THE EXAMINATION OF COMPLEX PROJECT OF ACHIMOV RESERVOIR GAS CONDENSATE FIELD DEVELOPMENT
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Abstract: article created a geological and the hydrodynamic sector model of the deposit, developed a detailed long-term development project that maximizes recoverability of condensate for a period of 15 years, conducted an investment assessment and detailed the economic effectiveness of the proposed project. As a result of low permeability, a large number of lenses and heterogeneity collection properties, it was decided to implement 210 wells on the area of 825 square km, provide hydraulic fracturing. That would result in total production of condensate over 15 years equal to 240620 tonnes. Therefore total amount of investments is 64.76 billion rubles (1.1 billion dollars), total income from sales is 500.7 billion rubles (9.1 billion dollars).
Keywords: gas-condensate, field development, gas recovery.

ИССЛЕДОВАНИЕ КОМПЛЕКСНОГО ПРОЕКТА РАЗРАБОТКИ АЧИМОВСКОГО ГАЗОКОНДЕНСАТНОГО МЕСТОРОЖДЕНИЯ
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Аннотация: в статье были построены геологическая и гидравлическая модели месторождения, а также разработан проект разработки месторождения и добычи газоконденсата на 15 лет, проведен анализ инвестиций и экономической эффективности проекта. Так как проницаемость пласта низкая, а коллекторы имеют линзовидную форму, было решено ввести в эксплуатацию 210 скважин на площади 825 квадратных километров, провести гидроразрыв пласта. В результате через 15 лет будут добывать примерно 240620 тонн газового конденсата, инвестиции составят 64.76 миллиарда рублей, выручка от продажи составит 500.7 миллиарда рублей.
Ключевые слова: газоконденсат, разработка месторождения, добыча газа.

The geological structure of the Achimov deposit is represented by platform formations of different periods - Jurassic, Cretaceous and Paleogene - Quaternary. They lie on the foundation of rocks of pre-Jurassic age [5].

The Achimov beds are reservoirs with a very complex distribution of lenticular bodies. In the Achimov deposits, several local reference strata of clays 3-15 meters thick are distinguished. These strata divide the Achimov strata into several independent layers. Lenticular form of sand bodies of the clinoform sequence, their reliable isolation provide a dense package in space, so the potential deposits in such bodies are almost independent of anticlines, but are controlled by the intrinsic morphology of each individual lens and the quality of the collectors and represent rather a layering of a broken or stepped structure [6].

The reservoir is characterized by poor and heterogeneous reservoir properties, low permeability, complicated by tectonic and lithological screens, characterized by a multiphase reservoir condition. In addition, the Achimov deposits are characterized by abnormally high reservoir pressure, more than 600 atmospheres, and the presence of heavy paraffin (Figure 1) [2].

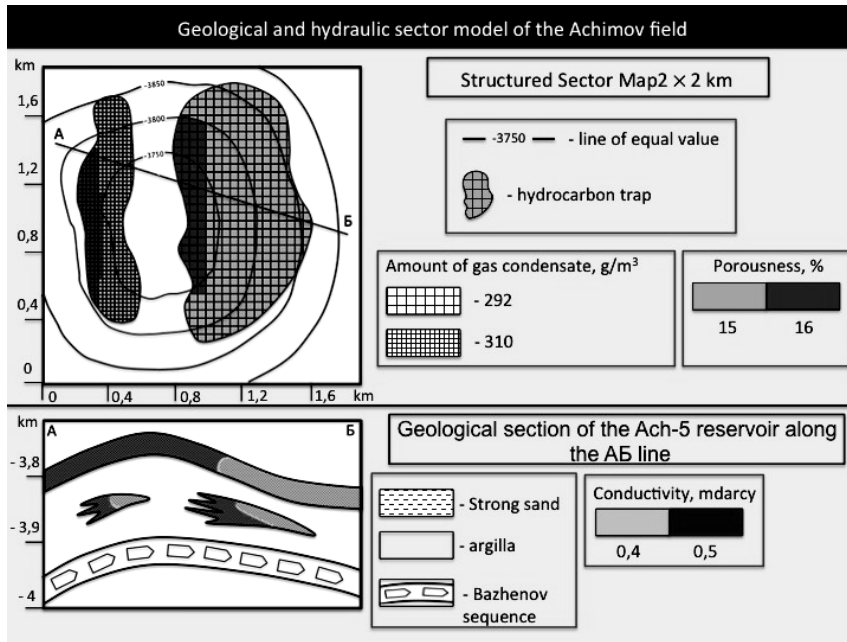Here is the plotted geological sector model of the Achimov field.

