LIMITED LIABILITY COMPANY

"INNOVATIVE OIL AND GAS TECHNOLOGIES"

(JSC INGT)

I CLAIM

Deputy CEO
on production of JSC INGT

_____ Yu. V. Ivanov

"____" _____ 2014.

REPORT

according to technical condition of upsetting columns, to definition of saturation of collectors parametrical well No. 4 of Elley-Igayskaya Square

Customer: JSC Bakcharneftegaz

IT IS DEVELOPED:

Head of department of interpretation of
geophysical methods

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"____" _____ 2014.

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"____" _____ 2014.

Moscow

2014

Object of research: Well of JSC Bachkarneftegaz No. 4
Elley-Igayskaya Square

Date of researches: 11-15.07.2014.

1. Purposes and research problems:

- an assessment of technical condition of upsetting columns with use of the scanning magnitnoimpulsny defectoscopy

- definition of lithologic structure, collection properties and the current saturation of breeds collectors with use of a complex of spectrometer methods

2. Data on a well according to geological data:

– category	The parametrical
– the drilled face	4100 m
– artificial face	4006 m
– current face	4012 m
– drilling expiration date	26.06.1992.
– altitude	138,3 m
– height of a table of a rotor	5,40 m

3. Stratigraphy of deposits

Stratigraphy		Intervals (m)		Power (m)
		from	to	
M e	Cenomanian + alb + top apt (pokursky suite)	695	1585	890

l about in and I	Nizhny Novgorod apt (alymsky suite)	1585	1615	30
	Barr + goteriv (kiyalinsky suite)	1615	2232	617
	Valanzhin (Tatar suite)	2232	2412	180
	Nizhny Novgorod valanzhin +berrias (kulomzinsky suite)	2412	2593	181
	Volga (Bazhenov shale)	2593	2626	33
Yurs-Kai	Oksford+kellovey (vasyugansky suite)	2626	2703	77
	Bat+bayoss+aalen (Tyumen suite)	2703	2973	270
Aeration bark		2973	2992	19
Paleozoic deposits (fransky circle, eyfelskiy+zhivetsky circles)		2992	4010	1018

4. Well design according to "Customer"

Table No. 1

Column type	Depth of descent, m	Diameter, mm	Steel brand	Descent interval on thickness of pipes, m	Thickness of walls, mm
Conductor	587	324x299	D, E	0-587	11
The technical	2977	219	D, L, E	0-914 914-2765 2765-2977	10,2 8,9 10,2
The operational	4099	140x146	D	0-820,23 820,23-947,01 974,01-2157,3 2157,3-4099,0	9,5 8,5 7,7 9,2

4.1. Data on opening of the design horizons

Table No. 2

Intervals of perforation, m	Puncher type	Perforation density, otv./p.m.	In total openings
3541-3558	PR-43	10	510
3698-3708	PR-43	10	100
3772-3780	PR-43	10	80
3812-3830	PR-43	10	180
3886-3900	PR-43	10	140
3913-3922	PR-43	10	90
3950-3969	PR-43	10	280
3975-3978	ZPKS-80	14	40
4020-4027	ZPKS-80	10	70

5. Conditions of carrying out geophysical surveys

The well is filled with salt KCl solution with a density of 1,07 g/cm3.

6. Methods of geophysical surveys

For the solution of the tasks connected with an assessment of technical condition of a well, and definitions of the current saturation of layers collectors were applied by the characteristic of lithologic features of breeds methods of the scanning magnetic pulse defectoscopy and spectrometer radioactive logging.

Intervals of researches and borehole devices are presented in table 3.

Table No. 3

Research method	**Interval of research, m**	**The borehole device**	**device No.**	**Speed of record, m/h**
The Magnitnoimpulsny defectoscopy scanning	0–4012,0	MID-K-GK-S	19	200
Three-probe spectrometer pulse neutron gamma logging	1555-1628 2600-2700 2950-4010	TSSP-3INGKS-73		60
Spectrometer Gamma Logging (SGL)	1555-1628 2550-4010	KSPRK-SH-90	1	60
Spectrometer Neutron Gamma Logging — Shirokodiapazonny (SNGL\2S)	1555-1628 2558-2966	KSPRK-SH-90	1	60

The method of the scanning magnitnoimpulsny defectoscopy which allowed to reveal is applied to technical diagnosing of a well:

- constructive elements of wells (boots, muftovy connections of columns, perforation intervals);
- corrosion zones, various defects of columns: cracks and other violations of integrity.

For the solution of tasks of definition of lithologic structure, collection properties of breeds, determination of coefficients of saturation was applied neutron spectrometer methods with use of the complex borehole TsSP-3INGKS-73 and KSPRK-Sh-90 equipment.

At interpretation of the materials received as a result of complex spectrometer researches of a well were used:

- the technique of interpretation of spectrometer gamma logging consisting in an assessment of the maintenance of radioactive elements of thorium, potassium and uranium which ratio in breed defines the nature of natural radioactivity;
- the technique of interpretation 3INGKS based on possibility of identification like a fluid on character of ranges in gamma radiation areas from hydrogen (N), oxygen (About), chlorine (Cl), presence and which share in a pore space defines availability of oil, the fresh or mineralized water, respectively;
- the technique of interpretation of SNGK-Sh consisting in an assessment of density of a matrix of rocks and the maintenance of radioactive elements;
- the technique of interpretation of 2HHK consisting in the determination of coefficient of water-saturated porosity and parameters of deficiency of density allowing to identify oil water - gas-saturated collectors and to calculate coefficient of the corresponding saturation.

7. Technological parameters of the equipment

7.1. Spectrometer methods

Method:	**SNGK-SH**	**SNGK-Sl + 2HHK**	**SGK**
equipment:	**NO. 1 KSPRK-SH-90**		
Design: - diameter, mm - lengths of probes, cm	 90 35 and 64	 90 25 and 50 (2NNK)	 90 -
Detecting block			

- detectors: type size - FEU (type)	 NaJ(Tl) 40x40; 50x150 HAMAMATSU R4607-27	SNM-56	 NaJ(Tl) 50x250 HAMAMATSU R4607-27
Number of the measured channels	256x4		256

Method:	**INGKS, NAC, SGK**
equipment:	**TSSP-3INGKS-73**
Design: - diameter, mm - lengths of probes, cm	 76 30, 50, 70
Detecting block - detector: type size	 BGO, NaJ(Tl) 36x65, 10x40, 18H40
Generator of neutrons	ING-10-20-120/150
Number of the measured channels	256

7.2. MID-K-GK-S

Borehole device:	**MID-K-GK-S**
Device sizes: - diameter, mm - length with the module of group of companies, mm	 42 2800
Metrological parameters of the device: - limits of thickness of the studied pipes, mm - error of measurement of thickness of a wall of pipes, mm one-columned design; two-columned design (at research EK in shopping mall); - an additional error of measurement of thickness of walls of pipes due to magnetic heterogeneity, mm	 3-25 ± 0,3 ± 0,7 ± 0,2
Date of an etalonirovka:	19.12.2013

8. Results of geophysical surveys

8.1. Results of the scanning magnetic pulse defectoscopy

As a result of interpretation of the obtained data tightness of muftovy connections and thickness of walls of upsetting pipes, perforation intervals, the provision of the borehole equipment, centralizers, etc. was defined.

8.1.1. Muftovy connections

Couplings of an operational column of D = 146/140 mm on all interval of researches are noted by positive anomalies on early temporary delays. Couplings of a technical column of D = 219 mm are allocated on late temporary delays.

In the range of 2846,0-2847,2 m the filling coupling is revealed.

8.1.2. Thickness of walls of columns

The well is surrounded with pipes of different thickness, the order of descent does not correspond specified in acts from business of a well. Thickness of walls of pipes of an operational column of EK changes from 5,6 mm to 11,1 mm. Results of calculation of thickness of an operational column by data the Ministry of Foreign Affairs are presented in the appendix 1.

8.1.3. Provision of boots of columns

The boot of the conductor of D=324x299 mm is noted at a depth of 588,5 m.

The boot of a technical column of D=219 mm beats off at a depth of 2990,0 m (figure 1).

The boot of an operational column of D=146x140 mm is not captured by researches, at a depth of 2169,5 m transition from diameter of 146 mm to diameter of 140 mm is noted.

