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

OILFIELD RESEARCH LABORATORIES

813 EAST SIXTH
OKMULGEE, OKLAHOMA
PHONE: 1466

- REGISTERED ENGINEERS -
Chanute, Kansas

536 N. HIGHLAND
CHANUTE, KANSAS
PHONE: 728

August 12, 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. L-36, Wilson County, Kansas, and submitted to our laboratory on August 7, 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 Corporation
Route 1
Earlton, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Schermerhorn Oil Corporation Lease Hultine Well No. L-36

Location NW¼, SW¼, SE¼

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

Name of Sand	Bartlesville
Top of Core	975.0
Bottom of Core	1017.0
Top of Pay Sand	990.6
Bottom of Pay Sand	1009.5
Total Feet of Permeable Sand	21.9
Total Feet of Floodable Sand	16.1

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 50	3.8	3.8
50 - 75	4.9	8.7
75 - 100	3.4	12.1
100 - 150	4.0	16.1
150 - 200	2.4	18.5
200 & above	3.4	21.9

Average Permeability Millidarcys	111.6
Average Percent Porosity	21.2
Average Percent Oil Saturation	37.8
Average Percent Water Saturation	41.2
Average Oil Content, Bbls./A. Ft.	625.
Total Oil Content, Bbls./Acre	13,768.
Average Percent Oil Recovery by Laboratory Flooding Tests	19.6
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	328.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	5,297.
Total Calculated Oil Recovery, Bbls./Acre	3,800.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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
975.0 - 978.0	Loss.
978.0 - 980.8	Laminated sandy shale.
980.8 - 986.8	Light brown laminated shaley sandstone.
986.8 - 989.1	Light brown slightly shaley sandstone.
989.1 - 989.3	Light brown shaley sandstone.
989.3 - 990.1	Light brown slightly shaley sandstone.
990.1 - 991.2	Brown sandstone.
991.2 - 991.4	Brown laminated shaley sandstone.
991.4 - 991.9	Brown sandstone.
991.9 - 992.1	Brown and gray shaley sandstone.
992.1 - 993.1	Brown sandstone.
993.1 - 999.9	Brown slightly shaley sandstone.
999.9 - 1000.1	Brown laminated shaley sandstone.
1000.1 - 1003.0	Dark brown sandstone.
1003.0 - 1003.2	Brown and gray shaley sandstone.
1003.2 - 1009.5	Dark brown sandstone.
1009.5 - 1012.0	Gray sandy shale.
1012.0 - 1017.0	Loss.

Coring was started at a depth of 975.0 feet and completed at 1012.0 feet. The core representing the intervals extending from 975.0 to 978.0

feet, and from 1012.0 to 1017.0 feet were not recovered. This core shows a total of 28.7 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 105.5, 141.1 and 90.1 millidarcys respectively; the overall average being 111.6 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a rather irregular permeability profile. The permeability of the sand varies from 7.4 to a maximum of 304 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 37.8. The weighted average percent oil saturation of the upper, middle and lower sections is 11.0, 39.4 and 44.9 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 81.5, 44.1 and 31.7 respectively; the overall average being 41.2 (See Table III). This gives an overall weighted average total fluid saturation of 79.0 percent. This total fluid saturation indicates some fluid was lost during coring which probably was oil.

The weighted average oil content of the upper, middle and lower sections is 174, 640 and 750 barrels per acre foot respectively; the overall average being 625. The total oil content, as shown by this core, is 13,768 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 5,297 barrels of oil per acre was obtained from 16.1 feet of sand. The weighted average percent oil saturation

was reduced from 44.1 to 24.5, or represents an average recovery of 19.6 percent. The weighted average effective permeability of the samples is 6.35 millidarcys, while the average initial fluid production pressure is 13.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 23 samples tested, 22 produced water and 16 oil. This indicates that approximately 70 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a fairly uniform effective permeability.

CONCLUSION

It is evident from the enclosed data that an efficient water-flood within the vicinity of this well will recover approximately 3,800 barrels of oil per acre. This represents an average recovery of 236 barrels of oil per acre foot from the 16.1 feet of floodable pay sand analyzed. The following factors and assumptions were used in calculating this recovery:

Original formation volume factor	1.07
Present formation volume factor	1.02
True water saturation, percent	36.0
Primary oil recovery, percent	5.0
Calculated present oil saturation, percent	56.0
Porosity, percent	21.5
Oil saturation at abandonment, percent	27.0
Performance factor	0.50

The analysis results show 16.1 feet of floodable pay sand in the interval extending from 990.6 to 1009.5 feet. The pay sand has good oil and normal water saturations, and good effective permeability. It is evident that the sand above the depth of 990.6 feet is gas sand or a depleted zone.