Fig. 1. Geological and hydraulic sector model of Achimov field

As a result of investigated properties of the reservoir it was decided to put in 200 horizontal multi-hole wells with uniform location. That will give us minimal number of wells and equal pressure. The scheme of exploitation (Figure 2).
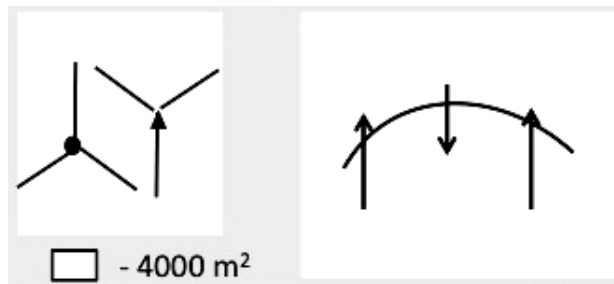

Fig. 2. The scheme of exploitation

The effectiveness of multi-study hydraulic fracturing would be 2 times more than simple hydraulic fracturing with the same cost. It would also have 100 metres length of the crack versus 20 metres for hydraulic fracturing. [1, 3].

Next figure shows the strategy for production operation for next 16 years. (Figure 3).
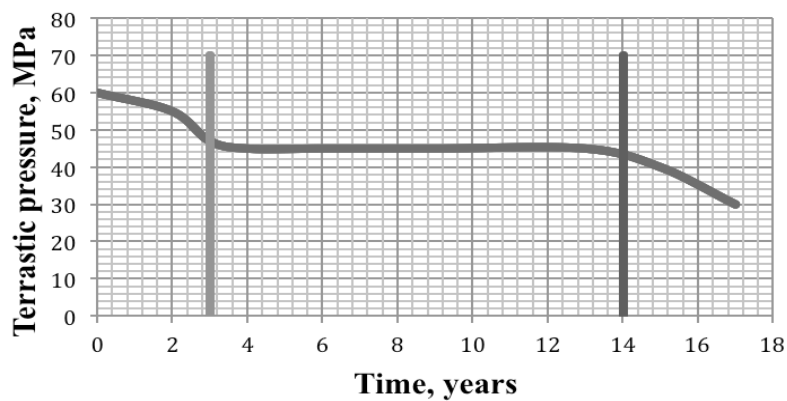

Fig. 3. The dependence of terrastic pressure during production activity on time for the next 16 years

Another plotted graph gives information on expected condensate production during the upcoming 16 years. (Figure 4)
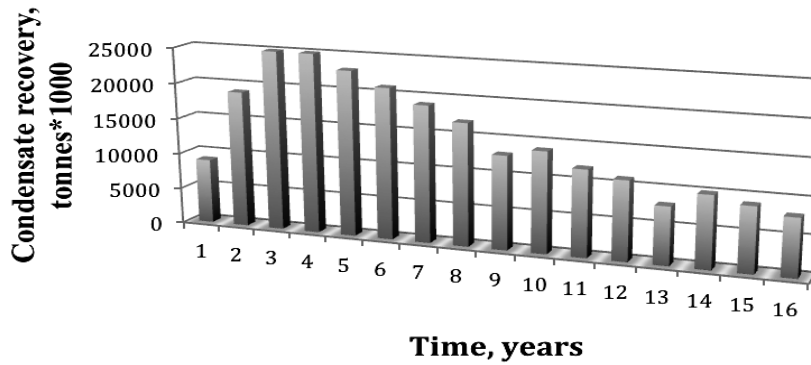
Fig. 4. Dependence of condensate recovery(thousand tonnes) on timefor the next 16 years