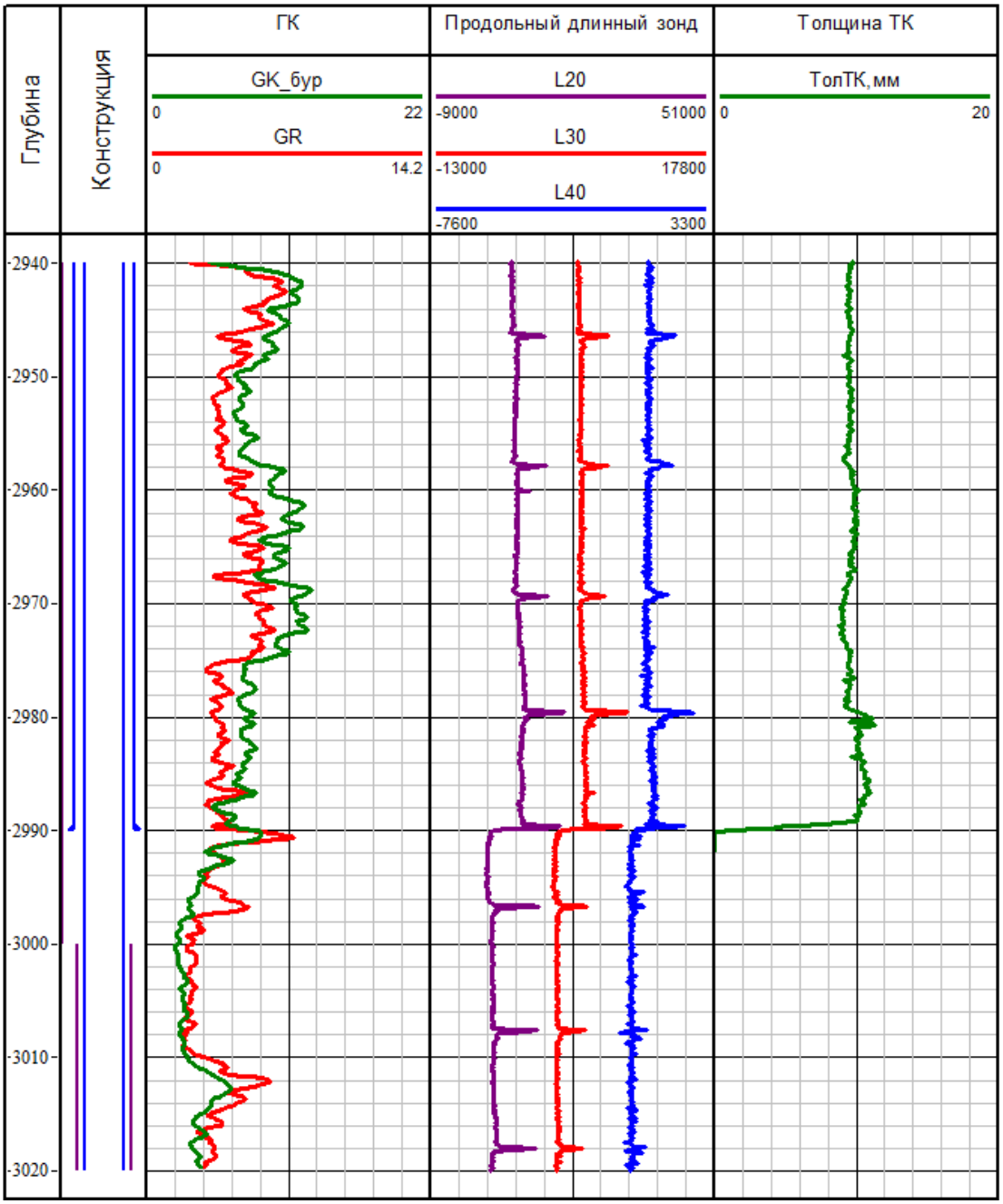

Figure 1. Boot of a technical column.

8.1.4. Allocation of intervals of perforation

Perforation is noted in intervals:

1) Design interval of 3541,0-3558,0 m.

Actual interval of 3539,0-3557,2 m. Cracking of a column happened in the range of 3547,7-3557,2 m, within depths of 3539,0-3547,2 m reduction of amount of metal is noted (figure 2).

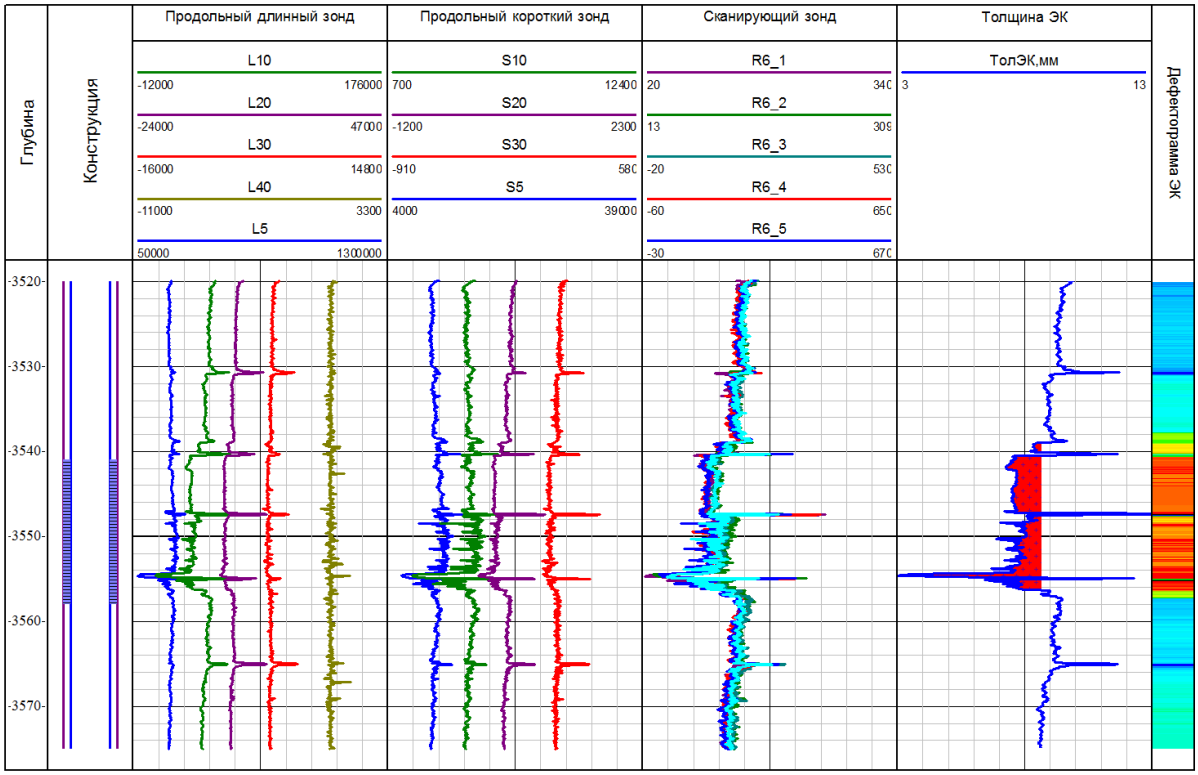

Figure 2. Allocation of an interval of perforation.

2) Design interval of 3698,0-3708,0 m.

Within depths of 3698,0-3708,0 m the change of a signal on L and S probes connected with perforation is noted, cracking of a column is not observed.

3) Design interval of 3772,0-3780,0 m.

The actual interval of 3771,0-3779,3 m is allocated with reduction of amount of metal (figure 3).

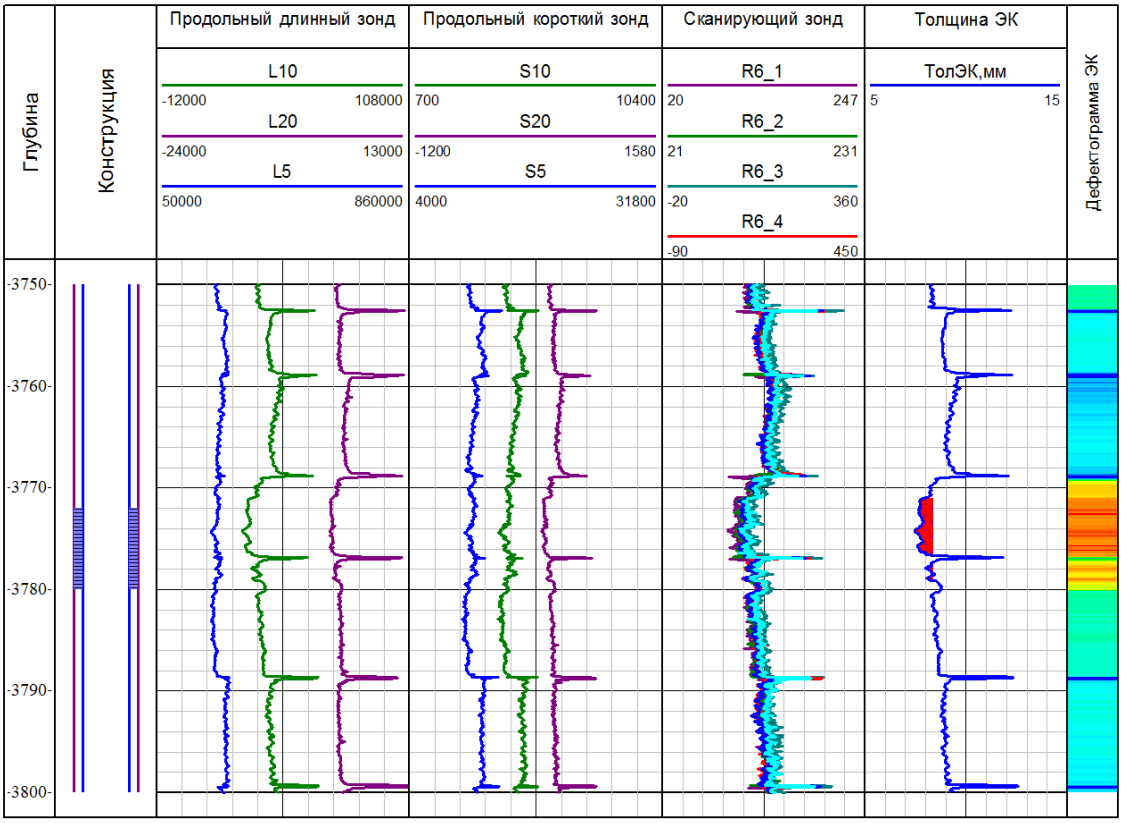

Figure 3. Allocation of an interval of perforation.

4) Design interval of 3812,0-3830,0 m.

The lower part of perforation in the range of 3821,0-3828,9 m is allocated with longitudinal L and S probes. The top part of perforation in the range of 3812,5-3821,0 m accurately is not allocated and noted by insignificant decrease in amount of metal.

Besides, in the range of 3812,0-3830,0 m the increase of natural gamma activity (radio geochemical anomaly of RGHA) which is indirectly confirming the movement of formation fluid during test of object (figure 4) is observed.

