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Increased gas recovery at the final stage of development of natural gas fields in a water pressure mode

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ABSTRACT: The article discusses the main tasks of the gas industry and finding a set of optimal technical and economic solutions to increase gas recovery at the final stage of the development of natural gas fields in a water pressure mode. Also, the main method of increasing the gas recovery factor at the final stage of field development with a water-driven regime is the implementation of forced gas and water extraction by operating water-cut wells and methods to prevent emerging development complications, tested by various design options for further development and technical and economic analysis of design solutions. Recommendations are given for increasing the rate of natural gas production by means of a water pressure regime.

KEYWORDS: reservoir, gas content, flooding, water-sand production, production, extraction, micro entrapment, bottom hole pressure, maintaining reservoir pressure.

I.INTRODUCTION

At present, one of the urgent problems is to increase the efficiency of systems for the development of natural gas deposits entering the final period of operation. At the final stage of field development, residual gas reserves are classified as hard-to-recover by geological, technological and economic criteria, and the produced gas is classified as low-pressure in terms of energy and economic indicators. To maintain proper levels of gas production from fields at a late stage of development, as well as to take effective measures to use the remaining low-pressure gas in them, new scientific, technical and technological solutions are needed. In such conditions, an integrated approach to the management of field development is required on the basis of the introduction of innovative solutions, timely modernization and technical re-equipment of the fields, optimization, operating modes of the field equipment.

The main problems in the fields that are at the final stage of development are: a decrease in the production capacity of the reservoir and the productivity of wells; watering of deposits and intense water and sand showings during the operation of wells; physical and obsolescence of field equipment, requiring constant renewal and, accordingly, significant amounts of capital investments in the reconstruction and technical re-equipment of facilities.

In the flooded zones, micro and macro trapped gas are distinguished, micro trapping of gas with water is due to the heterogeneity of the structure of the pore space of productive sediments. Micro-trapped gas is dispersed in a porous medium, in the form of separate, disconnected bubbles, and is firmly held by capillary forces acting at the interface. Under real conditions, the pressure gradient is practically motionless. The change in the residual gas saturation due to gas diffusion is also insignificant.

To extract micro-trapped gas, it is necessary to reduce the pressure in the kick-in volumes of the formation. This will lead to the expansion of the residual gas and the formation of a network of communicating channels for its movement.

Due to the uneven movement of the gas-bearing contour, separate gas-saturated areas may remain in the wind-up zone, bypassed and estimated by the front of the penetrating water.

Micro entrapment of gas is associated with a heterogeneous structure and uneven drainage of productive deposits, as well as the manifestation of an initial pressure gradient in poorly permeable layers during gas and water filtration. Macro trapping of gas also contributes to the conduct of isolation works in flooded wells and their premature shutdown from the existing stock.

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Recovery of macro-trapped gas is possible by drilling additional wells in gas-saturated zones and reducing the pressure in the surrounding watered areas of the formation.

The study of two-phase filtration of a gas-liquid mixture in a porous medium shows that a free gas passes through the water of a gas in a saturated rock practically without losses, and in some cases even involves a part of a micro-trapped gas.

To drill additional wells, it is necessary to establish the location of gas saturated zones, which is not always possible, and also requires significant costs.

Therefore, the main method for increasing the gas recovery factor at the final stage of field development with a water-driven regime is the implementation of forced gas and water withdrawal by operating water-flooded wells.

According to the results of experimental studies, in the initial period of pressure reduction in the watered volumes of the formation, the trapped gas expands and practically does not move, and water is mainly extracted from the formation. The maximum water consumption is observed in the initial period, then it falls. Initially, the insignificant gas flow rate gradually increases, reaches a maximum, and further decreases. The gas-water factor changes in a similar way. A decrease in pressure in the watered volumes of the formation is accompanied by an increase in the gas saturation of the porous medium. in this case, part of the gas becomes mobile and is extracted together with water.

In the case of inflow downstream of the loop water, the performance of the residual gas production process deteriorates. In this regard, it is very important to speed up the extraction of the gas-liquid mixture from the watered reservoirs. This will shorten the time before field development and reduce the volume of water withdrawn.

