CASE STUDY:

GAZPROM GEOLOGORAZVEDKA COMES UP WITH A NEW METHOD OF FINDING RESERVOIR HYDRODYNAMIC PARAMETERS TO IMPROVE THE EXPLORATION EFFICIENCY ON THE ARCTIC SHELF

CONTENTS

DISCLAIMER

This case study has been written by Aleksei Afonin, Russian Oil & Gas Translation Services, exclusively as a **TECHNICAL WRITING SAMPLE**.

The author of this sample case study has made every effort to document all the information accurately and completely based on publicly available data.

The author assumes no liability for any errors or damages that may result from the use of this sample case study.

SUMMARY

Gazprom Geologorazvedka, a ***Gazprom***'s subsidiary, was faced with the tasks of optimizing the methodology of geological exploration, improving its cost efficiency, and reducing its negative environmental impact.

A new method developed by the company's experts has provided a solution. It allowed finding hydrodynamic parameters of productive oil or gas reservoirs using data obtained from hydrodynamic logging and wireline formation testing tools integrated with geophysical well logging data.

QUICK FACTS

Company: ***Gazprom Geologorazvedka, LLC***

Industry: oil and gas exploration

Headquarters location: Tyumen, Russia

Number of projects: 60 license blocks

Number of employees: over 700

ISSUES

According to the Russian classification of oil and gas reserves and resources effective from January 01, 2016, in order to be able to classify a hydrocarbon reservoir as “explored” or “prepared for development”, it is required to use cased-hole testing to directly obtain — among other parameters — commercial oil and gas flow rates, as well as hydrodynamic and commercial parameters of that reservoir.

Cased-hole testing methods using legacy hydrodynamic logging and wireline formation testing tools had the following typical disadvantages:

Considerable Financial and Time Costs

In the conditions of the Arctic shelf, it is impossible to test all potentially productive reservoirs in a wildcat during one season due to a short navigation period which only lasts for two to three months. Taking two seasons to drill a well significantly increases the exploration time and hence the time needed to prepare the field for commercial development, thereby increasing financial costs.

Scarce Data

Cased-hole testing involves only random measurements of reservoir pressures and sampling of reservoir fluids at given points. So it covers only the perforation interval of the well. The rest of the productive reservoir penetrated by drilling remains unexplored.

Environmental Aspects

Significant amounts of natural gas and gas condensate are burned during the steady-state development of highly productive reservoirs, with gas flow rates of up to a million cubic meters per day.

SOLUTIONS

The problem is solved by finding the hydrodynamic parameters of productive oil or gas reservoirs using the hydrodynamic logging and wireline formation testing tools in open holes to initiate inflows of the reservoir fluid on the surface. No running the casing string in the hole, no perforation, and no cased-hole testing is needed in this case.

The method involves conducting a certain number of measurements (depending on the type of the section, the reservoir properties, and the degree of heterogeneity) and integrating this data with geophysical well logs.

The method includes the following steps:

1. Effective permeabilities are measured at given points.
2. The function of absolute permeability vs. effective permeability is then used to obtain an effective permeability curve for the entire productive interval.
3. The effective permeability curve is used to calculate the conductivity ratio for each interlayer.
4. The total conductivity ratio is calculated based on the conductivity ratio values and the reservoir fluid parameters.
5. After that, the Dupuis equation is used to calculate the productivity index for the entire reservoir penetrated in the well or part of it.
6. Inflow performance relationship (IPR) curves are then built. These are used to predict well flow rates for a range of underbalance conditions.

RESULTS

1. This method for estimating the reservoir hydrodynamic parameters based on hydrodynamic logging and wireline formation testing now allows reducing the number of cased-hole tests, and hence the exploration time, without any data loss.

2. The new solution also allows monitoring reservoir fluid parameters online from the surface, changing the underbalance conditions, and recording the PBU (pressure build-up) curve.

3. Data obtained using this method can also be used to assess the quality of predictions based on cased-hole tests.

S.Ye. Dmitriyev, S.A. Kurdin, A.A. Martyn, V.N. Khoshtariya are the inventors of the new method. The patent for the invention was registered in the State Register of Inventions of the Russian Federation on October 17, 2018.

РОССИЙСКАЯ ФЕДЕРАЦИЯ

ПАТЕНТ

НА ИЗОБРЕТЕНИЕ

№ 2669980

СПОСОБ ОПРЕДЕЛЕНИЯ ГИДРОДИНАМИЧЕСКИХ ПАРАМЕТРОВ ПРОДУКТИВНЫХ ПЛАСТОВ

Патентообладатель: *Общество с ограниченной ответственностью "Газпром геологоразведка" (RU)*

Авторы: *Дмитриев Сергей Евгеньевич (RU), Курдин Сергей Алексеевич (RU), Мартын Антон Александрович (RU), Хоштария Владислав Николаевич (RU)*

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RESULTS

"Today, we've found another confirmation of the high scientific potential of our employees. We are capable of not only implementing large-scale production projects in various regions of our country under the most adverse climatic conditions. While solving ongoing problems, the company's experts also find opportunities for successful research that increases productivity and gives a significant economic effect," Alexey Davydov, Gazprom Geologorazvedka CEO, said.

CONTACT US

For more information, visit **http://geologorazvedka.gazprom.ru** or contact Gazprom Geologorazvedka press relations office at **info@ggr.gazprom.ru**.

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Written and translated by

Aleksei Afonin,
Russian Oil & Gas Translation Services
+7 909 33 22 578
info@5gbp.ru