НАУКИ О ЗЕМЛЕ И ПЛАНЕТЫ

FINDING OF EXTRA COLLECTOR LAYERS AS A WAY OF A RESOURCE INCREMENT

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The summary. Geological and technological research is one of the most optimal methods of getting additional information about gas and oilfields. This kind of research can also be used for determining the most effective solution when the results of the geophysical analysis of a well are impossible to be interpreted explicitly or for having some extra data about the cross section of a well. On the Tchepakovskoye oil basin(Russia, Stavroposkiy krai) such data were revealed in the clay of the Maikop series. The lower part of the cross section of the series is formed from the clays of the Hadum series which as also a collector. According to the results of the basin exploration strata rocks have the apex at the depth of 2305 m and the subface at the depth of 2350 m thus the thickness of the series is 45 m. Mud logging has detected significant differences with the project data in relation to oil and gas collector rocks which this article will run about.

Nowadays geological research is the most precise remote method of determining lithologic boundaries which has no analogs. However the results of mud logging show the increasing of gas indications already at the point of 2112 m vertically and that is 200 m higher than the boundary of the top collector apex determined with the help of geophysical methods of a well research during the basin exploration. Thus it is possible to expect the presence of some extra collector rocks above the project boundaries of the top collector.

To prove such a supposition it is necessary to analyze the graphical chart of the mud logging and use a method of a luminescent – bitumen analysis in order to determine authentic presence of oil hydrocarbons in the rock.

The procedure of the research

The taking of samples was doing along the well bore 207 s each 10 m in the interval of 0 – 2530 m including vertical points of 0 – 2350 m. Qualitative and quantitative evaluation of oil-bitumen content in the rocks was fulfilled using a luminoscope “Philin” according to the intensity of the luminescence of chloroform extracts in a 5-point scale and a nomographic chart (table 1-2).

Table 1.

a luminescent - bitumen analysis. Qualitative evaluation.

Groupe A	colour ot the luminescence of capillary extracts	composition of the bitumoid	Type of the bitumoid
1	WB – white-blue	hydrocarbon fluids which don't contain resins and asphaltenes	LB – a light bitumoid
2	W- white BY – blue and yellow WY – white and yellow	Oil and bitumoids that contain a low amount of resins and asphaltenes, a low content or no content	OB – an oily bitumoid
3	Y- yellow OY – orange and yellow O - orange YB – yellow and brown	Oil and bitumoids that contain oils more than 60%, resins and asphaltenes 1-2%	ORB – oily and resinous bitumoids
4	OB – orange and brown LB – light brown B – brown	Bitumoid and oil that contain a big amount of resins and asphaltenes 3-20%.	RB - resinous bitumoid
5	DB – dark brown GB – green and brown RB – red and brown BG – black and green B– black	Bitumoid that contains resins and asphaltenes more than 20%.	RAB – resinous and asphaltene biumoid

Table 2.

Quantitative evaluation

The form of a luminescenting spot	The characteristics of a luminescenting spot	Point
	Dots	1
	A thin and torn ring	2
	A thin continuous ring	3
	An uneven spot, a thick ring	4
	An even spot	5

During the luminescent-bitumen analysis the tables of qualitative evaluation of hydrocarbons were produced (table 3-4).

Table.3

The table of qualitative evaluation of hydrocarbons in the interval of 0-1300 m.

