8-28s-17E

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

OILFIELD RESEARCH LABORATORIES

- REGISTERED ENGINEERS -

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August 5, 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. K-33, Wilson County, Kansas, and submitted to our laboratory on July 30, 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.
Route 1
Earlton, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Schermerhorn Oil Corporation Lease Hultine Well No. K-33

Location W½, SE¼

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

Name of Sand	Bartlesville
Top of Core	975.0
Bottom of Core	1018.0
Pay Top of Sand	987.0
Pay Bottom of Sand	1008.0
Total Feet of Permeable Sand	23.3
Good Total Feet of Floodable Sand	18.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 25	3.8	3.8
25 - 50	4.1	7.9
50 - 75	5.5	13.4
75 - 125	4.4	17.8
125 - 175	2.9	20.7
175 & above	2.6	23.3

Average Permeability Millidarcys	86.2
Average Percent Porosity	21.2
Average Percent Oil Saturation	44.0
Average Percent Water Saturation	41.2
Average Oil Content, Bbls./A. Ft.	721.
Total Oil Content, Bbls./Acre	16,800.
Average Percent Oil Recovery by Laboratory Flooding Tests	19.3
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	316.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	6,259.
Total Calculated Oil Recovery, Bbls./Acre	3,740.
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 - 986.0	Gray sandstone (Discarded at well).
986.0 - 987.0	Light brown laminated shaley sandstone.
987.0 - 988.5	Brown slightly laminated slightly shaley sandstone.
988.5 - 989.2	Brown laminated shaley sandstone.
989.2 - 993.7	Brown sandstone.
993.7 - 994.8	Brown conglomeratic sandstone.
994.8 - 1001.1	Brown slightly shaley sandstone.
1001.1 - 1001.3	Brown shaley sandstone.
1001.3 - 1001.5	Brown slightly shaley sandstone.
1001.5 - 1002.1	Brown conglomeratic sandstone.
1002.1 - 1007.0	Brown slightly shaley sandstone.
1007.0 - 1008.0	Brown slightly laminated shaley sandstone.
1008.0 - 1009.5	Brown to dark slightly shaley carbonaceous sandstone.
1009.5 - 1013.0	Dark carbonaceous sandstone.
1013.0 - 1018.0	Shale (Discarded at well).

Coring was started at a depth of 975.0 feet in gray sandstone and completed at 1018.0 feet in shale. This core shows a total of 38.0 feet of sandstone. For the most part, the pay is made up of brown slightly shaley sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections.

The weighted average permeability of the upper and lower sections is 105.6 and 53.6 millidarcys respectively; the overall average being 86.2 (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 2.8 to a maximum of 255 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 44.0. The weighted average percent oil saturation of the upper and lower sections is 41.9 and 47.5 respectively. The weighted average percent water saturation of the upper and lower sections is 44.7 and 34.7 respectively; the overall average being 41.2 (See Table III). This gives an overall weighted average total fluid saturation of 85.2 percent.

The weighted average oil content of the upper and lower sections is 682 and 786 barrels per acre foot respectively; the overall average being 721. The total oil content, as shown by this core, is 16,800 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded very well to laboratory flooding tests, as a total recovery of 6,259 barrels of oil per acre was obtained from 19.8 feet of sand. The weighted average percent oil saturation was reduced from 44.5 to 25.2, or represents an average recovery of 19.3 percent. The weighted average effective permeability of the samples is 5.17 millidarcys, while the average initial fluid production pressure is 17.2 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 24 samples tested, 23 produced water and 21 oil. This indicates that approximately 88 percent of the sand represented by these samples is

floodable pay sand. The tests also show that the sand has a 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 3,740 barrels of oil per acre, or an average of 208 barrels of oil per acre foot from the 18.0 feet of good 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	37.0
Primary oil recovery, percent	8.0
Calculated present oil saturation, percent	52.0
Porosity, percent	21.0
Oil saturation at abandonment, percent	26.0
Performance factor	0.50

The analysis results show 18.0 feet of good floodable pay sand in the interval extending from 987.0 to 1008.0 feet. The pay sand has good oil and normal water saturations, and a wide variation in permeability.

