

17-285-17E

OILFIELD RESEARCH LABORATORIES

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June 16, 1959

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

Gentlemen:

Enclosed herewith is the report of the analysis of the 2 7/8" Rotary core taken from the Friedline "B" Lease, Well No. M-31, Wilson County, Kansas, and submitted to our laboratory on June 10, 1959.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Carl L. McElrea

CLM:cs

1 c. to Schermerhorn Oil Corporation
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Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Schermerhorn Oil Corporation Lease Friedline "B" Well No. M-31

Location 660' E. of W. Line & 650' S. of N. Line, NE 1/4

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

Name of Sand - - - - - Bartlesville

Top of Core - - - - - 965.0

Bottom of Core - - - - - 1008.0

Top of Sand - - - - - 973.6

Good
Bottom of Sand - - - - - 991.4

Total Feet of Permeable Sand - - - - - 18.3

Good
Total Feet of Floodable Sand - - - - - 15.5

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 20	4.9	4.9
20 - 40	4.4	9.3
40 - 80	5.6	14.9
80 & above	3.4	18.3

Average Permeability Millidarcys - - - - - 52.7

Average Percent Porosity - - - - - 19.8

Average Percent Oil Saturation - - - - - 37.9

Average Percent Water Saturation - - - - - 39.4

Average Oil Content, Bbls./A. Ft. - - - - - 584.

Total Oil Content, Bbls./Acre - - - - - 10,292.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 14.0

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 222.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 3,534.

Total Calculated Oil Recovery, Bbls./Acre - - - - - 3,250.

Packer Setting, Feet - - - - -

Viscosity, Centipoises @ - - - - -

A. P. I. Gravity, degrees @ 60 °F - - - - -

Elevation, Feet - - - (Assumed Datum) - - - - - 948.1

A water base 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:

<u>Depth Interval, Feet</u>	<u>Description</u>
965.0 - 970.0	Gray sandy shale.
970.0 - 970.7	Light brown shaley sandstone.
970.7 - 972.8	Gray sandy shale.
972.8 - 973.0	Brown fine grained sandstone.
973.0 - 973.6	Sandy shale.
973.6 - 973.9	Brown fine grained micaceous slightly shaley sandstone.
973.9 - 974.0	Shale.
974.0 - 975.0	Brown fine grained micaceous sandstone.
975.0 - 975.2	Brown fine grained laminated micaceous shaley sandstone.
975.2 - 978.0	Brown fine grained micaceous slightly shaley sandstone.
978.0 - 979.8	Brown fine grained micaceous sandstone.
979.8 - 980.4	Brown fine grained micaceous slightly shaley sandstone.
980.4 - 983.5	Brown fine grained micaceous sandstone.
983.5 - 984.0	Brown fine grained laminated micaceous shaley sandstone.
984.0 - 985.2	Brown fine grained micaceous slightly shaley sandstone.
985.2 - 986.7	Brown fine grained micaceous conglomeratic sandstone.
986.7 - 987.2	Brown fine grained micaceous sandstone.
987.2 - 989.3	Brown fine grained micaceous conglomeratic sandstone.
989.3 - 991.4	Brown fine grained micaceous slightly shaley sandstone.

991.4 - 993.4 - Laminated sandy shale.
993.4 - 993.6 - Brown fine grained micaceous slightly shaley sandstone.
993.6 - 994.2 - Dark carbonaceous sandstone.
994.2 - 994.4 - Dark brown fine grained micaceous carbonaceous sandstone.
994.4 - 999.0 - Dark carbonaceous sandstone.
999.0 - 1000.5 - Shale.
1000.5 - 1008.0 - Loss.

Coring was started at a depth of 965.0 feet in gray sandy shale and completed at 1008.0 feet. The core representing the interval extending from 1000.5 to 1008.0 feet was not recovered. This core shows a total of 24.2 feet of sandstone. For the most part, the pay is made up of brown fine grained micaceous 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 119.6, 41.5 and 18.8 millidarcys respectively; the overall average being 52.7 (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 0.57 to a maximum of 176 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 37.9. The weighted average percent oil saturation of the upper, middle and lower sections is 34.6, 44.8 and 34.1 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 44.2, 31.3 and 43.6 respectively; the overall average being 39.4 (See Table III). This gives an overall weighted

average total fluid saturation of 77.3 percent. This low total fluid saturation indicates considerable fluid was lost during coring, part of which probably was oil.