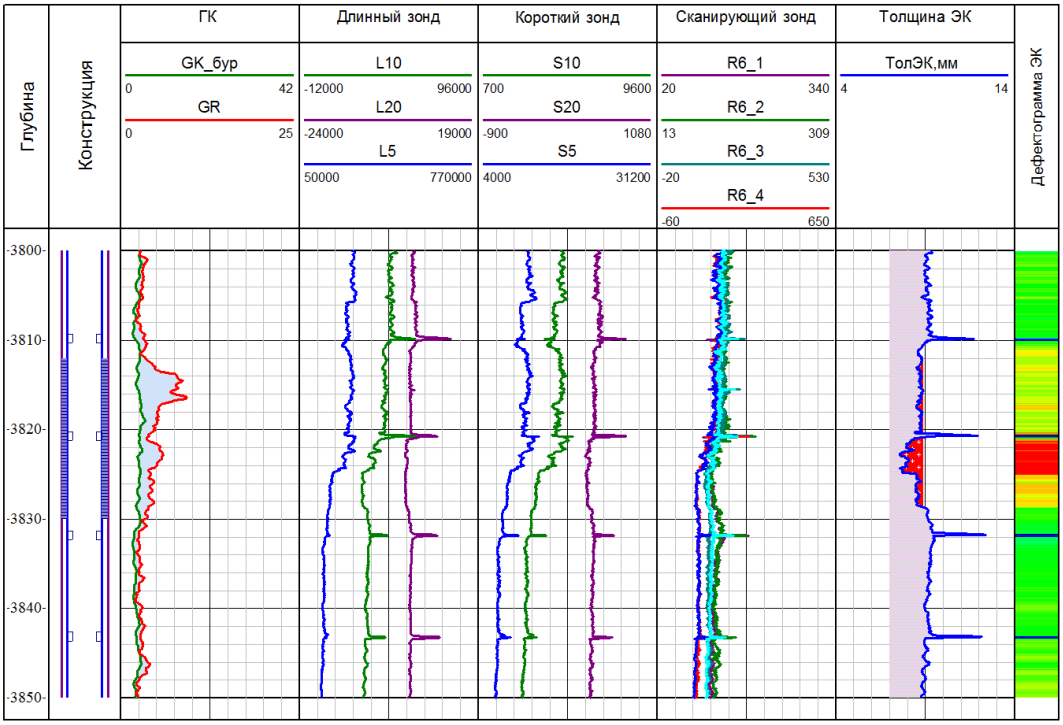

Figure 4. Allocation of an interval of perforation.

5) Design interval of 3886,0-3900,0 m.

The actual interval of 3885,0-3899,5 m is surely revealed by all probes (figure 5).

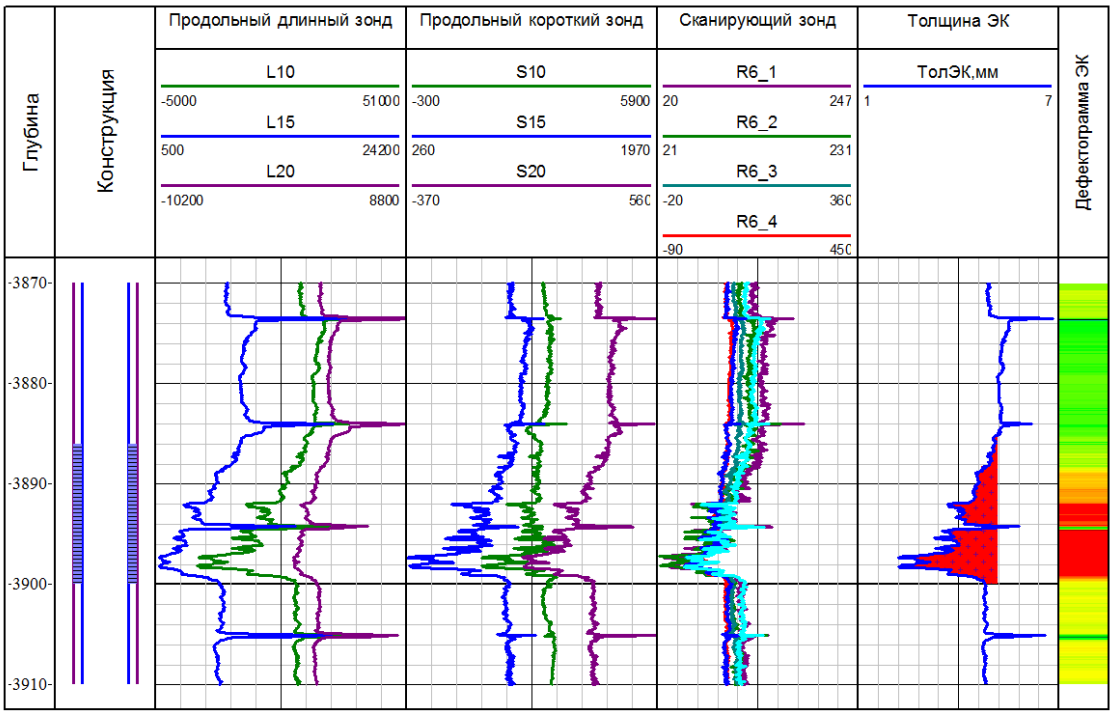

Figure 5. Allocation of an interval of perforation.

6) Design interval of 3913,0-3922,0 m.

The actual interval of 3913,0-3922,0 m is allocated with reduction of amount of metal and on change of a signal on L and S probes (figure 6).

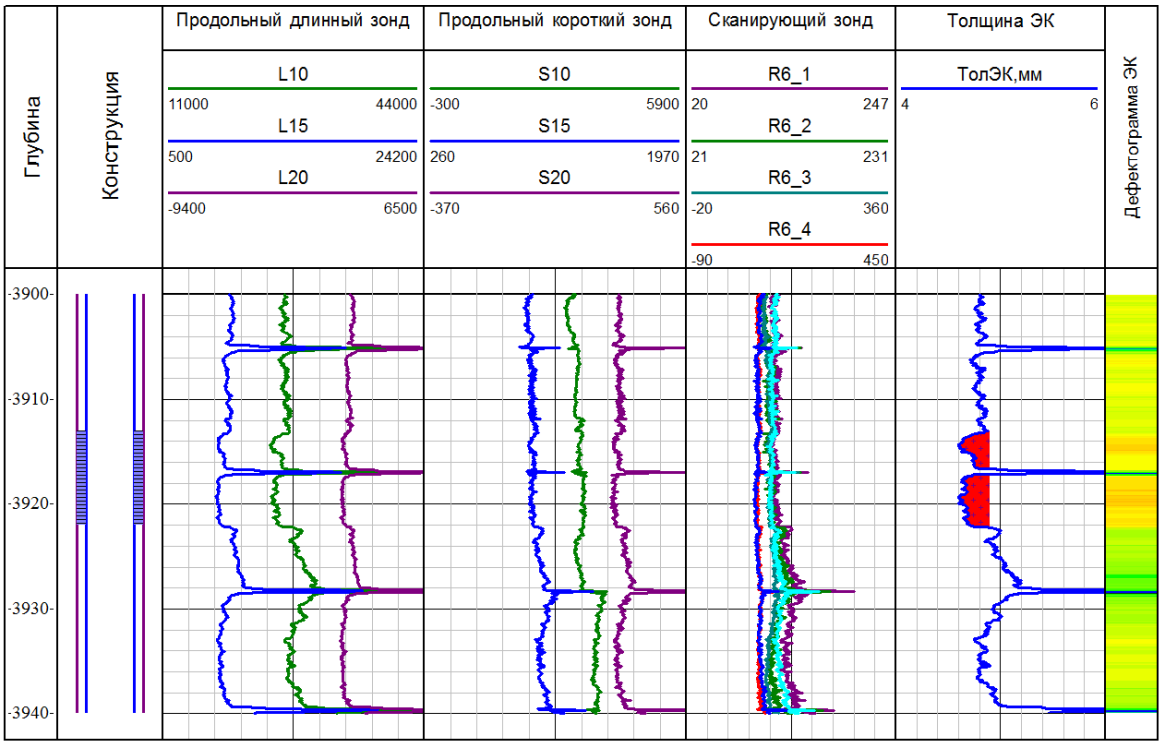

Figure 6. Allocation of an interval of perforation.

7) Design interval of 3950,0-3969,0 m.

The actual perforation is noted by reduction of amount of metal in the range of 3950,5-3968,0 m (figure 7).

8) Design interval of 3975,0-3978,0 m.

The actual perforation is allocated in the range of 3974,6-3977,6 m with reduction of amount of metal and on change of a signal on L, S and R probes (figure 7).

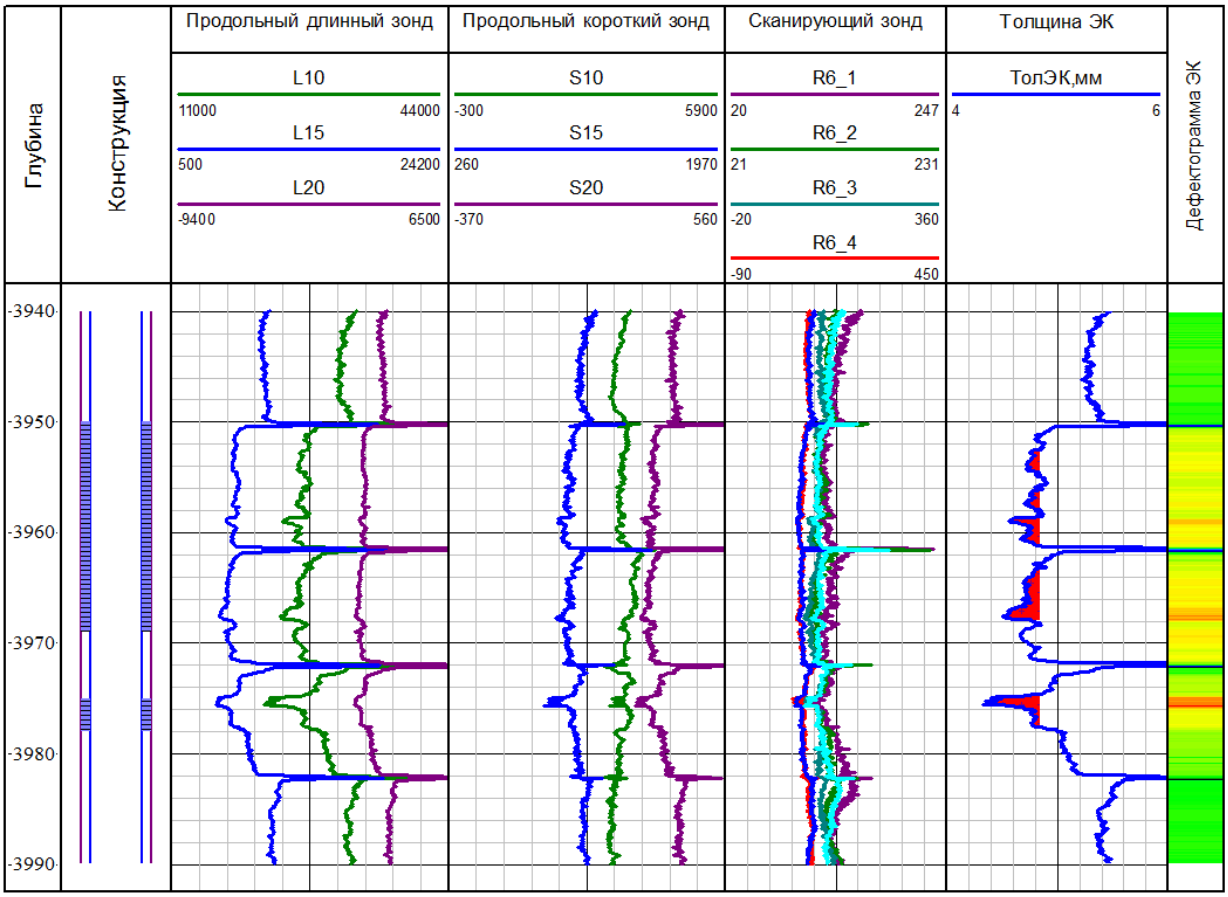

Figure 7. Allocation of an interval of perforation.