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RESULTS OF PERMEABILITY TESTS

TABLE I

Company Schermerhorn Oil Corporation Lease Hultine Well No. K-33

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	986.3	41.	0.6	0.6	24.60
2	986.9	8.3	0.4	1.0	3.32
3	987.3	55.	0.6	1.6	33.00
4	987.9	113.	0.5	2.1	56.50
5	988.3	125.	0.4	2.5	50.00
6	988.9	5.2	0.7	3.2	3.64
7	989.3	106.	0.4	3.6	42.40
8	989.9	124.	0.5	4.1	62.00
9	990.3	115.	0.5	4.6	57.50
10	990.9	150.	0.5	5.1	75.00
11	991.3	223.	0.5	5.6	111.50
12	991.9	206.	0.5	6.1	103.00
13	992.3	73.	0.5	6.6	36.50
14	992.9	131.	0.5	7.1	65.50
14	993.3	255.	0.6	7.7	153.00
16	993.9	2.8	0.4	8.1	1.12
17	994.3	6.6	0.7	8.8	4.62
18	994.9	105.	0.3	9.1	31.50
19	995.3	96.	0.5	9.6	48.00
20	995.9	74.	0.5	10.1	37.00
21	996.3	74.	0.5	10.6	37.00
22	996.9	180.	0.5	11.1	90.00
23	997.3	170.	0.5	11.6	85.00
24	997.9	49.	0.5	12.1	24.50
25	998.3	194.	0.5	12.6	97.00
26	998.9	78.	0.5	13.1	39.00
27	999.3	139.	0.5	13.6	69.50
28	999.9	163.	0.5	14.1	81.50
29	1000.3	37.	0.5	14.6	18.50
30	1000.9	49.	0.5	15.1	24.50
31	1001.4	117.	0.2	15.3	23.40
32	1001.9	12.	0.6	15.9	7.20
33	1002.4	47.	0.5	16.4	23.50
34	1002.9	62.	0.5	16.9	31.00
35	1003.3	41.	0.5	17.4	20.50
36	1003.9	51.	0.5	17.9	25.50
37	1004.3	51.	0.5	18.4	25.50
38	1004.9	67.	0.5	18.9	33.50
39	1005.3	69.	0.5	19.4	34.50
40	1005.9	71.	0.5	19.9	35.50

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RESULTS OF PERMEABILITY TESTS

TABLE I

Company Schermerhorn Oil Corporation Lease Hultine Well No. K-33

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	1006.3	110.	0.5	20.4	55.00
42	1006.9	61.	0.4	20.8	24.40
43	1007.3	49.	0.6	21.4	29.40
44	1007.9	21.	0.4	21.8	8.40
45	1008.3	9.0	0.6	22.4	5.40
46	1008.9	96.	0.5	22.9	48.00
47	1009.3	28.	0.4	23.3	11.20

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RESULTS OF SATURATION TESTS

TABLE II

Company Schermerhorn Oil Corporation Lease Hultine Well No. K-33

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	986.1	22.2	18	72	90	310	1.0	1.0	310
2	987.1	20.8	34	57	91	549	0.6	1.6	329
3	988.1	22.7	43	39	82	757	0.9	2.5	682
4	989.1	16.1	48	43	91	600	0.7	3.2	420
5	990.1	21.0	38	54	92	619	1.4	4.6	867
6	991.1	21.9	44	45	89	747	1.0	5.6	747
7	992.1	21.4	49	39	88	814	1.0	6.6	814
8	993.1	22.8	53	40	93	937	1.1	7.7	1,031
9	994.1	14.2	41	49	90	452	1.1	8.8	497
10	995.1	23.0	46	42	88	821	0.8	9.6	657
11	996.1	19.5	57	31	88	862	1.0	10.6	862
12	997.1	23.3	38	35	73	686	1.0	11.6	686
13	998.1	22.0	42	43	85	717	1.0	12.6	717
14	999.1	21.6	38	42	80	636	1.0	13.6	636
15	1000.1	22.6	40	39	79	701	1.0	14.6	701
16	1001.0	22.4	37	38	75	643	0.5	15.1	322
F-16	1001.2	17.3	47	-	-	631	0.2	15.3	126
F-17	1002.0	22.8	40	-	-	708	0.6	15.9	425
17	1002.2	22.4	40	41	81	695	0.5	16.4	348
18	1003.1	22.0	46	35	81	785	1.0	17.4	785
19	1004.1	21.2	46	34	80	757	1.0	18.4	757
20	1005.1	22.4	47	35	82	817	1.0	19.4	817
21	1006.1	21.9	49	32	81	832	1.4	20.8	1,162
22	1007.1	18.1	47	44	91	660	1.0	21.8	660
23	1008.1	21.3	52	35	87	859	0.6	22.4	515
24	1009.1	21.4	62	23	85	1,030	0.9	23.3	927
							Total-	- - - - -	-16,800