from	till	type	point	colour	from	till	type	point	colour	from	till	type	point	colour
0	10	LB	3	WB	430	440	LB	2	WB	870	880	LB	3	WB
10	20	LB	3	WB	440	450	LB	1	WB	880	890	LB	3	WB
20	32	LB	3	WB	450	460	LB	1	WB	890	900	LB	3	WB
32	40	LB	3	WB	460	470	LB	3	W	900	910	LB	3	WB
40	50	LB	2	WB	470	480	LB	3	W	910	920	LB	3	WB
50	58	LB	3	WB	480	490	OB	3	BY	920	930	LB	3	WB
58	70	LB	2	WB	490	500	LB	3	WB	930	940	LB	3	WB
70	80	LB	3	WB	500	510	LB	3	WB	940	950	LB	3	WB
80	90	LB	3	WB	510	520	LB	3	WB	950	960	LB	3	WB
90	100	LB	3	WB	520	530	LB	3	WB	960	970	LB	3	WB
100	110	LB	3	WB	530	540	LB	3	WB	970	980	LB	3	WB
110	120	LB	3	WB	540	550	LB	3	WB	980	990	LB	3	WB
120	130	LB	3	WB	550	560	LB	3	WB	990	1000	LB	3	WB
130	140	LB	3	WB	560	570	LB	3	WB	1000	1010	LB	3	WB
140	150	LB	3	WB	570	580	LB	3	WB	1010	1020	LB	3	WB
150	160	LB	3	WB	580	590	LB	3	WB	1020	1030	LB	3	WB
160	170	LB	2	WB	590	600	LB	3	WB	1030	1040	LB	3	WB

170	180	OB	3	BY	600	610	LB	3	WB	1040	1050	LB	3	WB
180	190	LB	3	WB	610	620	LB	3	WB	1050	1060	LB	3	WB
190	200	lB	3	WB	620	630	LB	3	BY	1060	1070	LB	3	WB
200	210	ORB	3	OY	630	640	OB	3	BY	1070	1080	LB	3	WB
210	220	OB	3	BY	640	650	OB	3	BY	1080	1090	LB	3	WB
220	230	LB	3	WB	650	660	OB	3	BY	1090	1100	LB	3	WB
230	240	LB	3	WB	660	670	OB	3	BY	1100	1110	LB	3	WB
240	250	LB	3	WB	670	683	OB	3	BY	1110	1120	LB	3	WB
250	260	LB	3	WB	683	690	LB	1	WB	1120	1130	LB	3	WB
260	270	LB	3	WB	690	700	LB	2	WB	1130	1140	LB	3	WB
270	280	LB	3	WB	700	710	LB	1	WB	1140	1150	LB	3	WB
280	290	LB	3	WB	710	720	LB	2	WB	1150	1160	LB	3	WB
290	300	LB	3	WB	720	730	LB	2	WB	1160	1170	LB	3	WB
300	310	LB	2	WB	730	740	LB	2	WB	1170	1180	LB	3	WB
310	320	LB	2	WB	740	750	LB	2	WB	1180	1190	LB	3	WB
320	330	LB	2	WB	750	760	LB	2	WB	1190	1200	LB	3	WB
330	340	ORB	2	O	760	770	LB	2	WB	1200	1210	LB	3	WB
340	350	LB	3	WB	770	780	LB	2	WB	1210	1220	LB	3	WB
350	360	LB	2	WB	780	790	LB	2	WB	1220	1230	LB	2	WB
360	370	ORB	2	OY	790	806	LB	3	WB	1230	1240	LB	2	WB
370	380	LB	2	WB	806	820	LB	3	WB	1240	1250	LB	2	WB
380	390	LB	2	WB	820	830	LB	3	WB	1250	1260	LB	2	WB
390	400	LB	2	WB	830	840	ЛБ	4	WB	1260	1270	LB	2	WB
400	410	LB	2	WB	840	850	LB	5	WB	1270	1280	LB	3	WB
410	420	LB	2	WB	850	860	LB	6	WB	1280	1290	LB	3	WB
420	430	LB	2	WB	860	870	LB	3	WB	1290	1300	LB	3	WB

Table 3

The table of qualitative evaluation of hydrocarbons in the interval of 1300-2550м