The method of secondary gas production from flooded reservoirs was patented for the first time in the USA. With a decrease in pressure, all the expanding gas becomes mobile, migrates to the upper part of the structure and is extracted through free wells, which, after operating for a short time with gas and water, are converted to pure gas.

In subsequent years, several methods have been published devoted to the secondary production of gas from flooded fields. In order to increase the final gas recovery factor, it is proposed to withdraw water from the wells at bottomhole pressure, which is 25% lower than the formation pressure.

After the completion of the primary development of the field in conditions of complete flooding, intensive water withdrawal is carried out mainly from wells located in the vicinity of the initial gas-bearing contour. This contributes to the creation of a zone of reduced pressure in the roof part of the structure, due to which part of the residual gas can be additionally recovered in pure form or together with water.

The reality and effectiveness of active stimulation of an aquifer in order to extract trapped gas is evidenced by data on gas condensate fields. As a result of the general decrease in pressure in the gas and flooded zones in a number of germinating flooded wells, no gas manifestation was noted over time, and they are periodically operated with the extraction of gas with water.

It should be emphasized that it is much more difficult to organize the extraction of dissolved gas from aquifers than the development of watered gas deposits.

In order to maintain reservoir pressure, the produced gas is re-injected into the reservoir. This oil rim development technology is considered to be very effective.

During the development of the field, formation water was actively introduced, which led to the watering of a part of the gas in the saturated volume of the formation. Mathematical modeling of the process before field development has shown that an increase in the final gas recovery factor can be achieved by forming gas withdrawal from the gas zone.

Its introduction helps to reduce the pressure of gas entrapment by water and the secondary production of a part of the entrapped gas from the flooded volumes of the formation. As a result, the final gas recovery coefficient is increased.

In order to increase the final gas recovery factor of deposits, the possibility of organizing secondary gas production by means of intensive water withdrawal was studied.

How the application of the technology of secondary gas production by intensive withdrawal of water from flooded formations allows to increase the coefficient of final gas recovery at the final stage of development of drive fields in a pair mode.

In the process of sampling gas from gas fields confined to reservoir water-pressure systems, gas flows into the saturated part of the marginal or bottom water layers, flooding and disposal of the well from the producing fund due to heterogeneous construction.

Gas fields have been explored by several scientists who are dedicated to the secondary production of gas from flooded fields.

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The research carried out made it possible to solve the following technological and technical and economic problems:

• to reduce by 1-2% the loss of reservoir energy during the development of large gas fields due to the redistribution of production levels between production areas;

• to ensure the minimum retirement of wells from operation due to their low productivity and water cut;

• to carry out a number of measures for the reconstruction of field equipment to ensure the fulfillment of planned targets for gas production;

• to improve the scheme of functioning of air coolers in severe conditions of compression, which made it possible to reduce energy consumption by 14-15%;

• to reduce by 5-10% the pressure loss in the system inside the field gas transport.

As a result of research and generalization of data on the history of gas field development, with the technology and technology of gas production, the following conclusions were drawn:

1. It has been established that the main problems of gas production from deposits at the final stage of development are: decrease in production capabilities; flooding and intense water and sand production in production wells; physical and moral deterioration of field equipment, requiring constant renovation, reconstruction and technical re-equipment. Seasonal changes in gas production also negatively affect the operation of unstable wells and field equipment.

2. Based on the results of the analysis of various approaches to the problem of assessing gas reserves, a method for determining the final gas recovery factor was proposed, based on taking into account both the geological and field parameters and the state of the field infrastructure, which makes it possible to develop recommendations for the reconstruction of gas production facilities. The principle of operational regulation of the development of gas and gas condensate fields has been substantiated, which consists in minimizing pressure losses in the system “reservoir - well - gas gathering networks - BCS - UKPG”, which allows increasing the final gas recovery by 1-2%.

REFERENCES

1. Aliev 3.S., Bondarenko V.V. Gas Development Design Guide; and gas condensate fields.-Pechera: publishing house; "Pechersk time", 2002. 894 p.
2. Basniev K.S., Dmitriev N.M., Rosenberg G.D. Oil and gas hydromechanics. M., Izhevsk, 2003 .-- 479 p.
3. Shirkovsky A.I. Development and operation of gas and gas condensate fields. –M .: Nedra. 1987 year