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RESULTS OF PERMEABILITY TESTS

TABLE I

Company Schermerhorn Oil Corporation Lease Hultine Well No. L-36

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	986.9	304.	0.3	0.3	91.20
2	987.3	41.	0.5	0.8	20.50
3	987.9	234.	0.5	1.3	117.00
4	988.3	88.	0.5	1.8	44.00
5	988.9	69.	0.5	2.3	34.50
6	989.4	28.	0.3	2.6	8.40
7	989.9	23.	0.5	3.1	11.50
8	990.3	212.	0.5	3.6	106.00
9	990.9	212.	0.6	4.2	127.20
10	991.3	34.	0.2	4.4	6.80
11	991.8	255.	0.5	4.9	127.50
12	992.4	120.	0.5	5.4	60.00
13	992.9	261.	0.5	5.9	130.50
14	993.4	130.	0.5	6.4	65.00
15	993.9	196.	0.5	6.9	98.00
16	994.3	144.	0.5	7.4	72.00
17	994.9	143.	0.5	7.9	71.50
18	995.3	184.	0.5	8.4	92.00
19	995.9	41.	0.5	8.9	20.50
20	996.3	110.	0.5	9.4	55.00
21	996.9	68.	0.5	9.9	34.00
22	997.3	55.	0.5	10.4	27.50
23	997.9	68.	0.5	10.9	34.00
24	998.3	88.	0.5	11.4	44.00
25	998.9	54.	0.5	11.9	27.00
26	999.3	68.	0.5	12.4	34.00
27	999.8	38.	0.3	12.7	11.40
28	1000.3	78.	0.5	13.2	39.00
29	1000.9	82.	0.5	13.7	41.00
30	1001.3	66.	0.5	14.2	33.00
31	1001.9	68.	0.5	14.7	34.00
32	1002.3	183.	0.5	15.2	91.50
33	1002.9	95.	0.4	15.6	38.00
34	1003.3	72.	0.4	16.0	28.80
35	1003.9	115.	0.5	16.5	57.50
36	1004.3	150.	0.5	17.0	75.00
37	1004.9	147.	0.5	17.5	73.50
38	1005.3	7.4	0.5	18.0	3.70
39	1005.9	86.	0.5	18.5	43.00
40	1006.3	77.	0.5	19.0	38.50

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RESULTS OF PERMEABILITY TESTS

TABLE I

Company Schermerhorn Oil Corporation Lease Hultine Well No. L-36

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	1006.9	68.	0.5	19.5	34.00
42	1007.3	200.	0.5	20.0	100.00
43	1007.9	7.4	0.5	20.5	3.70
44	1008.3	114.	0.5	21.0	57.00
45	1008.9	38.	0.5	21.5	19.00
46	1009.3	159.	0.4	21.9	63.60

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RESULTS OF SATURATION TESTS

TABLE II

Company Schermerhorn Oil Corporation Lease Hultine Well No. L-36

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	987.1	22.8	10	84	94	177	0.8	0.8	142
2	988.1	23.5	9	82	91	164	1.0	1.8	164
F-3	989.0	18.5	10	-	-	144	0.5	2.3	72
3	989.2	12.6	27	69	96	264	0.2	2.5	53
F-4	990.0	20.9	11	-	-	178	0.8	3.3	142
4	990.2	22.7	26	54	80	458	0.5	3.8	229
5	991.1	22.7	34	42	76	598	0.6	4.4	359
F-6	992.0	14.0	27	-	-	293	0.2	4.6	59
6	992.2	22.5	34	47	81	593	0.5	5.1	297
F-7	993.0	23.5	40	-	-	729	0.5	5.6	364
7	993.2	18.3	41	46	87	582	0.5	6.1	291
8	994.1	21.4	46	42	88	764	1.0	7.1	764
9	995.1	21.7	40	40	80	674	1.0	8.1	674
10	996.1	21.7	47	38	85	791	1.0	9.1	791
11	997.1	20.6	37	44	81	591	1.0	10.1	591
12	998.1	18.2	41	50	91	578	1.0	11.1	578
13	999.1	21.5	44	31	75	734	1.3	12.4	955
F-14	1000.0	12.6	27	-	-	264	0.2	12.6	53
14	1000.2	20.2	40	31	71	627	0.5	13.1	314
15	1001.1	21.2	46	32	78	757	1.0	14.1	757
16	1002.1	20.4	44	34	78	696	1.4	15.5	975
17	1003.1	16.6	24	44	68	309	0.2	15.7	62
18	1004.1	21.1	37	31	68	605	1.4	17.1	847
19	1005.1	21.8	46	35	81	778	1.0	18.1	778
20	1006.1	19.6	44	33	77	670	1.0	19.1	670
21	1007.1	23.6	46	29	75	844	1.0	20.1	844
22	1008.1	23.6	52	28	80	953	1.0	21.1	953
23	1009.1	23.2	61	30	91	1,100	0.9	22.0	990
							Total-	- - - - -	13,768