8.1.5. Allocation of defects of columns

At depths 1310,2m, 1875,1 m 3301,7 m 3485,2 m, 4008,4 m the scanning probe revealed heterogeneity of an internal surface of a pipe without loss of a sploshnost of metal (figure 8).

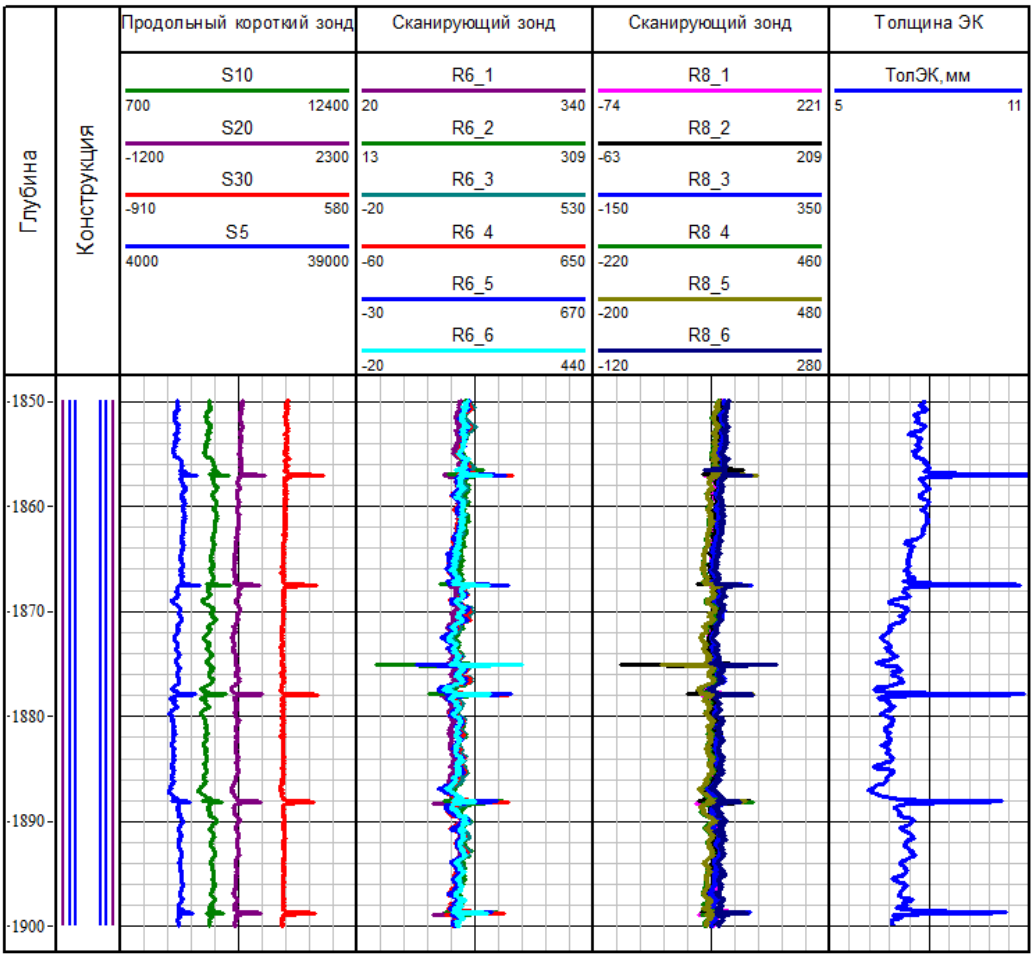

Figure 8. Defect of an internal surface of a pipe at a depth of 1875,1 m.

In the range of 198,0-207,7 m the pipe of an operational column, non-uniform on electromagnetic properties, with thickness less than 8 mm (figure 9) is distinguished from pipes with a nominal thickness of 9-10 mm.

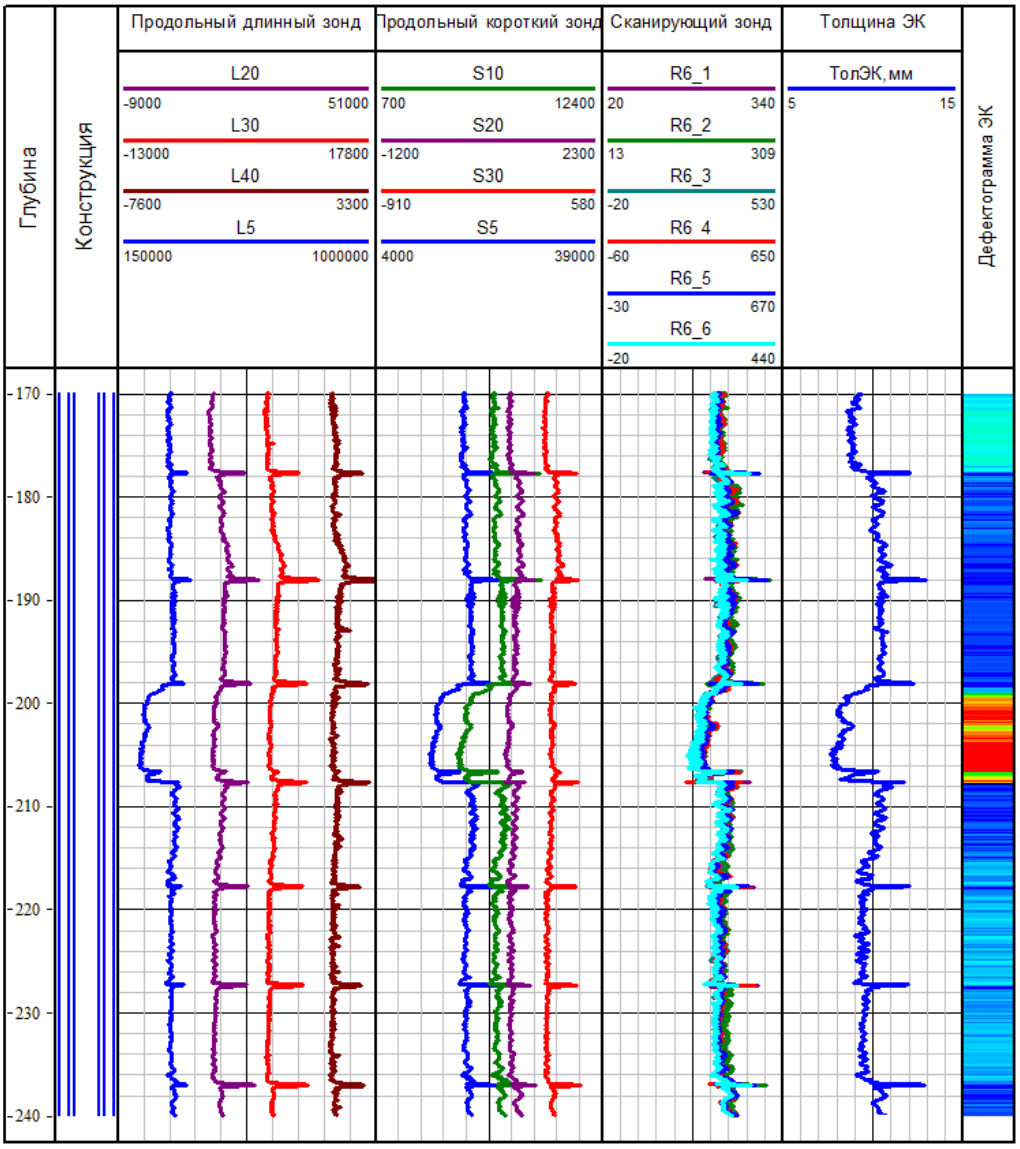

Figure 9. A non-uniform pipe in the range of 198,0-207,7 m.

9. Results of spectrometer radioactive logging

In the range of research at a kompleksirovaniye of methods of spectrometer radioactive logging the following tasks were solved:

- the lithologic model is constructed;
- collection properties and saturation of breeds collectors are specified.

9.1. Creation of lithologic model

According to the SGK method the mass maintenance of radioactive elements of uranium, thorium, potassium is defined, the lithologic model with attraction of data of GIS-drilling is constructed.

The ratio of the maintenance of radioactive elements U, Th, K with correlation with indications of methods of an open trunk reflects shaliness of rocks. The increased values of uranium can be connected with a jointing of rocks, secondary transformations of carbonate breeds, radiochemical anomalies (RGHA), breeds of other lithology. In this regard for an assessment of shaliness the KTI parameter equal to work of the maintenance of K and Th was used. Existence of RGHA in perforation intervals probably is connected with chemical processings of collectors.

Allocation of collectors in a terrigenous section is carried out traditionally according to indications of PS and group of companies, that is on degree of shaliness of sandstones. In a low-porous carbonate section allocation of productive collectors is carried out on existence of set of the qualitative signs given above and also in size KN_ING taking into account existence of a jointing according to an open trunk (BQ, MBK).

9.2. Collection properties and oil saturation of breeds collectors

Layer collector in the range of 1550-1559 m (pokursky suite) is investigated only in a sole because of shift of an interval of record after coordination. The considerable divergence of KN in a near zone and KN in average and distant zones in the range of 1555,0-1559,1 m can indicate existence of flood in a near zone as a result of a behind-the-casing overflow of water (figure 10). For perforation the interval of 1550-1559 m is recommended.