Table 1. The parameters of Achimov field production

Initial gas reserves	Average production rate of 1 well	Total gas recovery after 15 years
138 billions m³	1095000 tonnes	240620000 tonnes

Here is the process flowsheet and the infographic of holding (Figure 5).
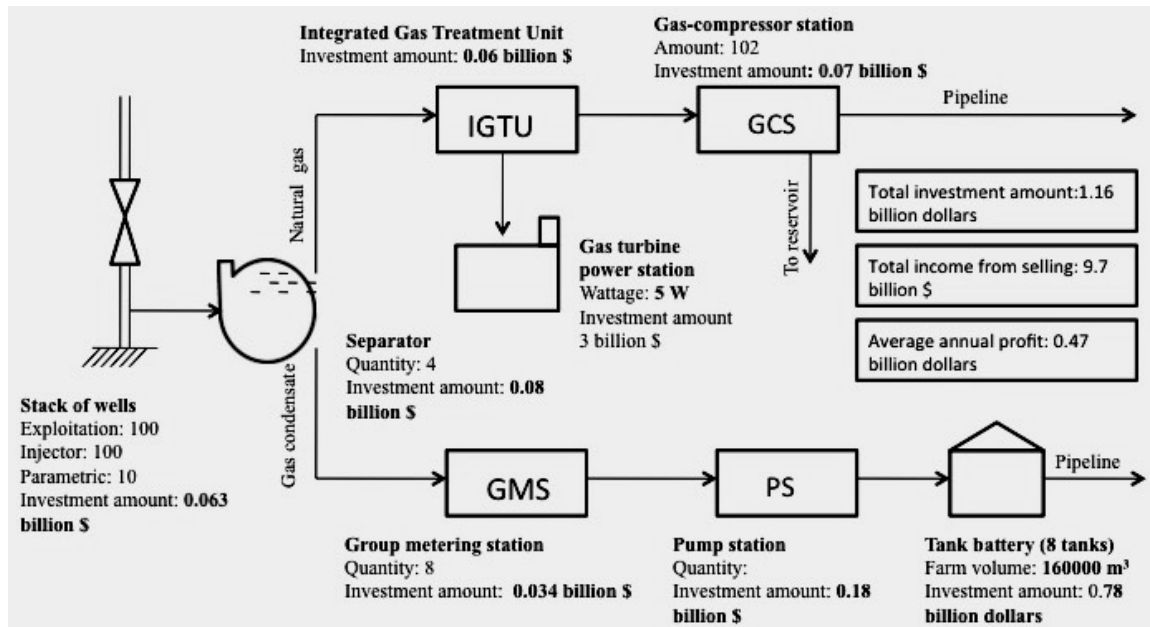

Fig. 5. Process flow sheet and info graphic of holding

CAPEX. Well stock: drilling of a horizontal well with a hydraulic fracturing of the reservoir with an average depth of 4000 m - 3 million $. 200 wells (100 exploitation, 100 injection) - 0.6 billion $. Borehole of a parametric borehole 4.5 million $. 10 parametric wells - 2.5 billion rubles.

Equipment: The separator with a capacity of 440 thousand m³ / h, based on our production rate, there are 2 separators + 2 reserve ones – 0.72 million $. Compressor capacity of 19500 m³ / h (T = 118 C, P = 5.5 MPa). It is necessary to build 102 compressors (one per injection well for injecting gas into the reservoir, 2 to maintain pressure in the main pipeline - 0.07 billion $).

GMS "Sputnik". Counts the production rate of 14 wells, it is necessary to have 8 such facilities – 0.15 million $. Pumping station: Capacity 335 m³ / h. Requires 2 stations to maintain condensate pressure in the main pipeline – 0.14 million $.

