● CORE ANALYSIS ● WATER REPRESSURING ENGINEERING ● WATER ANALYSIS ● FLOODING WATER TREATMENT ● SURVEYING

OILFIELD RESEARCH LABORATORIES

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May 1, 1959

Schermerhorn Oil Corporation
P. O. Box 287
Tulsa, Oklahoma

Gentlemen:

Enclosed herewith is the report of the analysis of the 3" Rotary core taken from the Hultine Lease, Well No. O-37, Wilson County, Kansas, and submitted to our laboratory on April 24, 1959.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. McElrea

Carl L. McElrea

CLM:cs

1 c. to Schermerhorn Oil Corp.
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Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Schermerhorn Oil Corporation Lease Hultine Well No. 0-37

Location W½, SE¼

Section 8 Twp. 28S Rge. 17E County Wilson State Kansas

Name of Sand	Bartlesville
Top of Core	980.0
Bottom of Core	1016.0
Top of Pay Sand	989.0
Bottom of Pay Sand	1004.4
Total Feet of Permeable Sand	21.4
Total Feet of Good Floodable Sand	12.7

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 20	4.1	4.1
20 - 40	3.2	7.3
40 - 80	6.3	13.6
80 - 160	4.0	17.6
160 & above	3.8	21.4

Average Permeability Millidarcys	81.7
Average Percent Porosity	21.6
Average Percent Oil Saturation	37.8
Average Percent Water Saturation	40.6
Average Oil Content, Bbls./A. Ft.	635.
Total Oil Content, Bbls./Acre	9,772.
Average Percent Oil Recovery by Laboratory Flooding Tests	11.3
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	193.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	2,649.
Total Calculated Oil Recovery, Bbls./Acre	3,370.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet (Assumed Datum)	970.9

A fresh water mud was used as the circulating fluid during the coring of the sand.

This core was sampled and the samples were sealed in cans by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
980.0 - 987.3	Light brown and gray shaley sandstone.
987.3 - 987.8	Limestone.
987.8 - 989.0	Light brown and gray shaley sandstone.
989.0 - 990.6	Brown slightly laminated slightly shaley sandstone.
990.6 - 992.3	Dark brown sandstone.
992.3 - 992.5	Brown laminated shaley sandstone.
992.5 - 993.3	Dark brown sandstone.
993.3 - 993.5	Laminated sandstone and shale.
993.5 - 1004.4	Dark brown sandstone.
1004.4 - 1011.0	Dark shale.
1011.0 - 1016.0	Gray shale.

Coring was started at a depth of 980.0 feet in light brown and gray shaley sandstone and completed at 1016.0 feet in gray shale. This core shows a total of 23.7 feet of sandstone. For the most part, the pay is made up of dark brown sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 39.7, 63.0 and 118.9 millidarcys respectively; the overall

average being 81.7 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from 0.52 to a maximum of 255 millidarcys.

PERCENT SATURATION & OIL CONTENT

The oil sand in this core shows a good weighted average percent oil saturation, namely, 37.8. The weighted average percent oil saturation of the middle and lower sections is 32.3 and 40.6 respectively. The weighted average percent water saturation of the middle and lower sections is 44.0 and 39.2 respectively; the overall average being 40.6 (See Table III). This gives an overall weighted average total fluid saturation of 78.4 percent. This total fluid saturation indicates some fluid was lost during coring, part of which probably was oil.

The weighted average oil content of the middle and lower sections is 537 and 681 barrels per acre foot respectively; the overall average being 635. The total oil content, as shown by this core, is 9,772 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The oil sand in this core responded rather well to laboratory flooding tests, as a total recovery of 2,649 barrels of oil per acre was obtained from 13.7 feet of sand. The weighted average percent oil saturation was reduced from 38.3 to 27.0, or represents an average recovery of 11.3 percent. The weighted average effective permeability of the samples is 7.26 millidarcys, while the average initial fluid production pressure is 19.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 15 samples tested 13 produced water and oil. This indicates that approximately 87 percent of the sand represented by these samples is floodable

pay sand. The tests also show that the sand has a rather wide variation in effective permeability.

CONCLUSION

It is evident from the enclosed data that an efficient water-flood, within the vicinity of this well, will recover approximately 3,370 barrels of oil per acre, or an average of 265 barrels of oil per acre foot from the 12.7 feet of good floodable pay sand analyzed. The following factors and assumptions were employed in calculating this recovery:

Original formation volume factor	1.06
Present formation volume factor	1.03
True water saturation, percent	36.0
Primary oil recovery, percent	2.0
Calculated present oil saturation, percent	60.2
Porosity, percent	22.0
Oil saturation at abandonment, percent	28.0
Performance factor	0.50

The analysis results show 12.7 feet of good floodable pay sand in the interval extending from 989.0 to 1004.4 feet. The sand in this section of the core has good oil and normal water saturations, and good effective permeability.

