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Mathematical Model of the Processes of Polymer Exposure to Oil Deposits

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Annotation: *The issue of modeling the silage of oil with the help of polymer solutions, taking into account the state of dispersion of liquids, has been considered. Filtering-the process is modeled within the framework of multicomponent multi-phase filtering mechanics using the mean values of capacitance parameters. A mathematical model of replacing oil with polymer solutions is presented, taking into account the state of dispersion of liquids. On the basis of the proposed model, the movement of the active mixture and the change in the filtration properties of the reservoir during the reagent injection are checked.*

Keywords: distributed state, component, concentration, mathematical modeling, saturation, oil layer, polymer solution, phase, filtration.

1. INTRODUCTION

The efficiency of oil production from oil-producing reservoirs using modern, industrial-developed methods of development in all countries is currently considered unsatisfactory, but the consumption of petroleum products throughout the world is growing year by year. The average oil production rate in different countries and regions is from 25 to 40%.

The average of the initial geological reserves of oil in the depth of oil produced by the residual or non-renewable industrial method

It reaches 55-75 percent.

Therefore, the tasks of applying new technologies of oil extraction are relevant, which allow to significantly increase the processing of oil from the already produced layers, where there is no longer the possibility of extracting the residual reserves of oil with the use of conventional methods.

In this regard, the actual task of limiting the production of connected water on the basis of polymer solutions capable of ensuring the scientific basis of conducting oil extraction, the development of new technologies and the factor of obtaining high oil in the water bodies is the solution of which is of great practical importance for the oil industry.

There are the following technologies that use polymers:

Polymer overflow (edge overflow) in highly viscous oil ores, which are at the initial stage of development, with non-uniform permeability);

Komplex effect on effective formations with polymer gel-forming systems in combination with intensifying reagents (surfactants, hydrochloric, acid) is used in the final stage of development;

Influence of solids with viscoelastic compositions (VES) for leveling the profile and promoting oil production;

Polymer flood is the leader in the physical and chemical methods of water stimulation. Polymer overflow this is due to the fact that the high - molecular chemical reagent-polymer (polyacrylamide) dissolves in water, which significantly increases the viscosity of water even in low concentrations, reducing its mobility and thereby increasing the coating of reservoirs with floods.

The main and simple feature of polymers is the thickening of water. This leads to a uniform decrease in the ratio of fat and water viscosity in the layer and a decrease in the conditions for the opening of the water due to the difference in the viscosity or heterogeneity of the layer.

Preparation of polymer compositions in combination with various reagents significantly reduces the range of application of polymer. The main purpose of the polymers in the process of degreasing is to equalize the fertile layers and reduce flaking during flooding. The second is explained by the rheological properties of filtration of polymer solutions in a layer environment. The effectiveness of the use of polymer solutions as a displacement medium in a heterogen porous environment is determined in advance by the following processes.

Treatment of the displaced environment with high molecular weight polymer compounds with low concentration (0,01-0,05%), giving it viscoelastic properties, significantly reducing the coefficient of mobilitytiradi, as a result of a decrease in the speed of the silencing environment, the probability of its premature absorption decreases, and the consumption of 1 ton of oil decreases.

Most polymer solutions are characterized by non-specific (viscoelastic) properties of Newton, their physical constants depend on the speed of movement, due to which in different water bodies the front of the Silge is evenly pegged. Many polymers, both natural and synthesized, are known, but some of them are distinguished only by their good solubility in water and fat.

In the oil industry, mainly water-soluble polymers are used. For these polymers to dissolve well in water, it is necessary that in the chain of macromolecules there are polymer hydrophilic functional groups (amide, carboxyl, hydroxyl, etc.). Polyacrylamides have found the most common way to restore oil.

The molecular weight of polymers suitable for use in the oil industry, which includes polymers of the polyacrylamide group, is up to several million. Their polymerization rate reaches several tens of thousands. If the molecules of such polymers are stretched, then their length will be equal to several microns. Even in the form of a static coil, their dimensions consist of several tens of microns. Such polymer molecules are partially mechanically captured and adsorbed to the surface of the stone in narrow hole channels. As a result, the composition of the polymer formation in the solution with silzhish facade silzhishi gradually decreases.

Mechanical retention of polymer formation in Porous Media and adsorption are factors that reduce the solid effect of polymer formation, which omillarni must be taken into account. At the same time, high molecular weight and relatively large molecular sizes provide an increase in the viscosity of the solvent-water. In this regard, there is a need to optimize the composition and properties of polymer solutions.