The weighted average oil content of the upper, middle and lower sections is 520, 731 and 496 barrels per acre foot respectively; the overall average being 584. The total oil content, as shown by this core, is 10,292 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded rather well to laboratory flooding tests, as a total recovery of 3,534 barrels of oil per acre was obtained from 15.9 feet of sand. The weighted average percent oil saturation was reduced from 38.0 to 24.0, or represents an average recovery of 14.0 percent. The weighted average effective permeability of the samples is 3.73 millidarcys, while the average initial fluid production pressure is 17.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 21 samples tested, 20 produced water and oil. This indicates that approximately 95 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 3,250 barrels of oil per acre, or an average of 210 barrels of oil per acre foot from the 15.5 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	1.03

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True water saturation, percent	37.0
Primary oil recovery, percent	5.0
Calculated present oil saturation, percent	55.7
Porosity, percent	20.0
Oil saturation at abandonment, percent	28.0
Performance factor	0.50

The analysis results show 15.5 feet of good floodable pay sand in the interval extending from 973.6 to 991.4 feet. The pay sand has good oil and normal water saturations and a rather wide variation in effective permeability.

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RESULTS OF PERMEABILITY TESTS
TABLE I

Company Schermerhorn Oil Corporation Lease Friedline "B" Well No. M-31

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	973.5	Imp.	0.6	0.6	0.00
2	973.8	18.	0.3	0.9	5.40
3	974.3	53.	0.5	1.4	26.50
4	974.7	112.	0.3	1.7	33.60
5	974.9	138.	0.2	1.9	27.60
6	975.4	81.	0.4	2.3	32.40
7	975.9	176.	0.5	2.8	88.00
8	976.3	173.	0.5	3.3	86.50
9	976.9	70.	0.5	3.8	35.00
10	977.3	163.	0.5	4.3	81.50
11	977.9	163.	0.4	4.7	65.20
12	978.3	129.	0.6	5.3	77.40
13	978.9	59.	0.5	5.8	29.50
14	979.3	51.	0.7	6.5	35.70
15	979.9	31.	0.3	6.8	9.30
16	980.3	52.	0.3	7.1	15.60
17	980.9	46.	0.7	7.8	32.20
18	981.3	35.	0.5	8.3	17.50
19	981.9	34.	0.5	8.8	17.00
20	982.3	26.	0.5	9.3	13.00
21	982.9	59.	0.5	9.8	29.50
22	983.3	45.	0.4	10.2	18.00
23	983.9	3.4	0.5	10.7	1.70
24	984.3	50.	0.6	11.3	30.00
25	984.9	41.	0.6	11.9	24.60
26	985.3	1.4	0.4	12.3	0.56
27	985.9	0.57	0.5	12.8	0.28
28	986.3	1.2	0.6	13.4	0.72
29	986.9	36.	0.5	13.9	18.00
30	987.3	30.	0.4	14.3	12.00
31	987.9	16.	0.5	14.8	8.00
32	988.3	15.	0.6	15.4	9.00
33	989.2	6.9	0.6	16.0	4.14
34	989.6	26.	0.4	16.4	10.40
35	989.9	10.	0.4	16.8	4.00
36	990.3	16.	0.5	17.3	8.00
37	990.9	30.	0.5	17.8	15.00
38	991.3	65.	0.3	18.1	19.50
39	993.3	24.	0.5	18.6	12.00
40	993.7	33.	0.3	18.9	9.90
41	994.1	Imp.	0.3	19.2	0.00
42	994.5	Imp.	0.6	19.8	0.00

RESULTS OF SATURATION TESTS

TABLE II

Company Schermerhorn Oil Corporation Lease Friedline "B" Well No. M-31

Set No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acres
			Oil	Water	Total		Ft.	Cum. Ft.	
1	973.7	19.3	30	37	67	449	0.3	0.3	135
2	974.5	20.7	29	42	71	465	1.0	1.3	465
3	975.1	12.9	39	55	94	390	0.2	1.5	78
F=3	975.3	18.1	33	-	-	463	0.4	1.9	185
4	976.1	19.8	34	47	81	521	1.0	2.9	521
5	977.1	18.9	37	46	83	541	1.4	4.3	757
6	978.1	21.5	41	39	80	683	0.6	4.9	410
7	979.1	19.6	47	31	78	714	1.2	6.1	856
8	980.1	19.2	50	35	85	744	0.6	6.7	447
9	981.1	21.7	45	30	75	756	1.2	7.9	907
10	982.1	20.6	46	29	75	734	1.0	8.9	734
11	983.1	22.8	35	34	69	545	0.6	9.5	635
12	984.1	20.1	50	31	81	934	0.6	10.4	327
13	985.1	24.1	37	56	93	450	1.5	12.5	560
14	986.1	15.7	36	40	76	633	0.5	13.0	675
15	987.1	22.7	32	42	74	464	2.1	15.1	316
16	988.1	18.7	35	40	75	561	0.4	15.5	975
17	989.4	20.7	34	39	73	506	0.9	16.4	224
18	990.1	19.3	33	36	69	494	0.8	17.2	455
19	991.1	23.1	33	39	72	590	0.2	17.4	395
20	993.5	22.3	34	41	75	587	0.2	17.6	118
21	994.3	22.3	34	41	75	587	0.2	17.6	117
							Total-	- - - -	-10,292

