

NEW TECHNOLOGIES FOR INCREASING OIL RECOVERY

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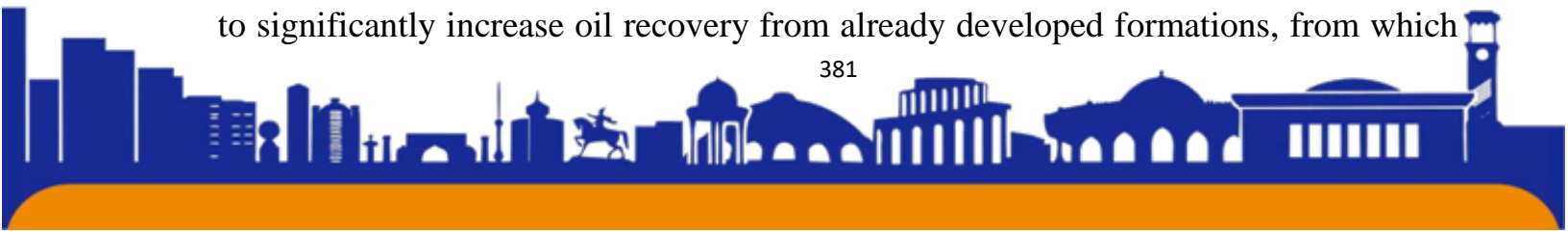
Аннотация: в статье анализируются методы увеличения нефтеотдачи, применяемые на сегодняшний день. Применение методов увеличения нефтеотдачи на нефтяных месторождениях предназначено для повышения эффективности разработки месторождения. Существует несколько групп этих методов, применяемых у нас в России и за рубежом. В статье рассмотрены основные из этих методов, используемых для увеличения коэффициента извлечения и оптимизации системы разработки.

Ключевые слова: методы увеличения нефтеотдачи, нефтяное месторождение, трудноизвлекаемые запасы, гидродинамические методы, физико-химические методы, газовые методы, тепловые методы.

Abstract: the article analyzes the methods of increasing oil recovery used today. The use of enhanced oil recovery methods in oil fields is intended to increase the efficiency of field development. There are several groups of these methods used here in Russia and abroad. The article discusses the main of these methods used to increase the recovery rate and optimize the development system.

Key words: enhanced oil recovery methods, oil field, hard-to-recover reserves, hydrodynamic methods, physical and chemical methods, gas methods, thermal methods.

The efficiency of oil extraction from oil-bearing formations using modern, industrialized development methods in all oil-producing countries today is considered unsatisfactory, although the consumption of petroleum products throughout the world is growing from year to year. The average final oil recovery of reservoirs in various countries and regions ranges from 25 to 40%. For example, in the countries of Latin America and Southeast Asia, the average oil recovery is 24–27%, in Iran – 16–17%, in the USA, Canada and Saudi Arabia – 33–37%, in the CIS countries and Russia – up to 40%. , depending on the structure of oil reserves and the development methods used. Residual or non-recoverable oil reserves using industrial development methods reach on average 55–75% of the original geological reserves of oil in the subsoil. Therefore, the tasks of applying new oil production technologies are urgent, allowing to significantly increase oil recovery from already developed formations, from which



it is no longer possible to extract significant residual oil reserves using traditional methods. Oil reserves can be divided into several categories. Conventional reserves are those that are economically extractable using current technologies that have already been developed and are available. Hard-to-recover reserves are those that can be extracted by reducing tax burdens or providing some benefits. They also highlight unconventional reserves - those reserves for which humanity currently does not know the extraction technologies. Also, the number of fields with hard-to-recover reserves has now increased. Low oil recovery factors are caused by a lack of necessary technologies for developing hard-to-reach deposits. Based on this, an urgent task in the modern world is the use of new technologies and methods for increasing oil recovery from fields where it is impossible to extract significant residual oil reserves using traditional methods. All over the world, interest in methods for enhancing oil recovery is growing every year; laboratory, scientific and field studies are being conducted to identify the most effective methods of influencing the formation. Modern methods of increasing oil recovery are, to one degree or another, based on waterflooding.