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RESULTS OF PERMEABILITY TESTS

TABLE I

Company Schermerhorn Oil Corporation Lease Hultine Well No. O-37

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	981.0	16.	1.0	1.0	16.00
2	982.0	79.	1.0	2.0	79.00
3	983.0	30.	1.0	3.0	30.00
4	984.0	4.0	1.0	4.0	4.00
5	985.0	42.	1.0	5.0	42.00
6	986.0	63.	1.0	6.0	63.00
7	987.0	45.	0.8	6.8	36.00
8	988.0	Imp.	0.7	7.5	0.00
9	988.9	Imp.	0.5	8.0	0.00
10	989.2	37.	0.4	8.4	14.80
11	989.7	90.	0.5	8.9	45.00
12	990.2	0.52	0.7	9.6	0.36
13	990.7	186.	0.3	9.9	55.80
14	991.2	241.	0.5	10.4	120.50
15	991.7	34.	0.5	10.9	17.00
16	992.2	31.	0.4	11.3	12.40
17	992.8	15.	0.4	11.7	6.00
18	993.2	22.	0.4	12.1	8.80
19	993.8	18.	0.5	12.6	9.00
20	994.2	193.	0.5	13.1	96.50
21	994.7	26.	0.5	13.6	13.00
22	995.2	137.	0.5	14.1	68.50
23	995.7	76.	0.5	14.6	38.00
24	996.2	183.	0.5	15.1	91.50
25	996.7	3.2	0.5	15.6	1.60
26	997.2	211.	0.5	16.1	105.50
27	997.7	91.	0.5	16.6	45.50
28	998.2	78.	0.5	17.1	39.00
29	998.7	135.	0.5	17.6	67.50
30	999.2	56.	0.5	18.1	28.00
31	999.7	122.	0.5	18.6	61.00
32	1000.2	255.	0.5	19.1	127.50
33	1000.7	40.	0.5	19.6	20.00
34	1001.2	103.	0.5	20.1	51.50
35	1001.7	111.	0.5	20.6	55.50
36	1002.2	115.	0.5	21.1	57.50
37	1002.7	174.	0.5	21.6	87.00
38	1003.2	191.	0.5	22.1	95.50
39	1003.7	78.	0.5	22.6	39.00

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RESULTS OF PERMEABILITY TESTS

TABLE I

Company Schermerhorn Oil Corporation Lease Hultine Well No. O-37

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	981.0	16.	1.0	1.0	16.00
2	982.0	79.	1.0	2.0	79.00
3	983.0	30.	1.0	3.0	30.00
4	984.0	4.0	1.0	4.0	4.00
5	985.0	42.	1.0	5.0	42.00
6	986.0	63.	1.0	6.0	63.00
7	987.0	45.	0.8	6.8	36.00
8	988.0	Imp.	0.7	7.5	0.00
9	988.9	Imp.	0.5	8.0	0.00
10	989.2	37.	0.4	8.4	14.80
11	989.7	90.	0.5	8.9	45.00
12	990.2	0.52	0.7	9.6	0.36
13	990.7	186.	0.3	9.9	55.80
14	991.2	241.	0.5	10.4	120.50
15	991.7	34.	0.5	10.9	17.00
16	992.2	31.	0.4	11.3	12.40
17	992.8	15.	0.4	11.7	6.00
18	993.2	22.	0.4	12.1	8.80
19	993.8	18.	0.5	12.6	9.00
20	994.2	193.	0.5	13.1	96.50
21	994.7	26.	0.5	13.6	13.00
22	995.2	137.	0.5	14.1	68.50
23	995.7	76.	0.5	14.6	38.00
24	996.2	183.	0.5	15.1	91.50
25	996.7	3.2	0.5	15.6	1.60
26	997.2	211.	0.5	16.1	105.50
27	997.7	91.	0.5	16.6	45.50
28	998.2	78.	0.5	17.1	39.00
29	998.7	135.	0.5	17.6	67.50
30	999.2	56.	0.5	18.1	28.00
31	999.7	122.	0.5	18.6	61.00
32	1000.2	255.	0.5	19.1	127.50
33	1000.7	40.	0.5	19.6	20.00
34	1001.2	103.	0.5	20.1	51.50
35	1001.7	111.	0.5	20.6	55.50
36	1002.2	115.	0.5	21.1	57.50
37	1002.7	174.	0.5	21.6	87.00
38	1003.2	191.	0.5	22.1	95.50
39	1003.7	78.	0.5	22.6	39.00