2. MATERIAL AND METHODS

The effectiveness of silage with oil polymer solutions is determined mainly by the properties that arise when filtering them in a porous environment, in particular their rheological properties. The results of the study show that the permeability is not the same as filtering different solutions of polyacrylamides in the same speed range in similar nuclei. An important role in this process is played by the molecular weight and solvent property of the polymer. It was found that homopolymers with a molecular mass of 1 × 106 were filtered through vessels of high permeability (in order of 10-12 m2 and higher) at a speed of less than 12 m per day, like Newton's liquids.

In the preparation of a polymer solution, it is desirable to create conditions in which the ability of polymers to thicken water can be maximized by insignificant adsorption and mechanical retention by the porous medium.

When studying the filtration of polymer solutions, it is necessary to take into account that the adhesive forces that produce resistance are only a decisive factor in the level of low filtration, which is significantly reduced by its increase. Thus, the law of filtration for speeds at which the resistance begins to flow can be written in the form

It should be borne in mind that a number of factors significantly affect the filtration process of a polymer solution. For example, if the filtration of a solution is suspended for a while, and then restored, then the flow of the liquid initially becomes larger before stopping, which is explained by the relaxation and inequality of the process inherent in structural systems. For liquids with low viscosity, the pressure relief time is in order 10-10 C.

This is due to the size of the molecules, which increases with the transition from the lower homologues to the upper one. On the other hand, polymers with very long molecules have a tremendous relaxation time. Polymer solutions are characterized by elastic deformation, which is largely determined by the mass elasticity of the solvent at the initial time moment. Subsequently, deformation of the volumetric adhesive current develops.

Despite the many known polymers, not all of them are equally suitable for water-thickening substances due to their viscosity, adsorption capacity is high, thermal and temporary distortion, filtration ability is low, etc. The most effective polymers (with a molecular weight of 1O106) are the following three types: acrylamide-based polymers, in particular goulized polyacrylamides; polyoxyethylene and polysaccharides.

As criteria for the effectiveness of the use of polymers, you can use the amount of fat produced in addition to 1 ton of injected polymer.

This figure is from 300-400 to 10-13 thousand m3 per 1 ton of polymer.

The most important factor determining the effectiveness of the process is the stage of development of this aqua-grime, during which the transition to a polymer flood.

From an economic point of view, it is desirable to create a water boundary between water enriched with polyacrylamide and water poured into the reservoir without polymer enrichment. Polymer solution for creating borders

0,05% concentration is recommended.

The practice of the use of polymer floods has revealed some disadvantages inherent in the existing technique, as well as positive results. Among them, the most characteristic is: significant adsorption of polymers in the porous environment; the need to create high heads when pumping a polymer solution; the non-mixing nature of the lubrication of the oil with a polymer solution.

In this regard, in a number of cases, it is desirable to use fat-soluble polymers. Hydrocarbon solvents such as condensate, light oil, hydrocarbon emissions, some hydrocarbon emissions of chemical production, etc., can be used as a compression agent. They can be thickened with polymers such as polyisobutylene, synthetic rubber, etc.

From an economic point of view, it is also desirable to create an edge of a thickened hydrocarbon liquid with polymers on the siljish facade. Part of the injected water is treated with water-soluble polymers to prevent water from opening on the polymer edge.

Moving substances are pumped in this sequence. First, mucus is formed, which is formed from a thickened hydrocarbon solvent with a polymer, then the mucous membrane of the aqueous polymer solution is formed, after which the mucous membrane moves along the area with waste water. At the first stage, the oil is silenced in the territory of the reservoir, wrapped in the first row of the well. After the front part reaches the hydrocarbon polymer edge of the production wells, they are closed and transferred to the observation wells. From this moment, the second stage of oil silencing begins in the wells of the external battery, according to the data of the first stage of oil silencing in the pilot area, the dynamics of the flow rate of the well, the pressure of the reservoir and the bottom of the well, the moment of formation of a thickened solvent in the Wells, the

During the period of grinding oil into the wells of the second battery, in addition to the above parameters, it assumes the determination of the moment of formation of hydrocarbon polymer solution and pure hydrocarbon polymer solution by sampling (starting them from time to time) from the wells to monitor the movement of the oil mixture zones. observation and extraction wells.

The method of interaction of layers with viscoelastic compositions (VES) is especially effective for layers characterized by sharp heterogeneity and weak hydrodynamic composition.

This method equates the conductivity and thereby increases the coating of the polymer effect of water ombor and reduces the reduction of water in the oil produced.

Thus, Silge can provide a high rate of oil extraction coefficient in the waters by processing the environment with polymer compounds, increasing the volume of oil extraction and limiting the production of water associated with it, and their solution is of great practical importance for the oil industry.

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