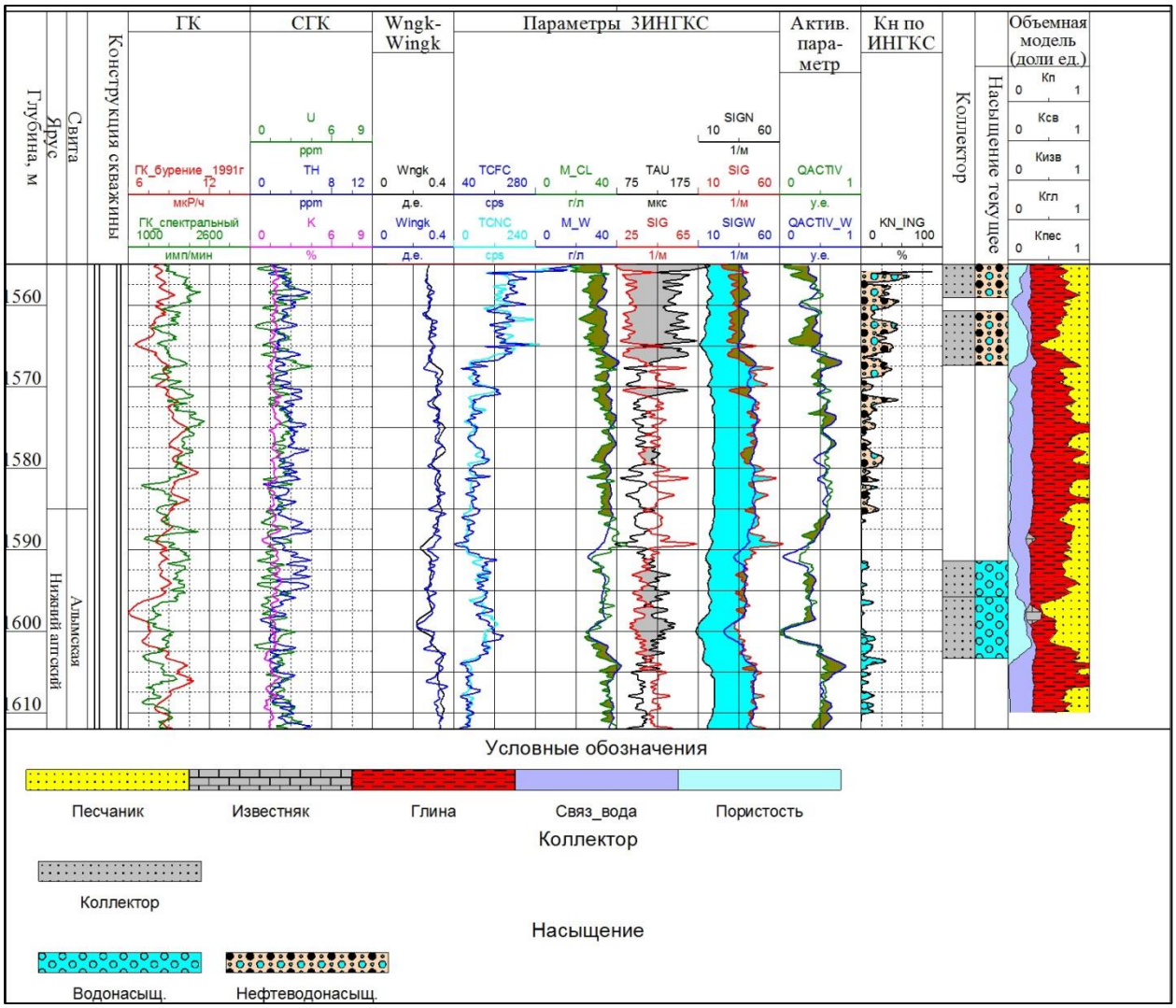

Figure 10. Determination of nature of saturation of collectors of cretaceous deposits.

By results of researches of a collector of vasyugansky suite are water-saturated.

In deposits of the Tyumen suite oil saturation is noted in the range of 2764,5-2766,3 m; in intervals of 2861,4-2870,3 m (it is possible a collector, clay), 2871,9-2879,0 m and 2949,0-2957,4 m (it is possible a collector, clay) in addition are present a gas component (figure 11), in the range of 2766,3-2772,0 m – weak oil saturation.

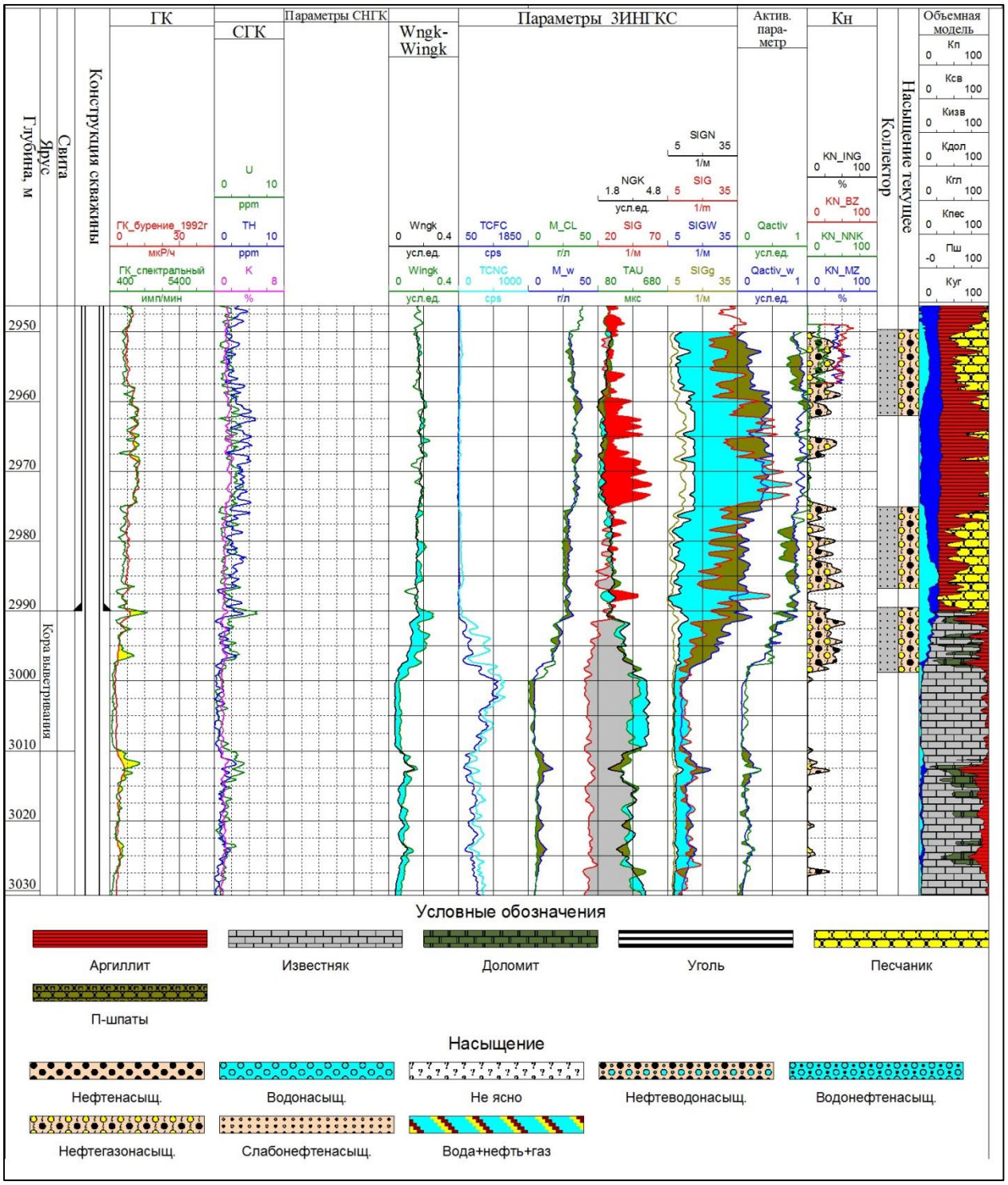

Figure 11. Determination of nature of saturation of collectors of the Jurassic deposits

Collectors in the range of a bedding of Paleozoic deposits the jointed, jointed and porous, condensed (nonconventional). Are sated with oil with a high gas factor (figure 12). Quantitative values of coefficient of KNG_ING on the studied section can have errors due to low porosity of collectors which filtrational properties are caused by

existence of a fracture component, and also influence of a near zone at bad quality of cementation or lack of cement behind a column.

Nature of saturation of layers collectors is presented in table 4.

