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Simultaneous Separate Operation of Several Productive Horizons in Gas Wells of the Gazli Field

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Abstract
Background: The paper considers options for further development X, XI and XIII horizons of the Gazli field with the use of a system of simultaneous-separate operation (SSO). The use of the SSO system will make it possible to reduce the costs of well construction by almost two times due to the combination of production facilities, as well as on internal field communications.
Keywords: production facilities, internal field communications.

1. Introduction

The use of the technology of simultaneous-separate exploitation is advisable if there are separate productive layers in the section of a multi-layer field that differ in reservoir properties, physico-chemical properties and occurrence conditions.

At present, for the Gazli field, the most acceptable option, from an economic point of view, is to involve additional horizons in the development. Under the current conditions, an effective solution is the development and implementation of systems for simultaneous-separate operation at the stages of declining production, when the proportion of residual reserves is quite large, and the reservoir energy is almost exhausted. All of the above determines the relevance of this work.

In order to analyze and justify the effectiveness of the simultaneous-separate operation of wells that penetrated the X, XI and XIII horizons of the Gazli field, the following tasks were performed:

- The initial materials obtained in the process of analyzing the geological features, extracted and residual reserves of the field, the history of the development of the field, the fund and the history of well operation are analyzed;

- The effectiveness of the application of the WEM technology is analyzed;

- Forecast of development indicators in various modifications of well design, technological modes of well operation.

The results of some development indicators for various development options are shown in Table 1. From an economic point of view, it is expedient to use the method of simultaneous-separate operation of three productive horizons to extract residual reserves of natural gas. The method of simultaneous - separate operation of three horizons significantly reduces the number of production wells (Table 1) and commercial reservoirs, which in turn will significantly reduce the cost of the project.

Analysis of the table shows that the application of the WEM method leads to a reduction in the number of wells by almost half. The highest value of the gas recovery factor (GER) is achieved when the well is operated at a constant drawdown developed by a system of horizontal wells - 87.2% on the one hand, on the other hand, this option requires the construction of 169 wells, which in turn will significantly increase the cost of the entire project. The project term will be 20 years, of which 10 years is a period of declining production.

Table 1

Number of planned production wells

Option	Well operation mode	Number of wells in separate operation by horizons, pcs			The sum of wells for three horizons of separate operation, pcs.	Number of wells for three WEM horizons pcs.
		X	XI	XIII		
Syst . vertical well WEM	ΔP= cons t	169	72	57	298	169
Syst . vertical well WEM	Py = const	fifteen	27	28	70	34
Syst . vert.well.wre.radial	ΔP= cons t	29	fourteen	35	78	43

To determine an effective option for additional development , a summary of the results of calculations of the main development indicators is given in Table N.2.

table 2

Options and main indicators of follow -up development

Option	index				
	well operation mode	Qsak , billion m ^{3}	Number of wells , PCS	CIG, %	pre-development period , year
syst . vertical well WEM	ΔP= const	44.436	169	87.2	twenty
syst . vertical well WEM	R_y = const	31.619	34	64.8	16
syst . horiz . well _ (separately)	ΔP= const	41.476	60	81.4	twenty
syst . horiz . well _ (separately)	R_y = const	34.351	58	67.2	twenty
syst . vert.well.ORE , radial	ΔP= const	40.389	43	79.3	eighteen

2. Methods

The variant with the well operation mode at a constant wellhead pressure, developed by vertical wells, showed the lowest KIG coefficient - 64.8%. This is due to low reservoir pressures, the period of additional development of the X (reservoir pressure 0.93 MPa) horizon will be 6 years with KIG - 33.6%. With this option of additional development by the method of simultaneous-separate operation, the number of wells is the smallest - 34 pcs.

The construction of horizontal wells is complicated by the fact that productive formations have low formation pressures, which can lead to clogging of the horizontal wellbore and create difficulties in inducing fluid inflow. Relatively small effective reservoir thicknesses (6.6-9.1 m) will significantly complicate the construction of horizontal wells and, consequently, their cost. KIG slightly differs from the base case, the difference was -5.8% in the constant drawdown mode and +2.4% in the constant wellhead pressure mode. The number of wells operating under constant drawdown and constant wellhead pressure will be 60 and 58 , respectively. It should be noted that the construction of horizontal wells will be a significant part of the costs, because. the object is complicated by low power and low reservoir pressure. The development period, as well as in the base one, will be 20 years.

The option of developing a system of vertical wells using the WEM method in combination with the technology of drilling lateral orientable wells shows the best results in terms of predictive indicators. The number of wells in this case reaches 43 units with a CIG of 79.3%, the development period is 2 years less than with the base case and the option with horizontal wells. The above analysis showed the effectiveness of the use of WEM together with the method of plano-radial opening of the formation for additional development X , XI XIII horizons of the Gazli deposit. The use of the WEM method assumes that the underlying formation will be further developed along the tubular space, and the overlying formation along the annular space, thus, the calculation of sand production from the bottom of the well allows tubing of a larger diameter for the development of X and XI horizons with a nominal diameter of 114 mm and an inner row with a nominal diameter of 73 mm.

The analysis showed the effectiveness of the use of WEM together with the method of plano-radial opening of the formation, for additional development X , XI XIII horizons of the Gazli field is the most acceptable. Applying the constant drawdown mode to the formation for additional development of objects, it is possible to obtain a pressure difference at the wellhead, which can be used as the energy of ejection of natural gas of the X horizon due to the greater energy of the underlying horizons through the field pipeline, thus, such a solution will allow effective additional development X and increase the gas recovery factor.

Having analyzed all the above options for additional development and taking into account the features of X , XI and XIII horizons such as the fact of depletion of productive horizons, low reservoir pressures, relatively small interlayers of effective reservoir thickness, the presence of the existing vertical well stock, we can say that the use of WEM in combination with plano-radial opening of the reservoir allows increase the drainage radius, increase the productivity of the well, use wells from the existing well stock, after carrying out the relevant work on the overhaul.

References

1. Алиев З.С., Мараков Д.А. Учебное пособие «Разработка месторождений природных газов» для ВУЗов М.: Изд. «Нефть и Газ», 2011 г.,542 с.
2. Гриценко А.И., Алиев З.С., Ермилов О.М. и др. Руководство по исследованию скважин. М.: Наука, 1995.
3. Одновременно-раздельная эксплуатация и «интеллектуализация» скважин: вчера, сегодня, завтра / В. И. Ивановский // Инженерная практика. - 2010. - № 1. – С. 4-15.
4. Вафин Р.В., Вафин Т.Р., Щекатурова И.Ш. - Об опыте разработки совместно-разноименных пластов с применением технологии одновременно-раздельной эксплуатации. Нефтепромысловое дело. - 2014г. № 8. С. 5-11. 2.
5. Ивановский В.Н. - ОРЭ и «интеллектуализация» скважин»: вчера, завтра, сегодня. Инженерная практика. 2011. - 156-159 с. 3.
6. Цику Ю.К. - Сургутнефтегаз: конструкции одновременно-раздельной и совместной добычи нефти / Научно-технический журнал «Нефтегазовая вертикаль», 2013. - № 20. С. 62-65. 4.
7. «Технология одновременно-раздельной эксплуатации трех пластов» Матуров Р.Р. Научно-технический журнал «Инженерная практика». - 2015. - № 8. - С. 64-67.