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Schermerhorn Oil Corporation Lease Hultine Well No. L-36

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
986.8 - 990.1	3.1	105.5	327.10
990.1 - 998.6	8.3	141.1	1,171.50
998.6 - 1009.5	10.5	90.1	946.20
986.8 - 1009.5	21.9	111.6	2,444.80

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
986.8 - 990.1	3.3	21.3	11.0	81.5	174	573
990.1 - 998.6	7.8	21.0	39.4	44.1	640	4,997
998.6 - 1009.5	10.9	21.4	44.9	31.7	750	8,198
986.8 - 1009.5	22.0	21.2	37.8	41.2	625	13,768

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Schermerhorn Oil Corporation Lease Hultine Well No. L-36

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	987.1	22.3	7	121	0	0	7	85	121	151	7.49	5
2	988.1	23.1	7	125	0	0	7	86	125	153	39.30	5
3	989.0	18.5	10	144	0	0	10	80	144	88	2.66	15
4	990.0	20.9	11	178	0	0	11	78	178	124	16.20	5
5	991.1	22.8	34	602	9	159	25	64	443	68	9.30	15
6	992.0	14.0	27	293	0	0	27	62	293	0	Imp.	50+
7	993.0	23.5	40	729	14	255	26	67	474	112	15.00	15
8	994.1	21.4	46	764	24	399	22	69	365	82	11.00	15
9	995.1	21.2	40	658	17	280	23	70	378	83	8.83	15
10	996.1	21.5	47	783	20	333	27	68	450	82	2.56	20
11	997.1	20.8	37	596	12	193	25	70	403	127	4.46	20
12	998.1	19.0	41	604	15	221	26	68	383	152	4.84	20
13	999.1	21.2	44	724	22	362	22	71	362	133	4.52	20
14	1000.0	12.6	27	264	0	0	27	68	264	7	0.344	40
15	1001.1	20.5	46	732	25	398	21	73	334	184	5.50	5
16	1002.1	20.8	44	710	21	339	23	68	371	181	7.38	15
17	1003.1	16.6	26	335	0	0	26	69	335	9	0.333	40
18	1004.1	21.2	37	608	12	197	25	66	411	202	5.60	15
19	1005.1	22.2	46	793	22	379	24	70	414	166	10.43	5
20	1006.1	19.9	44	679	16	247	28	68	432	57	1.80	15
21	1007.1	23.2	46	828	20	360	26	65	468	189	5.90	5
22	1008.1	23.7	52	955	27	496	25	72	459	60	2.05	15
23	1009.1	23.0	61	1,088	34	606	27	71	482	146	8.42	5

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. L-36

Depth Interval, Feet	990.6 - 998.6	998.6 - 1009.5	990.6 - 1009.5
Feet of Core Analyzed	6.1	10.0	16.1
Average Percent Porosity	21.2	21.7	21.5
Average Percent Original Oil Saturation	41.3	45.9	44.1
Average Percent Oil Recovery	16.5	21.5	19.6
Average Percent Residual Oil Saturation	24.8	24.4	24.5
Average Percent Residual Water Saturation	68.2	69.1	68.7
Average Percent Total Residual Fluid Saturation	93.0	93.5	93.2
Average Original Oil Content, Bbls./A. Ft.	677.	776.	737.
Average Oil Recovery, Bbls./A. Ft.	270.	365.	328.
Average Residual Oil Content, Bbls./A. Ft.	407.	411.	409.
Total Original Oil Content, Bbls./Acre	4,131.	7,755.	11,886.
Total Oil Recovery, Bbls./Acre	1,649.	3,648.	5,297.
Total Residual Oil Content, Bbls./Acre	2,482.	4,107.	6,589.
Average Effective Permeability, Millidarcys	7.34	5.73	6.35
Average Initial Fluid Production Pressure, p.s.i.	17.2	11.1	13.8

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