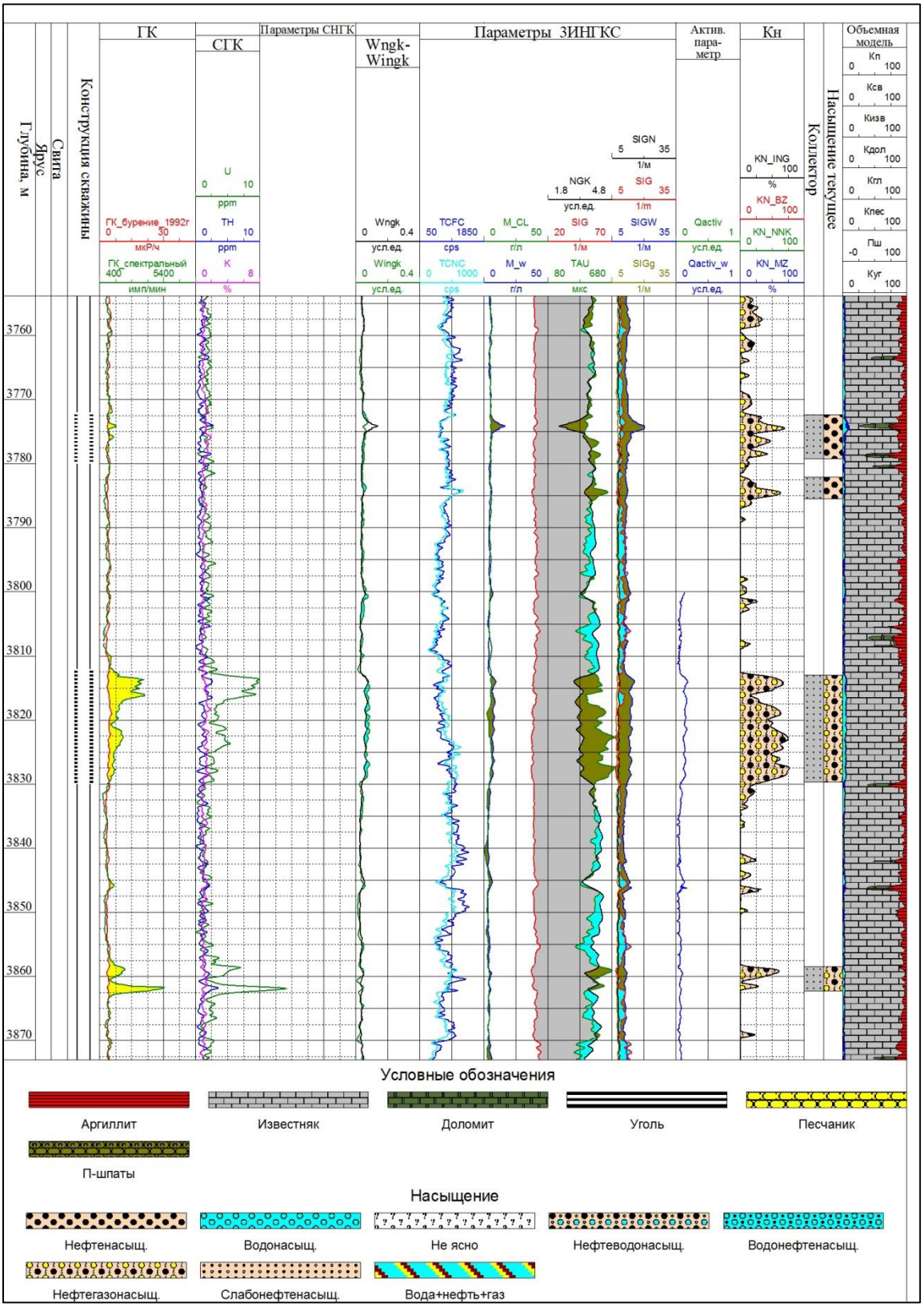

Figure 12. Determination of nature of saturation of collectors of Paleozoic deposits.

Nature of saturation of collectors on No. well 4-Elley-Igayskaya

Table 4.

No. software	Stratigraphy	Roof collector, m	Sole collector, m	Power layer, m	KN on SNGK, %			KN on INGK, %	Kp, %	Nature of saturation
					near zone		average zone	distant zone		
					NOC	NGK_MZ	NGK_BZ			
1	Pokurskaya is twisted	1555.0	1559.1	4.1	23	30	37	34	24	Neftevodonasyshch.
2		1560.7	1567.4	6.7	34	36	37	30	26	Neftevodonasyshch.
3	Alymskaya is twisted	1591.4	1595.8	4.4	23	29	32	1	11	Vodonasyshch.
4		1595.8	1603.3	7.5	24-36	30-43	34-46	5-13	24	Vodonasyshch.
5	Vasyuganskaya is twisted	2640.8	2643.0	2.2	33		29	7	11	Vodonasyshch.
6		2656.0	2659.2	3.2	33		33	7	18	Vodonasyshch.
7		2661.8	2664.0	2.2	31		35	0	16	Vodonasyshch.
8		2666.6	2668.0	1.4	30		34	11	16	Vodonasyshch.
9	Tyumen suite	2706.2	2709.4	3.2	32		40		14	Vodonasyshch.
10		2764.5	2766.3	1.8	32		45		14	Vodoneftenasyshch.
11		2766.3	2772.0	5.7	37		40		15	Neftevodonasyshch.
12		2781.4	2784.0	2.6	33		38		10	Vodonasyshch.
13		2861.4	2870.3	8.9	18		44		7	Voda+neft+gaz
14		2871.9	2879.0	7.1	21		47		10	Voda+neft+gaz
15		2949.7	2962.0	12.3				28	13	Neftegazonasyshch.
16		2975.1	2986.8	11.7				27	23	Neftegazonasyshch.
17	Aeration bark	2989.5	2998.8	9.3				35	13	Neftegazonasyshch.
18	Fransky circle	3064.0	3066.2	2.2				62 *	20	Not it is clear

19	Eyffelsky + zhivetsky circle	3090.1	3092.7	2.6				55 *	15	Not it is clear
20		3335.7	3342.9	7.2				8	2	Neftegazonasyshch.
21		3347.8	3352.6	4.8				5	3	Neftegazonasyshch.
22		3358.1	3373.2	15.1				23	3	Neftegazonasyshch.
23		3457.8	3475.1	17.3				10	7	Neftegazonasyshch.
24		3511.7	3519.7	8.0				4	6	Slaboneftenasyshch.
25		3519.7	3525.6	5.9				29	10	Neftegazonasyshch.
26		3534.8	3537.3	2.5				17	4	Slaboneftenasyshch.
27		3538.3	3547.9	9.6				13	4	Slaboneftenasyshch.
28		3547.9	3556.1	8.2				16	5	Slaboneftenasyshch.
29		3772.4	3779.2	6.8				36	3	Neftenasyshch.
30		3782.1	3785.5	3.4				33	2	Neftenasyshch.
31		3813.0	3829.7	16.7				62	5	Neftegazonasyshch.
32		3858.5	3862.3	3.8				40	3	Neftegazonasyshch.
33		3950.1	3970.0	19.9				12	2	Slaboneftenasyshch.
34		3974.1	3978.2	4.1				22	4	Neftegazonasyshch.
35		3998.3	4002.6	4.3				17	2	Slaboneftenasyshch.

10. Conclusions

The researches executed by method the scanning magnetic pulse defectoscopy allowed to estimate a condition of upsetting columns from the mouth to a well face.

As a result of the carried-out works by means of a complex of spectrometer methods collection properties are estimated and is defined current oil, water - gas saturation of layers collectors, the lithologic composition of rocks is specified.

The executed spectrometer researches confirmed their high efficiency at determination of nature of the current saturation of layers collectors.

11. Interpretation of curve parameters of a graphic application.

- Wngk – a vodorodosoderzhaniye according to oil and gas company of an open trunk;
- Wingk – a vodorodosoderzhaniye according to 2INGK;
- TCFC and TCNC – the integrated account of neutrons on big and small probes (imp / mines);
- M_cl – the conditional mineralization of formation fluid registered (g/litre);
- M_w – a conditional mineralization of formation fluid settlement for full water saturation of a pore space (g/litre);
- SIG - the curve of section of absorption of thermal neutrons registered (1/m);
- TAU - time of life of thermal neutrons registered (microsec); □
- SIGw, SIGn, SIGg – sections of absorption of thermal neutrons settlement for full water - oil - and gas-saturation of a pore space (1/m);

Qaktiv – the complex parameter of activation of oxygen registered;

Qaktiv_w – the complex parameter of activation of oxygen settlement for water-saturated porosity;

GK_SPEK – an integrated curve of natural gamma activity;

U – content of uranium;

Th – the content of thorium;

K – content of potassium;

KNG_ING – the oil-and-gas saturation coefficient flowing according to 3INGKS;

KP (PHIE) – coefficient of effective porosity;

KPO (PHIT) – coefficient of the general porosity;

Kizv (VC1) – the volume content of limestone;

Kdol (VC2) – the volume content of dolomite;

Kgl (VC3) – the volume content of clay;

Kpes (VC4) – the volume content of sandstone.

Appendix 1.

Calculation of thickness of an operational column according to MID-S.

№№	**beginning** pipes, m	**end** pipes, m	**length** pipes, m	**thickness** pipes, m	**the nominal** thickness, mm
1	3.9	9.4	5.5	9.3	9.5
2	9.4	20.6	11.2	8.4	9.5
3	20.6	32.1	11.5	8.5	9.5
4	32.1	42.8	10.7	8.2	9.5
5	42.8	53.8	11.0	8.2	9.5
6	53.8	64.5	10.8	10.8	9.5
7	64.5	75.1	10.6	9.0	9.5
8	75.1	85.7	10.6	8.8	9.5
9	85.7	96.9	11.3	9.0	9.5
10	96.9	107.9	11.0	9.4	9.5
11	107.9	118.8	10.9	10.8	9.5
12	118.8	129.7	10.9	10.7	9.5
13	129.7	139.6	9.9	10.0	9.5
14	139.6	149.5	10.0	10.0	9.5
15	149.5	159.0	9.5	9.5	9.5
16	159.0	168.4	9.4	10.7	9.5
17	168.4	177.7	9.4	9.1	9.5
18	177.7	188.1	10.4	10.4	9.5
19	188.1	198.1	10.1	10.5	9.5
20	198.1	207.7	9.6	8.5	9.5
21	207.7	217.8	10.1	10.1	9.5
22	217.8	227.4	9.6	9.5	9.5
23	227.4	237.0	9.7	9.6	9.5
24	237.0	247.9	10.9	10.5	9.5
25	247.9	257.4	9.5	8.5	9.5
26	257.4	267.2	9.8	9.5	9.5
27	267.2	277.8	10.6	8.3	9.5
28	277.8	288.8	11.0	8.2	9.5
29	288.8	298.9	10.1	9.5	9.5
30	298.9	308.7	9.8	9.2	9.5
31	308.7	317.4	8.7	10.3	9.5
32	317.4	327.5	10.2	9.0	9.5
33	327.5	338.4	10.9	8.9	9.5
34	338.4	348.8	10.4	9.1	9.5
35	348.8	359.2	10.5	8.2	9.5
36	359.2	369.4	10.2	8.1	9.5
37	369.4	378.9	9.5	8.1	9.5
38	378.9	389.0	10.1	9.5	9.5