IGTU. The device for cooling gas - 3 units – 0.2 million $, Cyclone 27000 m³ / h - 3 vehicles – 0.11 million $, Three-stage separator - 2 complexes – 0.73 million $, Security hangar – 0.05 million $. Tank farm. 8 tanks for condensate storage, equipped with a floating lid and heating, volume 20000 m³

Buildings and constructions: Electric station for 5 MWh. The power plant receives 40% of the produced gas, with a specific heat of combustion of 46KJ / mol and an efficiency of 45% will produce power up to 3.5 MWh

with the possibility of increasing the energy production up to 5 MWh while expanding the development zone – 0.08 mln $.

Operator room with administrative premises. Area - 800 m^2, 2 floors – 0.55 million $, Fire Department Equipped with a water storage tank / foam, 4 firemen ATV – 0.9 million $ Communications: borehole drilling for water – 1.8 thousand dollars. Water tower – 4.55 thousand dollars. The total cost: if we assume that the cost of developing a project is approximately 10% of the cost of equipment, and installation and commissioning is 50%, then

Σ = (0.74 billion $) x 160% = 1.184 billion $.

EBITDA recovery factor = 0.6 – 8.5 billion $.

The first 4 years we receive a profit from its sale. According to schedule, given the development capacity and the fact that only 60% of natural gas is used for production, it will go for sale in the first year - 0.014 billion, 2-year - 0.028 billion, 3-year - 0.042 Billion, 4-year – 0.056 billion cubic meters of natural gas. At the gas rate as of March 7, 16, 0.08 $ per 1 cubic meter of gas, we will receive a profit from gas sales for 4 years - 0.59 billion $, Σ = 9.7 billion $.

REVEX. Monthly costs are composed of salaries to employees, depreciation of work equipment, taxes. The average monthly income is 0.05 billion $, the tax is composed of the Value Added Tax 18% and the tax on the extraction of minerals (for gas condensate 11.8 $ from each ton of extracted raw materials), the monthly expenditure on taxes: 9.09 million + 84 million = 1.53 million $. About 30 people will be involved in this field, the average salary is about 1.8 thousand, the expenditure on the reserve is 0.054 million $. Depreciation of equipment, taking into account its service life of 20 years, about 0.36 million $ [9], Σ = 11.046 million $.

FCF. The net profit taking into account the deduction of expenses in the time interval equal to one month is Σ = 0.04 billion $.

NPV. Reading the profit for the entire development period, taking into account the deduction of monthly expenses and capital expenditures.

Σ = 9,7 billion $ - 2.22 billion $ = 7.48 billion $, Σ = 7.48 billion $.

In order to access the profit was plotted a chart showing the dependence of number of different wells on 15 years operating period (Figure 6).
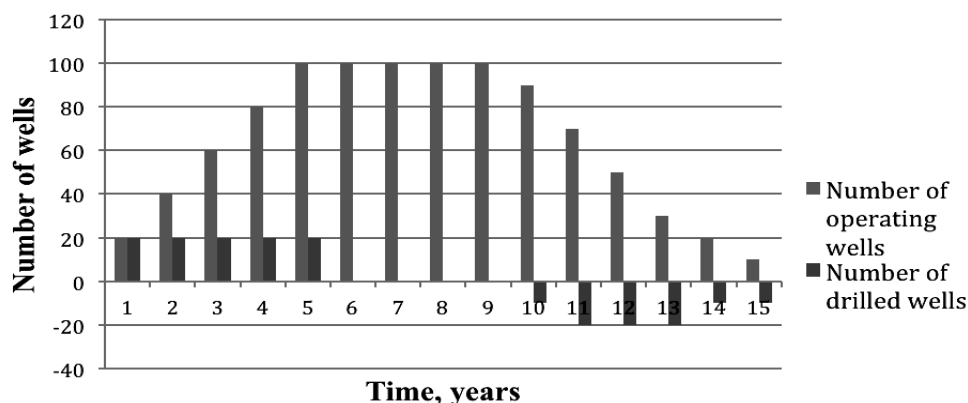

Fig. 6. Dependence of operating and drilled wells from time

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