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RESULTS OF SATURATION TESTS

TABLE II

Company Schermerhorn Oil Corporation Lease Hultine Well No. O-37

Sat. No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acre
			Oil	Water	Total		Ft.	Cum. Ft.	
1	989.5	21.8	30	45	75	506	1.0	1.0	506
2	990.5	18.7	29	46	75	420	0.6	1.6	252
3	991.5	23.5	33	44	77	600	1.7	3.3	1,020
F-4	992.4	14.2	27	-	-	297	0.2	3.5	59
4	992.6	21.0	36	44	80	585	0.8	4.3	467
F-5	993.4	14.1	24	-	-	262	0.2	4.5	52
5	993.6	22.8	38	40	78	671	0.5	5.0	336
6	994.5	23.7	32	38	70	587	1.0	6.0	587
7	995.5	22.2	37	42	79	636	1.0	7.0	636
8	996.5	22.6	35	39	74	612	1.0	8.0	612
9	997.5	23.7	42	41	83	771	1.0	9.0	771
10	998.5	21.6	39	48	87	652	1.0	10.0	652
11	999.5	19.5	41	40	81	620	1.0	11.0	620
12	1000.5	17.5	42	39	81	570	1.0	12.0	570
13	1001.5	21.0	48	30	78	780	1.0	13.0	780
14	1002.5	23.2	40	41	81	720	1.0	14.0	720
15	1003.5	22.2	47	35	82	808	1.4	15.4	1,132
							Total	- - - - -	9,772

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Schermerhorn Oil Corporation Lease Hultine Well No. O-37

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
980.5 - 987.3	6.8	39.7	270.00
989.0 - 994.0	4.6	63.0	289.66
994.0 - 1004.4	10.0	118.9	1,189.10
980.5 - 1004.4	21.4	81.7	1,748.76

Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
989.0 - 994.0	5.0	21.4	32.3	44.0	537	2,692
994.0 - 1004.4	10.4	21.8	40.6	39.2	681	7,080
989.0 - 1004.4	15.4	21.6	37.8	40.6	635	9,772

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Schermerhorn Oil Corporation Lease Hultine Well No. O-37

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation			Volume of Water Recovered cc*	Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	989.5	21.4	30	498	8	133	22	61	365	31	0.900	25
2	990.5	18.8	29	423	5	73	24	71	350	87	2.72	20
3	991.5	24.0	33	613	7	130	26	65	483	131	12.15	15
4	992.4	14.2	27	297	0	0	27	66	297	0	Imp.	50+
5	993.4	14.1	24	262	0	0	24	73	262	11	0.369	35
6	994.5	23.4	32	580	8	145	24	65	435	137	17.85	15
7	995.5	22.5	37	644	12	209	25	72	435	139	7.22	15
8	996.5	22.7	35	616	8	141	27	64	475	164	8.70	15
9	997.5	24.1	42	794	16	299	26	58	485	119	13.30	10
10	998.5	22.1	39	668	14	240	25	70	428	127	4.19	15
11	999.5	19.8	41	628	13	199	28	63	429	39	1.62	25
12	1000.5	17.9	42	582	10	138	32	59	444	0	0.012	35
13	1001.5	20.7	48	770	17	273	31	59	497	16	0.504	25
14	1002.5	23.5	40	728	12	218	28	64	510	138	10.14	20
15	1003.5	22.4	47	816	16	278	31	57	538	142	9.10	20

Notes: cc—cubic centimeter.

*—Volume of water recovered at the time of maximum oil recovery.

**—Determined by passing water through sample which still contains residual oil.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Schermerhorn Oil Corporation Lease Hultine Well No. O-37

Depth Interval, Feet	989.0 - 992.3	994.0 - 1004.4	989.0 - 1004.4
Feet of Core Analyzed	3.3	10.4	13.7
Average Percent Porosity	22.2	21.9	22.0
Average Percent Original Oil Saturation	31.3	40.5	38.3
Average Percent Oil Recovery	6.9	12.7	11.3
Average Percent Residual Oil Saturation	24.4	27.8	27.0
Average Percent Residual Water Saturation	64.8	62.8	63.4
Average Percent Total Residual Fluid Saturation	89.2	90.6	90.4
Average Original Oil Content, Bbls./A. Ft.	542.	686.	651.
Average Oil Recovery, Bbls./A. Ft.	120.	216.	193.
Average Residual Oil Content, Bbls./A. Ft.	422.	470.	458.
Total Original Oil Content, Bbls./Acre	1,794.	7,143.	8,937.
Total Oil Recovery, Bbls./Acre	398.	2,251.	2,649.
Total Residual Oil Content, Bbls./Acre	1,396.	4,892.	6,288.
Average Effective Permeability, Millidarcys	7.01	7.33	7.26
Average Initial Fluid Production Pressure, p.s.i.	20.0	19.5	19.6

NOTE: Only those samples which recovered oil were used in calculating the above averages.