39	389.0	399.3	10.3	9.3	9.5
40	399.3	409.3	10.1	9.7	9.5
41	409.3	420.5	11.2	9.0	9.5
42	420.5	430.2	9.7	9.4	9.5
43	430.2	441.1	10.9	8.3	9.5
44	441.1	452.0	10.9	10.5	9.5
45	452.0	462.8	10.9	11.1	9.5
46	462.8	473.8	11.0	10.5	9.5
47	473.8	484.9	11.1	10.8	9.5
48	484.9	494.9	10.1	10.0	9.5
49	494.9	504.2	9.3	9.3	9.5
50	504.2	513.4	9.3	9.5	9.5
51	513.4	523.4	10.0	9.4	9.5
52	523.4	534.3	10.9	10.4	9.5
53	534.3	545.9	11.6	10.0	9.5
54	545.9	555.9	10.1	9.3	9.5
55	555.9	566.9	11.0	10.1	9.5
56	566.9	577.6	10.8	10.0	9.5
57	577.6	588.4	10.8	10.0	9.5
58	588.4	598.0	9.6	9.4	9.5
59	598.0	607.4	9.4	9.5	9.5
60	607.4	616.9	9.6	8.9	9.5
61	616.9	626.3	9.4	9.2	9.5
62	626.3	637.1	10.8	11.1	9.5
63	637.1	646.6	9.5	9.3	9.5
64	646.6	656.0	9.4	9.5	9.5
65	656.0	665.9	9.9	9.0	9.5
66	665.9	675.5	9.6	8.7	9.5
67	675.5	685.9	10.4	9.4	9.5
68	685.9	695.6	9.8	9.4	9.5
69	695.6	706.1	10.5	10.7	9.5
70	706.1	715.6	9.6	9.4	9.5
71	715.6	725.3	9.7	9.9	9.5
72	725.3	735.7	10.4	9.7	9.5
73	735.7	746.0	10.3	8.7	9.5
74	746.0	756.4	10.5	10.3	9.5
75	756.4	767.7	11.3	9.2	9.5
76	767.7	777.9	10.3	9.2	9.5
77	777.9	788.6	10.7	10.4	9.5
78	788.6	799.4	10.8	8.7	9.5
79	799.4	810.0	10.6	9.6	9.5
80	810.0	820.5	10.6	9.8	9.5
81	820.5	830.9	10.4	9.0	9.5
82	830.9	841.6	10.8	10.7	9.5

83	841.6	851.0	9.4	8.7	9.5
84	851.0	860.8	9.8	8.9	9.5
85	860.8	870.4	9.6	8.8	9.5
86	870.4	879.7	9.3	9.4	9.5
87	879.7	889.8	10.1	9.8	9.5
88	889.8	899.5	9.8	9.5	9.5
89	899.5	909.1	9.6	9.6	9.5
90	909.1	918.9	9.8	9.0	9.5
91	918.9	926.9	8.0	8.4	8.5
92	926.9	936.3	9.4	9.3	8.5
93	936.3	945.6	9.4	9.2	8.5
94	945.6	955.6	10.0	8.7	8.5
95	955.6	965.3	9.7	9.2	8.5
96	965.3	974.6	9.3	9.0	8.5
97	974.6	985.5	10.9	7.6	7.5
98	985.5	996.0	10.6	7.9	7.5
99	996.0	1006.5	10.5	8.2	7.5
100	1006.5	1017.2	10.7	8.0	7.5
101	1017.2	1027.8	10.6	8.1	7.5
102	1027.8	1038.4	10.7	7.9	7.5
103	1038.4	1048.7	10.3	7.8	7.5
104	1048.7	1059.2	10.5	8.1	7.5
105	1059.2	1070.0	10.8	8.4	7.5
106	1070.0	1080.4	10.4	8.0	7.5
107	1080.4	1090.9	10.6	7.7	7.5
108	1090.9	1101.1	10.2	8.0	7.5
109	1101.1	1111.6	10.5	7.9	7.5
110	1111.6	1121.8	10.2	7.5	7.5
111	1121.8	1132.5	10.8	7.4	7.5
112	1132.5	1143.4	10.9	7.8	7.5
113	1143.4	1153.9	10.5	7.4	7.5
114	1153.9	1163.9	10.0	7.9	7.5
115	1163.9	1174.4	10.5	7.3	7.5
116	1174.4	1184.9	10.5	7.7	7.5
117	1184.9	1195.7	10.9	7.4	7.5
118	1195.7	1205.8	10.1	7.9	7.5
119	1205.8	1216.2	10.4	7.8	7.5
120	1216.2	1226.5	10.4	8.2	7.5
121	1226.5	1237.1	10.6	8.5	7.5
122	1237.1	1247.6	10.6	7.9	7.5
123	1247.6	1258.3	10.7	7.3	7.5
124	1258.3	1269.0	10.7	8.0	7.5
125	1269.0	1279.4	10.5	7.9	7.5
126	1279.4	1289.9	10.5	7.9	7.5

127	1289.9	1300.7	10.8	8.5	7.5
128	1300.7	1310.6	9.9	8.4	7.5
129	1310.6	1320.5	10.0	5.6	7.5
130	1320.5	1331.0	10.5	7.4	7.5
131	1331.0	1341.6	10.6	7.4	7.5
132	1341.6	1352.0	10.5	7.5	7.5
133	1352.0	1362.4	10.4	8.2	7.5
134	1362.4	1372.9	10.6	7.3	7.5
135	1372.9	1383.7	10.8	7.1	7.5
136	1383.7	1394.6	10.9	7.3	7.5
137	1394.6	1405.1	10.5	7.3	7.5
138	1405.1	1415.9	10.8	7.9	7.5
139	1415.9	1426.1	10.3	8.1	7.5
140	1426.1	1436.9	10.8	7.5	7.5
141	1436.9	1446.8	9.9	7.6	7.5
142	1446.8	1457.2	10.4	7.6	7.5
143	1457.2	1467.6	10.4	7.3	7.5
144	1467.6	1477.8	10.3	7.0	7.5
145	1477.8	1488.6	10.8	7.1	7.5
146	1488.6	1498.9	10.4	7.6	7.5
147	1498.9	1507.8	8.9	8.1	7.5
148	1507.8	1518.8	11.0	8.0	7.5
149	1518.8	1529.4	10.7	7.6	7.5
150	1529.4	1540.1	10.7	7.4	7.5
151	1540.1	1550.8	10.7	7.6	7.5
152	1550.8	1561.0	10.3	7.0	7.5
153	1561.0	1572.0	11.0	7.4	7.5
154	1572.0	1582.4	10.4	7.8	7.5
155	1582.4	1591.5	9.1	7.2	7.5
156	1591.5	1602.1	10.7	7.0	7.5
157	1602.1	1612.8	10.7	6.9	7.5
158	1612.8	1623.3	10.5	7.3	7.5
159	1623.3	1633.0	9.8	7.0	7.5
160	1633.0	1643.4	10.4	7.9	7.5
161	1643.4	1654.0	10.7	8.1	7.5
162	1654.0	1663.3	9.3	7.4	7.5
163	1663.3	1673.8	10.5	7.5	7.5
164	1673.8	1684.2	10.4	7.3	7.5
165	1684.2	1694.7	10.5	7.4	7.5
166	1694.7	1705.4	10.8	7.6	7.5
167	1705.4	1714.3	8.9	7.5	7.5
168	1714.3	1724.2	10.0	7.1	7.5
169	1724.2	1734.5	10.3	7.3	7.5
170	1734.5	1744.2	9.8	7.2	7.5

171	1744.2	1754.8	10.6	7.1	7.5
172	1754.8	1765.0	10.3	7.6	7.5
173	1765.0	1775.6	10.6	7.6	7.5
174	1775.6	1785.5	9.9	7.5	7.5
175	1785.5	1795.8	10.3	7.5	7.5
176	1795.8	1805.6	9.9	7.9	7.5
177	1805.6	1815.9	10.3	7.6	7.5
178	1815.9	1826.7	10.8	7.1	7.5
179	1826.7	1837.0	10.3	6.9	7.5
180	1837.0	1846.8	9.8	7.3	7.5
181	1846.8	1857.1	10.3	7.7	7.5
182	1857.1	1867.5	10.5	7.7	7.5
183	1867.5	1877.9	10.4	7.0	7.5
184	1877.9	1888.1	10.2	6.8	7.5
185	1888.1	1898.7	10.6	7.3	7.5
186	1898.7	1909.2	10.5	7.4	7.5
187	1909.2	1919.6	10.5	7.9	7.5
188	1919.6	1930.2	10.6	7.5	7.5
189	1930.2	1940.5	10.3	6.7	7.5
190	1940.5	1950.7	10.2	6.8	7.5
191	1950.7	1961.0	10.3	7.4	7.5
192	1961.0	1970.9	9.9	6.9	7.5
193	1970.9	1979.8	9.0	7.2	7.5
194	1979.8	1990.2	10.4	7.7	7.5
195	1990.2	2000.4	10.3	6.4	7.5
196	2000.4	2010.7	10.3	6.4	7.5
197	2010.7	2019.2	8.5	6.4	7.5
198	2019.2	2029.4	10.2	7.0	7.5
199	2029.4	2039.7	10.3	6.8	7.5
200	2039.7	2050.1	10.5	7.2	7.5
201	2050.1	2059.8	9.7	8.0	7.5
202	2059.8	2069.4	9.6	7.7	7.5
203	2069.4	2079.3	9.9	7.3	7.5
204	2079.3	2088.1	8.9	7.5	7.5
205	2088.1	2098.5	10.4	7.2	7.5
206	2098.5	2108.6	10.2	7.6	7.5
207	2108.6	2119.0	10.4	7.0	7.5
208	2119.0	2128.0	9.1	6.7	7.5
209	2128.0	2138.6	10.6	6.6	7.5
210	2138.6	2149.0	10.4	7.9	7.5
211	2149.0	2159.5	10.6	7.5	7.5
212	2159.5	2169.5	10.0	7.6	7.5
213	2169.5	2180.6	11.1	10.1	9.0
214	2180.6	2191.1	10.5	9.4	9.0