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Schermerhorn Oil Corporation Lease Hultine Well No. K-33

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
986.0 - 1000.6	14.6	105.6	1,541.70
1000.6 - 1009.5	8.7	53.6	466.40
986.0 - 1009.5	23.3	86.2	2,008.10

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
986.0 - 1000.6	14.6	21.0	41.9	44.7	682	9,956
1000.6 - 1009.5	8.7	21.4	47.5	34.7	786	6,844
986.0 - 1009.5	23.3	21.2	44.0	41.2	721	16,800

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Schermerhorn Oil Corporation Lease Hultine Well No. K-33

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	986.1	21.7	20	336	0	0	20	76	336	101	2.54	15
2	987.1	20.6	34	544	9	144	25	72	400	179	7.06	15
3	988.1	22.4	43	747	19	330	24	66	417	174	8.46	15
4	989.1	15.9	48	592	12	148	36	54	444	0	0.010	45
5	990.1	21.3	38	627	14	231	24	72	396	149	10.72	15
6	991.1	21.7	44	741	14	236	30	64	505	158	7.96	15
7	992.1	21.1	49	801	23	376	26	71	425	75	2.46	20
8	993.1	22.6	53	930	24	421	29	66	509	151	10.24	15
9	994.1	14.5	41	461	13	146	28	64	315	4	0.200	25
10	995.1	23.4	46	834	23	417	23	70	417	170	5.20	15
11	996.1	19.7	57	871	30	458	27	60	413	37	1.14	15
12	997.1	23.6	38	695	16	292	22	67	403	149	13.32	15
13	998.1	21.8	42	710	18	304	24	69	406	150	6.87	15
14	999.1	21.7	38	639	15	252	23	66	387	154	9.66	15
15	1000.1	22.8	40	707	12	212	28	64	495	166	9.74	15
16	1001.2	17.3	47	631	22	295	25	66	336	75	1.93	15
17	1002.0	22.8	40	708	21	372	19	72	336	78	1.99	15
18	1003.1	21.5	46	768	26	434	20	74	334	45	1.44	15
19	1004.1	20.8	46	742	23	371	23	69	371	33	0.788	15
20	1005.1	22.0	47	803	24	410	23	70	393	86	1.32	15
21	1006.1	21.9	49	832	23	391	26	66	441	70	1.69	15
22	1007.1	18.4	47	671	22	314	25	70	357	43	1.18	15
23	1008.1	21.1	49	802	0	0	49	48	802	4	0.102	45
24	1009.1	21.7	62	1,042	0	0	62	29	1,042	0	Imp.	50+

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. K-33

Depth Interval, Feet	987.0 - 1000.6	1001.1 - 1008.0	987.0 - 1008.0
Feet of Core Analyzed	13.6	6.2	19.8
Average Percent Porosity	21.0	21.0	21.0
Average Percent Original Oil Saturation	43.7	46.5	44.5
Average Percent Oil Recovery	17.5	23.3	19.3
Average Percent Residual Oil Saturation	26.2	23.2	25.2
Average Percent Residual Water Saturation	66.2	69.5	67.4
Average Percent Total Residual Fluid Saturation	92.4	92.7	92.6
Average Original Oil Content, Bbls./A. Ft.	711.	758.	724.
Average Oil Recovery, Bbls./A. Ft.	287.	380.	316.
Average Residual Oil Content, Bbls./A. Ft.	424.	378.	408.
Total Original Oil Content, Bbls./Acre	9,657.	4,699.	14,356.
Total Oil Recovery, Bbls./Acre	3,901.	2,358.	6,259.
Total Residual Oil Content, Bbls./Acre	5,756.	2,341.	8,097.
Average Effective Permeability, Millidarcys	6.88	1.40	5.17
Average Initial Fluid Production Pressure, p.s.i.	18.2	15.0	17.2

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