от	до	тип	бал	цвет	от	до	тип	бал	Цвет	от	до	тип	бал	цвет
1300	1310	LB	2	WB	1860	1870	OB	3	BY	2420	2430	ORB	4	YB
1310	1320	LB	2	WB	1870	1880	OB	3	BY	2430	2440	RB	4	B
1320	1330	LB	2	WB	1880	1890	ORB	3	OY	2440	2450	RB	4	LB
1330	1340	OB	2	OY	1890	1900	OB	3	BY	2450	2460	ORB	4	OY
1340	1350	LB	3	WB	1900	1910	RB	3	B	2460	2470	ORB	4	OY
1350	1360	LB	3	WB	1910	1920	OB	3	BY	2470	2480	RB	4	LB
1360	1370	LB	2	WB	1920	1930	LB	3	WB	2480	2490	ORB	4	O
1370	1380	LB	2	WB	1930	1940	OB	3	BY	2490	2500	ORB	5	YB
1380	1390	LB	2	WB	1940	1950	LB	3	WB	2500	2510	ORB	4	YB
1390	1400	LB	2	WB	1950	1960	OB	3	BY	2510	2520	OB	3	BY
1400	1410	LB	2	WB	1960	1970	RB	3	LB	2520	2530	OB	3	BY
1410	1420	LB	2	WB	1970	1980	OB	3	BY	2530	2540	OB	3	BY
1420	1430	LB	2	WB	1980	1990	OB	3	BY	2540	2550	OB	3	BY
1430	1440	LB	2	WB	1990	2000	OB	3	BY	2550	2560	LB	3	WB
1440	1450	LB	2	WB	2000	2010	OB	3	BY					
1450	1460	LB	2	WB	2010	2020	OB	3	BY					
1460	1470	LB	2	WB	2020	2030	OB	3	BY					
1470	1480	LB	2	WB	2030	2040	OB	3	WY					
1480	1490	LB	2	WB	2040	2050	OB	3	WY					
1490	1500	LB	2	WB	2050	2060	OB	3	BY					
1500	1510	LB	2	WB	2060	2070	OB	3	WY					
1510	1520	LB	1	WB	2070	2080	OB	3	BY					
1520	1530	LB	2	WB	2080	2090	OB	3	BY					
1530	1540	LB	2	WB	2090	2100	LB	3	WB					
1540	1550	LB	2	WB	2100	2110	RB	3	LB					
1550	1560	LB	2	WB	2110	2120	OB	3	BY					
1560	1570	LB	2	WB	2120	2130	LB	3	WB					
1570	1580	LB	2	WB	2130	2140	OB	3	BY					
1580	1590	LB	2	WB	2140	2150	OB	3	BY					
1590	1600	LB	2	WB	2150	2160	OB	3	BY					
1600	1610	LB	2	WB	2160	2170	OB	3	BY					
1610	1620	LB	2	WB	2170	2180	RB	4	B					
1620	1630	OB	2	WB	2180	2190	RB	4	LB					
1630	1640	LB	2	WB	2190	2200	RB	4	B					
1640	1650	LB	2	WB	2200	2210	OB	3	BY					
1650	1660	LB	2	WB	2210	2220	OB	3	BY					
1660	1670	LB	2	WB	2220	2230	OB	3	BY					
1670	1680	LB	2	WB	2230	2240	OB	3	BY					
1680	1690	LB	2	WB	2240	2250	ORB	4	YB					
1690	1700	LB	2	WB	2250	2260	RB	4	LB					
1700	1710	LB	2	WB	2260	2270	ORB	4	YB					
1710	1720	LB	2	WB	2270	2280	ORB	4	YB					
1720	1730	LB	2	WB	2280	2290	ORB	4	YB					
1730	1740	LB	2	WB	2290	2300	ORB	4	OY					
1740	1750	LB	2	WB	2300	2310	ORB	4	OY					
1750	1760	LB	2	WB	2310	2320	ORB	4	OY					
1760	1770	LB	2	WB	2320	2330	RB	4	B					
1770	1780	LB	2	WB	2330	2340	RB	4	B					
1780	1790	LB	2	WB	2340	2350	ORB	4	OY					
1790	1800	LB	2	WB	2350	2360	OB	3	BY					
1800	1810	LB	2	WB	2360	2370	OB	3	BY					
1810	1820	LB	2	WB	2370	2380	ORB	3	OY					
1820	1830	LB	2	WB	2380	2390	OB	4	BY					
1830	1840	LB	2	WB	2390	2400	RB	4	CK					
1840	1850	LB	2	WB	2400	2410	ORB	4	OY					
1850	1860	LB	2	WB	2410	2420	ORB	4	OY					

