевантажувальних засобів [4].