ABSTRACTS

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THE DECISION OF PROBLEM FOR ONE MODEL OF RELAXATIONAL FILTRATION BY PROBABILITY–DIFFERENCE AND MONTE CARLO METHODS

The Dirichlet, Newmann problem and mixed problem for model of relaxational filtration by the linear Darcy law in a three-dimentional case are considered in work. The problem are approximated only on temporary variable with the help of the implicit circuit. In result we receive the above-mentioned problem for the equation of an elliptic type. The decisions of the received problem are estimated by Monte Carlo and probability methods.

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THE MODEL OF MINERAL EXTRACTION BY THE UNDERGROUND LEACHING METHOD WITH TAKING INTO ACCOUNT NON-HOMOGENEITY OF INITIAL MINERAL DISTRIBUTION

The underground leaching method or method of In-Situ Leaching (ISL) is used at the low concentrated mineral deposits exploitation. The underground leaching method is distinguished by high ecological safety and profitability in comparison with the traditional method of production.

In-situ leaching is a method for development of ore deposits without lifting the ore to the surface by selective transfer of ions of natural uranium into productive solution in subsurface. This method is performed by drilling of wells through mineral ore bodies, supply of solution into mineral ore bodies, lifting of mineral containing solutions to the surface and extraction of mineral in sorption ion-exchanging units, addition of acid into mother solutions and injection into subsurface.

Thus, the method of in-situ leaching, without exaggeration, is the most economical and ecologically safe method of production compared with all other known methods.

The problems dealing with the increasing of mineral's excavation rate and the optimal wells locations arise at minerals extraction by ULM. The mineral's excavation rate depends on the types of wells location, the distribution of minerals in layer, the structure of layers and deposit's exploitation conditions. In this work the influence of wells location on mineral's extraction rate is investigated.

The study of liquid filtration in layer and dissolution of salt are based on the Darcy's law and one-step chemistry model of dissolution. In addition, the leaching processes in the layer (porous media) is simulated using conservation equations of mass and species.

The computer models of mineral extraction by the method of of In-Situ Leaching with taking into account of layer's anisotropy and non-homogeneity initial mineral distribution are elaborated in given work.

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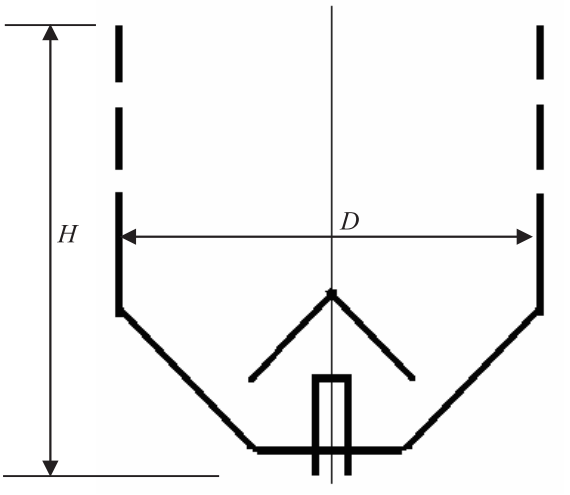
SIMULATION OF MASS-TRANSFER PROCESS IN POROUS MEDIA WITH COMPLEX SHAPE

Some rare minerals and metals are extracted by underground leaching. Thus sorption extraction of minerals on mass-transfer devices with use ion-exchange resin is the most widespread method of productive solutions processing. Now wide application finds sorbing device which represents the cylindrical column, filled by a layer of ion-exchange resin in the form of spherical porous granules. Through a column from below upwards with the filtration velocity the solution containing sorbing a mineral is pumped over. Velocity of solution admission is calculated off on kinetic parameters. A cone barrier located before a submitting pipe is intended for achievement of uniform distribution of a solution across a column.



Scheme of sorbing device

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On an output from a column through certain time tests of a solution which are analyzed on the maintenance in them of mineral are selected. Sorption proceeds until concentration of mineral on an outlet from a column will not be equal some admissible value. After that the saturated layer of a sorbent being below by a mineral is unloaded. Sorbing device from above is supplemented with a fresh sorbent and process repeats.

There are some questions, a degree of an involvement of a sorbent in mass-transfer process (especially, in a transverse direction of a column) and change of column resistance depending on the size and forms of cone barrier, influence of dispersive and kinetic characteristics on thickness of the saturated layer.

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MODELING OF RESERVOIR PROCESS USING THE METHOD OF RADIAL DRILLING

At present, a number of methods of improvement of reservoir recovery are well--known [1–4]: 1) thermal method of effect on productive horizon [1–3]; 2) formation hydro-breakdown and application of combustible gas energy for organizing of blast in a borehole [4]; 3) acid treatment of wellbottom zone etc. [1]. The most common is the first method, which maintains not only producing energy, but due to improvement of rheological characteristics increases oil fluidity [1–3]. However, this method is applied with large consumption of facilities at pumping and heating of heat carriers [2, 3]. Hydro-breakdown with application of combustible gas energy reqires delicate management and may lead to uncontrolled process that is fraught with dangerous situations [4]. The third method generally is suitable for bottomhole formation zone [1]. The method of radial drilling, when reservoirs with high permeability are made for oil withdrawal from strata with low conductive characteristics and extensive dimensions (of high thickness) – is one of effective methods improvement of reservoir recovery. This task is of large interest due to involving in treatment strata with complicated geological structure and for rehabilitation of deposits with abnormal rheological characteristics of oil. The problem is to determine interaction of low-permeable bank of high thickness with high-permeable reservoir, produced by radial drilling method, and find required oil withdrawal for rational exploitation of deposit.

The Report presents results of calculation-theoretical study of reservoir recovery using the method of radial drilling.

1. Mathematical model of oil filtration in the bed with high-permeable reservoir, formed in the result of radial drilling, has been developed. High-permeable reservoir represents itself porous medium with filtration characteristics, much exceeding coefficients

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of permeability of ambient block of high power. In high-permeable reservoir pressure decreases due to fluid withdrawal that leads to fluid influx from ambient low-permeable block. Using representation of mechanics of interpenetrating continuums the process may be described by single equation with different filtration characteristics [5]. Generalized mathematical model of filtration allows automatically meeting conditions of continuity of pressure and mass flows when passing the interface of porous mediums.

2. Obtained calculation data of pressure field and velocity vector illustrate the picture of filtration flow, regularities of interaction between porous block and high-permeable reservoir, and value of fluid influx through the interface depend upon order parameters.
3. The developed mathematical model allows assessing ratios of coefficients of permeability, piezoconductivity of the block and high-permeable reservoir, required for optimal consumption of withdrawing fluid for efficient development of the field with low permeability and higher power.

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