The data from the table show that there are potentially productive hydrocarbons in the interval 1860-1900, 2030-2070, 2120-2170, 2200-2550 along the well bore. Yellow colour highlights the analyses where the pollution with the greasing of thread connection was detected. The analyses with different bitumoids are below.

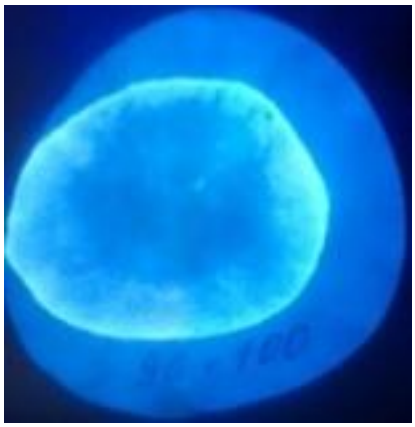


Photo 1. Interval 90-100 a light bitumoid

Photo 2. Interval 1890-1900 an oily bitumoid.

Photo 3. Interval 2240-2250 an oily and resinous bitumoid

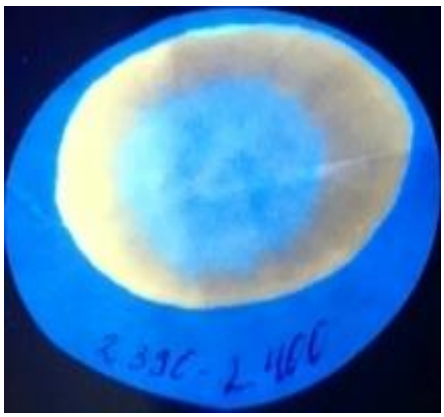


Photo 4. Interval 2390-2400 a resinous bitumoid
(the light zone is a distortion caused by the contact with fat pollution)