215	2191.1	2202.8	11.7	8.9	9.0
216	2202.8	2212.5	9.8	10.1	9.0
217	2212.5	2224.3	11.8	9.7	9.0
218	2224.3	2235.3	11.0	9.2	9.0
219	2235.3	2244.7	9.5	8.9	9.0
220	2244.7	2256.3	11.6	8.7	9.0
221	2256.3	2267.3	11.0	8.5	9.0
222	2267.3	2275.6	8.3	9.0	9.0
223	2275.6	2283.6	8.1	9.7	9.0
224	2283.6	2294.9	11.3	9.0	9.0
225	2294.9	2304.7	9.8	9.3	9.0
226	2304.7	2316.1	11.4	9.1	9.0
227	2316.1	2324.9	8.8	7.9	9.0
228	2324.9	2336.2	11.3	9.8	9.0
229	2336.2	2346.9	10.7	8.9	9.0
230	2346.9	2358.9	12.0	7.7	9.0
231	2358.9	2366.6	7.7	9.8	9.0
232	2366.6	2378.0	11.3	8.9	9.0
233	2378.0	2388.8	10.8	9.5	9.0
234	2388.8	2396.7	7.9	9.0	9.0
235	2396.7	2407.1	10.4	9.6	9.0
236	2407.1	2418.8	11.7	7.8	9.0
237	2418.8	2427.8	9.0	10.2	9.0
238	2427.8	2438.2	10.3	8.2	9.0
239	2438.2	2449.0	10.8	9.2	9.0
240	2449.0	2460.1	11.1	9.3	9.0
241	2460.1	2467.1	7.0	8.8	9.0
242	2467.1	2478.4	11.2	10.8	9.0
243	2478.4	2489.5	11.1	8.6	9.0
244	2489.5	2500.8	11.4	8.5	9.0
245	2500.8	2508.8	7.9	10.2	9.0
246	2508.8	2516.9	8.1	10.2	9.0
247	2516.9	2527.3	10.4	9.4	9.0
248	2527.3	2537.3	10.0	8.7	9.0
249	2537.3	2545.9	8.6	10.0	9.0
250	2545.9	2557.1	11.2	10.3	9.0
251	2557.1	2566.7	9.6	8.7	9.0
252	2566.7	2576.4	9.7	9.4	9.0
253	2576.4	2588.3	11.8	9.0	9.0
254	2588.3	2596.2	7.9	8.8	9.0
255	2596.2	2607.7	11.5	8.6	9.0
256	2607.7	2618.8	11.1	8.3	9.0
257	2618.8	2629.8	11.0	8.9	9.0
258	2629.8	2640.1	10.3	8.8	9.0

259	2640.1	2650.8	10.7	9.4	9.0
260	2650.8	2659.3	8.5	8.9	9.0
261	2659.3	2669.6	10.3	8.1	9.0
262	2669.6	2680.0	10.4	9.2	9.0
263	2680.0	2691.8	11.8	9.1	9.0
264	2691.8	2702.9	11.1	9.2	9.0
265	2702.9	2714.2	11.4	8.1	9.0
266	2714.2	2725.7	11.5	9.1	9.0
267	2725.7	2735.2	9.5	9.5	9.0
268	2735.2	2746.6	11.4	9.1	9.0
269	2746.6	2757.4	10.8	9.2	9.0
270	2757.4	2768.8	11.4	9.2	9.0
271	2768.8	2780.8	12.0	7.8	9.0
272	2780.8	2791.8	11.0	9.2	9.0
273	2791.8	2803.7	11.9	9.5	9.0
274	2803.7	2812.5	8.8	7.5	9.0
275	2812.5	2823.5	11.0	8.7	9.0
276	2823.5	2834.8	11.3	8.6	9.0
277	2834.8	2846.0	11.2	8.7	9.0
278	2846.0	2847.2	1.2	filling coupling	
279	2847.2	2855.9	8.8	8.1	9.0
280	2855.9	2867.3	11.4	8.4	9.0
281	2867.3	2874.8	7.5	9.6	9.0
282	2874.8	2881.3	6.5	8.6	9.0
283	2881.3	2891.5	10.2	8.6	9.0
284	2891.5	2903.4	11.9	7.8	9.0
285	2903.4	2914.8	11.4	9.7	9.0
286	2914.8	2926.1	11.3	9.4	9.0
287	2926.1	2936.3	10.1	8.1	9.0
288	2936.3	2946.5	10.2	7.6	9.0
289	2946.5	2958.0	11.5	8.2	9.0
290	2958.0	2969.4	11.4	8.3	9.0
291	2969.4	2979.6	10.2	9.4	9.0
292	2979.6	2989.7	10.1	9.1	9.0
293	2989.7	2996.7	7.0	9.1	9.0
294	2996.7	3007.7	10.9	9.0	9.0
295	3007.7	3018.1	10.4	9.8	9.0
296	3018.1	3029.0	10.9	9.0	9.0
297	3029.0	3040.6	11.6	9.3	9.0
298	3040.6	3049.1	8.6	9.7	9.0
299	3049.1	3056.9	7.8	9.1	9.0
300	3056.9	3067.4	10.5	9.3	9.0
301	3067.4	3078.2	10.7	9.1	9.0
302	3078.2	3090.0	11.8	9.4	9.0

303	3090.0	3101.8	11.8	9.2	9.0
304	3101.8	3111.3	9.5	8.8	9.0
305	3111.3	3122.3	10.9	9.0	9.0
306	3122.3	3133.5	11.2	8.9	9.0
307	3133.5	3144.3	10.8	9.1	9.0
308	3144.3	3153.9	9.7	8.8	9.0
309	3153.9	3164.8	10.9	8.8	9.0
310	3164.8	3176.6	11.8	8.8	9.0
311	3176.6	3187.4	10.8	9.4	9.0
312	3187.4	3197.1	9.7	8.9	9.0
313	3197.1	3208.0	10.9	9.3	9.0
314	3208.0	3217.4	9.5	9.3	9.0
315	3217.4	3228.4	10.9	8.8	9.0
316	3228.4	3238.4	10.0	9.2	9.0
317	3238.4	3250.0	11.6	9.2	9.0
318	3250.0	3259.6	9.6	9.2	9.0
319	3259.6	3269.4	9.8	9.5	9.0
320	3269.4	3278.5	9.1	8.5	9.0
321	3278.5	3289.2	10.7	9.1	9.0
322	3289.2	3295.8	6.6	9.6	9.0
323	3295.8	3303.7	7.9	7.7	9.0
324	3303.7	3313.3	9.5	9.1	9.0
325	3313.3	3323.3	10.1	8.8	9.0
326	3323.3	3331.6	8.3	9.2	9.0
327	3331.6	3338.6	7.0	8.6	9.0
328	3338.6	3348.1	9.4	9.2	9.0
329	3348.1	3354.9	6.9	10.0	9.0
330	3354.9	3367.0	12.1	9.2	9.0
331	3367.0	3375.9	8.9	8.6	9.0
332	3375.9	3386.1	10.3	9.1	9.0
333	3386.1	3395.7	9.5	9.0	9.0
334	3395.7	3405.6	10.0	7.8	9.0
335	3405.6	3414.4	8.8	9.2	9.0
336	3414.4	3423.5	9.1	9.5	9.0
337	3423.5	3432.5	9.0	8.8	9.0
338	3432.5	3444.3	11.8	9.6	9.0
339	3444.3	3455.6	11.3	8.6	9.0
340	3455.6	3467.4	11.8	9.1	9.0
341	3467.4	3478.0	10.6	9.0	9.0
342	3478.0	3487.3	9.3	7.6	9.0
343	3487.3	3497.5	10.2	9.4	9.0
344	3497.5	3508.8	11.3	9.4	9.0
345	3508.8	3519.8	11.0	8.8	9.0
346	3519.8	3530.7	10.9	9.4	9.0

347	3530.7	3540.4	9.7	9.0	9.0
348	3540.4	3547.4	7.0	perforation	9.0
349	3547.4	3555.0	7.6	perforation	9.0
350	3555.0	3565.0	10.1	9.0	9.0
351	3565.0	3576.5	11.5	8.8	9.0
352	3576.5	3585.9	9.4	8.3	9.0
353	3585.9	3595.9	10.0	9.4	9.0
354	3595.9	3607.8	11.9	8.9	9.0
355	3607.8	3617.3	9.5	9.7	9.0
356	3617.3	3627.7	10.4	9.3	9.0
357	3627.7	3639.4	11.7	8.7	9.0
358	3639.4	3650.3	10.9	9.1	9.0
359	3650.3	3659.8	9.5	9.1	9.0
360	3659.8	3668.0	8.2	9.4	9.0
361	3668.0	3675.0	7.0	9.2	9.0
362	3675.0	3686.3	11.2	8.6	9.0
363	3686.3	3697.7	11.4	8.9	9.0
364	3697.7	3708.1	9.4	9.0	9.0
365	3708.1	3717.7	9.6	9.5	9.0
366	3717.7	3729.2	11.6	8.6	9.0
367	3729.2	3741.2	12.0	8.9	9.0
368	3741.2	3752.6	11.4	8.5	9.0
369	3752.6	3758.9	6.3	9.0	9.0
370	3758.9	3768.9	9.9	9.3	9.0
371	3768.9	3776.9	8.1	8.0	9.0
372	3776.9	3788.8	11.8	8.6	9.0
373	3788.8	3799.4	10.7	9.0	9.0
374	3799.4	3809.8	10.4	9.2	9.0
375	3809.8	3820.8	10.9	8.6	9.0
376	3820.8 3828.9	3828.9 3831.9	8.1 3.0	perforation 9.3	9.0
377	3831.9	3843.2	11.3	9.3	9.0
378	3843.2	3854.9	11.7	9.0	9.0
379	3854.9	3864.6	9.7	9.5	9.0
380	3864.6	3873.5	8.9	8.9	9.0
381	3873.5	3884.1	10.6	9.6	9.0
382	3884.1	3894.3	10.2	perforation	9.0
383	3894.3 3899.5	3899.5 3905.1	5.2 5.6	perforation 8.7	9.0
384	3905.1 3913.0	3913.0 3917.0	7.9 4.0	8.7 perforation	9.0
385	3917.0 3922.0	3922.0 3928.4	5.0 6.4	perforation 9.0	9.0
386	3928.4	3939.7	11.3	8.9	9.0
387	3939.7	3950.2	10.5	9.6	9.0

388	3950.2	3961.6	11.4	perforation	9.0
389	3961.6 3968.0	3968.0 3972.1	6.4 4.1	perforation 8.7	9.0
390	3972.1 3974.6 3977.6	3974.6 3977.6 3982.3	2.5 3.0 4.7	9.0 perforation 9.1	9.0
391	3982.3	3992.8	10.6	9.8	9.0
392	3992.8	4000.9	8.1	9.3	9.0
393	4000.9	4010.4	9.6	9.3	9.0
394	4010.4	4014.0	3.6	8.5	9.0