The effectiveness of extracting raw materials from reservoirs is determined by modern methods of developing deposits.

Today, the recovery of hydrocarbons is considered unsatisfactory, given that their use is constantly increasing.

The average oil recovery rate for all countries is from 25 to 40%. So, for different countries it looks like this:

Latin America and Southeast Asia – 24-27%; Iran - 16-17%;

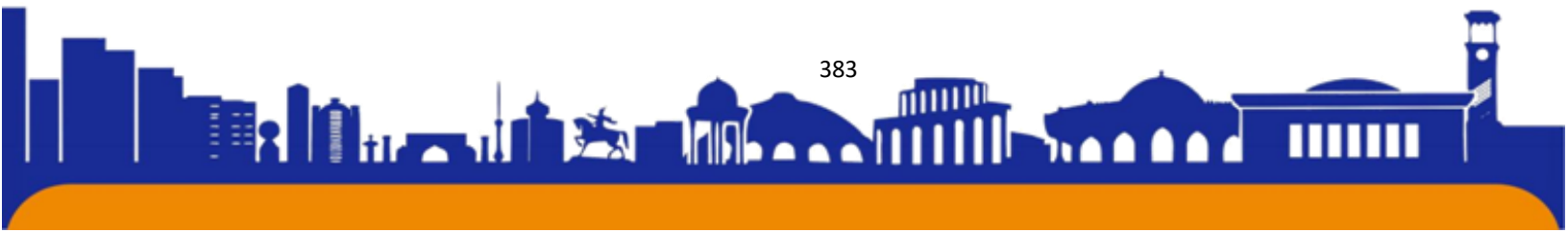
USA, Canada, Saudi Arabia - 33-37%; CIS countries and Russia – up to 40%.

The indicator directly depends on the content of raw materials reserves and the methods used. To increase the efficiency of extracting raw materials from reservoirs, it is necessary to apply new technologies to enhance oil recovery.

At the same time, interest in innovative technological solutions is growing every day. This is due to the fact that residual or non-recoverable industrially developed reserves of raw materials reach on average 55-75% of the original deposits in the reservoir.

New technologies make it possible to extract the remaining volumes of hydrocarbons. Traditional methods no longer provide maximum results.

In order to increase the economic efficiency of field development, reduce direct capital investments and maximize the use of reinvestments, the entire period of field development is usually divided into three main stages. At the first stage, the natural energy of the formation (elastic energy, energy of dissolved gas, energy of edge waters, gas cap, potential energy of gravitational forces) is used as much as possible for oil production. At the second stage, methods are implemented to maintain reservoir pressure by injecting water or gas. These methods are usually called secondary. At the third stage, to increase the efficiency of field development, enhanced oil recovery (EOR) methods are used: Among them, four main groups can be distinguished: 1) hydrodynamic methods - allow you to intensify current oil production, increase the degree of oil recovery, and also reduce the volume of water pumped through the formations and reduce current water cut of the produced fluid. For example, cyclic flooding, changing the directions of filtration flows, forced liquid withdrawal; 2) physical and chemical methods - waterflooding with the use of active impurities (surfactants, polymers, alkalis, sulfuric acid, carbon dioxide, micellar solutions); 3) gas methods - the method is based on the injection of air into the formation and its transformation into effective displacing agents due to low-temperature in-situ oxidation processes. As a result of low-temperature oxidation, a highly effective gas agent containing nitrogen, carbon dioxide and NGL (broad fractions of light hydrocarbons) is produced directly in the formation. For example, water-gas cyclic impact, displacement of oil by high-pressure gas; 4) thermal methods are methods for intensifying oil flow and increasing the productivity of production wells, based on an artificial increase in temperature in their trunk and bottom-hole zone. Thermal EOR is used mainly in the production of highly viscous paraffinic and resinous oils. Warming up leads to liquefaction of oil, melting of paraffin and resinous substances deposited during the operation of wells on the walls, risers and in the bottom-hole zone. For example, steam cyclic treatment, in-situ combustion, the use of water as a thermal solvent for oil.



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