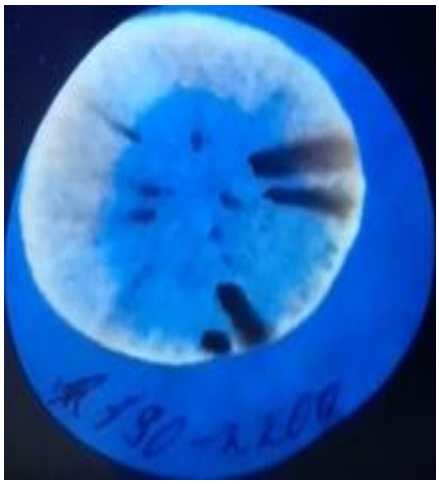
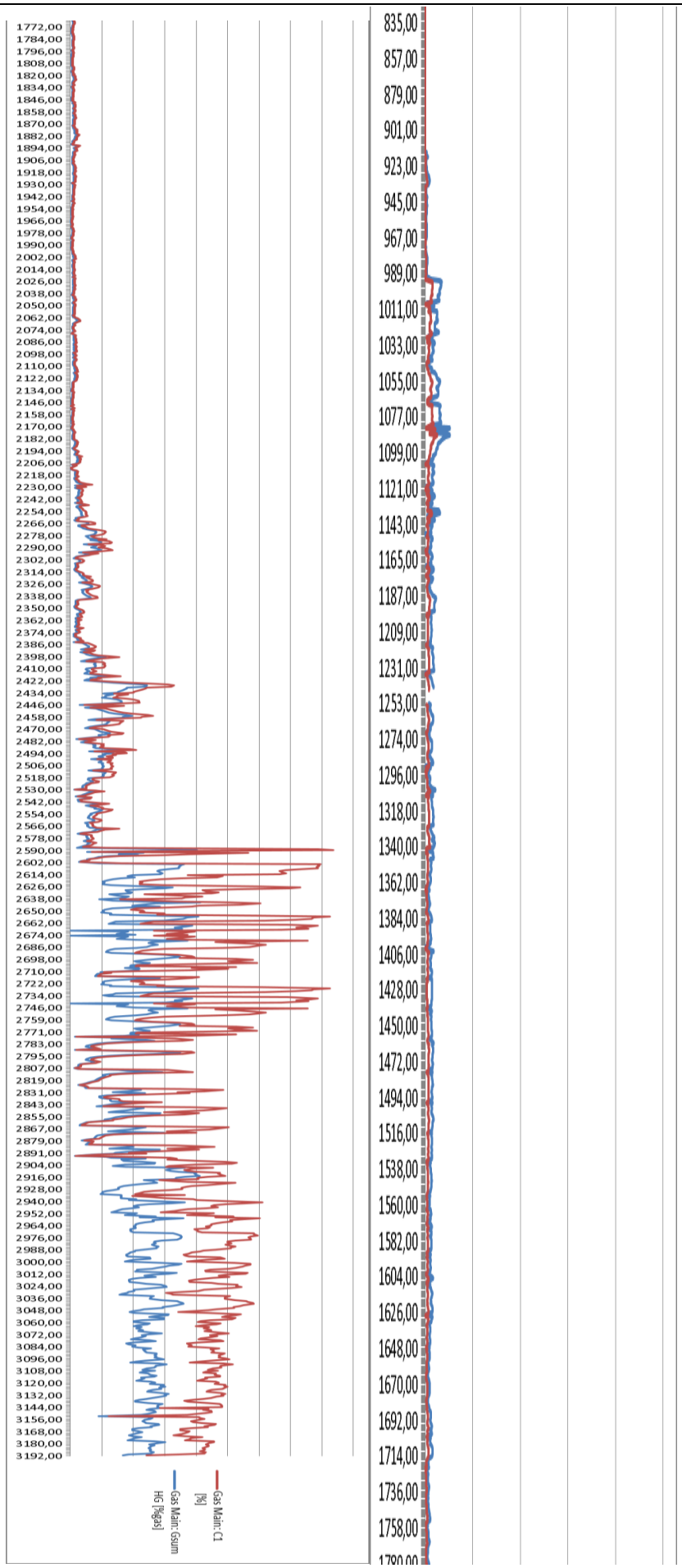


Photo 5. Interval 2190-2200. The analysis polluted with the greasing of the thread connection.

After the data processing of the results of the mud logging a graphic chart of the explored well 207 was fulfilled (Picture 6).



Picture 6. The graphic chart of the mud logging: total gas and methane.

The analysis of the graphic chart shows that in the intervals 1800-1940 and 1990-2122 along the well bore there is little increasing of hydrocarbons concentration which is higher than background indicators. After that in the interval of 2180-2585 along the well bore significant peaks of gas indications can be noticed mostly from 3 to 6 % of total gas, maximum 7,93%, what is important. Thus, taking into account the results of the mud logging and the luminescent-bitumen analysis it is possible to say that above the project collector determined during the basin exploration using geophysical methods there are extra collector rocks whose core should be selected and researched and the results of the research should be correlated with the data of geophysical basin exploration.

Conclusion

According to the results of this research it is possible to point out the necessity of additional core testing on the marks higher that the project collector in order to analyze collector peculiarities and increase resource increments. In this case the results of the mud logging of the well are very important as a necessity of analyzing them during further work at the basin and a research of the cross section by an expanded complex of geophysical methods for wells in order to localize and characterize the forms of oil-saturated rocks.

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