Автор: Shukurova M.E.
27.05.2020 16:16 - Обновлено 27.05.2020 16:22

METHODS FOR IMPROVING FILTRATION AND NUMERICAL SIMULATION OF LIQUIDS IN A TWO-PHASE (OIL AND GAS) SYSTEM IN A POROUS MEDIUM

Shukurova Markhabo Eshonkulovna (researcher,)

Karshi branch TUIT named after Muhammad Al-Khwarizmi

Annotation

The article discusses the problems of developing software in the Java programming language for two-phase filtering and the problem of two-phase filtering, the main stages of the method of mathematical modeling of various processes on a computer.

Key words: porous medium, filtration laws, oil storage layer, mathematical modeling method, two-phase homogeneous liquids, Darcy's law.

I.INTRODUCTION

For many sectors of the economy, liquid oil in the form of oil is the main source of energy. Their future development depends on an increase in oil production.

At present, the design and operation of new oil and gas fields, as well as the operation of wells, cannot be imagined without applying filtration laws.

ü How to place wells in a given layer;

ü Wells how many wells are in the reservoir and in what order they should be included;

ü What mode of operation should be supported in them;

ü How much water must be pumped into the layer to maintain pressure;

ü The movement of the liquid or gas in the layer must be directed and regulated, and many of these and similar issues are resolved based on the laws of filtration.

When oil is produced by the fountain method under natural reservoir pressure, it is usually impossible to recover even half of the reserves in the field. The rest of the mineral is recovered in one way or another by a secondary method, including pumping water into the oil storage layer and pumping out the remaining oil and water.

For each new field, geology, exploration, drilling, operation and management of the field is very expensive. In this regard, the use of secondary methods for a more complete exploitation of existing oil reserves in existing fields is becoming increasingly important. The effect of increasing oil recovery by 4% at existing fields is equally strong with the launch of several new fields. The development and application of methods, technologies and procedures to increase the level of production of existing oil reserves in these fields is an important task facing the fuel and energy sector of science, technology and economics.

The level of extraction of oil reserves in existing fields directly depends on the operating mode of the field and the optimality of oil production technology. The problem of optimal use of deposits is relevant, requiring a variety of methods, both theoretical and practical. Determining the order and technology of optimal use of the field using field experiments taking into account the characteristics of Iraq, minerals and mining is a complex technical problem associated with

high material and energy costs. In addition, given that the characteristics of the rocks and minerals in each deposit may be unique, natural experiments will have to be carried out separately for each new deposit, and costs will increase in the future.

II. METHODOLOGY

Nowadays, the use of computer technology in scientific and technical research has expanded the possibilities of studying various objects, processes and phenomena based on their mathematical models. The speed and memory capacity of modern computers allow the use of more complex mathematical models to describe physical processes. Computer analysis of the process is not only much cheaper than natural experimental research, but also allows a more complete and deep study of the process.

The demand of our economy for energy sources such as oil is growing day by day. Therefore, the development of techniques, methods and technologies that increase the production of stratified oil in specific fields, theoretical foundations and practical application, the development of software for computer modeling of oil and gas production.

III. EXPERIMENTAL RESULTS

In particular, the improvement of liquid filtration processes in a two-phase (oil and gas) system in a multilayer porous medium, as well as a number of methods for their solution, the solution of stationary and non-stationary filtration in oil and gas layers with poor permeability. To achieve this goal, the following tasks are performed:

ü Construction and research of various mathematical models of two-phase filtration in a porous medium and the process of oil and gas production;

ü The development and justification of methods and algorithms for the numerical implementation of mathematical models;

ü Development of software for modeling and prediction of two-phase filtering processes based on the Java programming language;

ü Carrying out computer experiments on modeling and prediction of two-phase filtration processes;

ü Analysis of the results of computational experiments.

Undeniable, in this process, the following key issues need to be addressed:

ü Problems of two-phase filtration of immiscible liquids in a porous medium at different values of the physical characteristics of the oil-bearing layer and the filtered phases;

ü Mathematical expression of physical conditions in water, oil and gas wells and their numerical implementation;

ü Application of object-oriented programming technology in software development;

ü Carrying out computer experiments to simulate and predict the processes of oil and gas production and analysis of the results.

ü Various forms of generalization of Darcy's law, defined for homogeneous liquids for a two-phase flow;

ü The effectiveness of Java programming technology in software development;

Conclusion

Mathematical models of two-phase filtration processes, algorithms for their numerical solution and developed software can be used to study the processes of joint flow of immiscible liquids in a porous medium, to determine the optimal order of oil and gas extraction processes. In a multiphase flow, part of the pores of the medium is occupied by one phase of the liquid, and the rest by the second and third phases.

The concept of the saturation function of each phase is introduced to characterize the amount of each liquid in a porous medium. The required phase saturation function is defined as the ratio of the pore volume occupied by the phase to the total pore volume.

Literature

1) Yaroslav Pokotny, Vaclav Turnip, Karel Richt, Vita Wojtowski, Henry Linger, Chris Berry, Michel Lang. Development of information systems. Business systems and services: modeling and development. ISBN: 978-1-4419-9645-9.2011.

2) Abutaliev F.B., Nazirova E.Sh. Computational algorithm for solving three-phase fluid filtration problems in porous media. // Uzbek journal Problems of informatics and energy. - Tashkent, 2010 .-- p. 35-42.

3) Anashkina N.V. Technologies and programming methods. 2012, 384 p., Academ.