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Schermerhorn Oil Corporation	Lease	Friedline "B"	Well No.	M-31
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft x Md.			
973.6 - 978.6	4.7	119.6	559.10			
978.6 - 985.2	6.6	41.5	273.60			
985.2 - 993.9	7.0	18.8	131.50			
973.6 - 993.9	18.3	52.7	964.20			

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 Bbbl./Acre
973.6 - 978.6	4.9	19.5	34.6	44.2	520	2,551
978.6 - 985.2	6.1	21.1	44.8	31.3	731	4,466
985.2 - 994.4	6.6	18.8	34.1	43.6	496	3,275
973.6 - 994.4	17.6	19.8	37.9	39.4	584	10,292

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Schermerhorn Oil Corporation			Lease		Friedline "B"			Well No.		M-31	
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						
1	973.7	19.1	30	444	4	59	26	63	118	3.54	20			
2	974.5	20.5	29	462	4	64	25	69	147	12.10	15			
3	975.3	18.1	33	463	6	84	27	63	83	10.78	15			
4	976.1	20.2	34	534	11	173	23	68	96	12.09	15			
5	977.1	19.4	37	558	12	181	25	66	194	10.35	15			
6	978.1	21.7	41	689	16	269	25	70	149	9.80	15			
7	979.1	19.2	47	700	21	313	26	68	48	1.50	15			
8	980.1	18.9	50	734	23	338	27	71	35	1.03	15			
9	981.1	21.5	45	750	21	350	24	69	31	1.04	15			
10	982.1	20.0	46	714	23	357	23	71	18	0.508	20			
11	983.1	22.5	40	698	17	297	23	68	43	1.09	15			
12	984.1	20.6	35	560	12	192	23	69	15	0.413	25			
13	985.1	23.8	50	923	31	572	19	68	36	0.934	15			
14	986.1	15.6	34	412	0	0	34	59	0	Imp.	50+			
15	987.1	21.4	36	598	13	216	23	71	40	1.20	20			
16	988.1	19.0	32	472	8	118	24	70	14	0.410	25			
17	989.4	20.5	35	556	9	143	26	70	15	0.393	20			
18	990.1	18.9	34	498	12	176	22	68	5	0.298	15			
19	991.1	19.8	33	507	12	184	21	73	22	0.620	20			
20	993.5	23.4	33	600	5	91	28	63	92	2.64	20			
21	994.3	22.9	34	604	4	71	30	61	95	2.68	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	Friedline "B"	Well No.	M=31
Depth Interval, Feet	973.6 - 978.6	978.6 - 985.2	986.7 - 994.4	973.6 - 994.4	
Feet of Core Analyzed	4.7	6.1	5.1	15.9	
Average Percent Porosity	20.0	20.8	19.8	20.2	
Average Percent Original Oil Saturation	34.4	43.8	33.2	38.0	
Average Percent Oil Recovery	9.6	21.0	9.6	14.0	
Average Percent Residual Oil Saturation	24.8	23.8	23.6	24.0	
Average Percent Residual Water Saturation	67.1	69.0	69.5	68.7	
Average Percent Total Residual Fluid Saturation	91.9	92.8	93.1	92.7	
Average Original Oil Content, Bbls./A. Ft.	534.	723.	511.	599.	
Average Oil Recovery, Bbls./A. Ft.	150.	341.	147.	222.	
Average Residual Oil Content, Bbls./A. Ft.	384.	382.	364.	377.	
Total Original Oil Content, Bbls./Acre	2,508.	4,414.	2,607.	9,529.	
Total Oil Recovery, Bbls./Acre	703.	2,081.	750.	3,534.	
Total Residual Oil Content, Bbls./Acre	1,805.	2,333.	1,857.	5,995.	
Average Effective Permeability, Millidarcys	10.61	0.976	0.675	3.73	
Average Initial Fluid Production Pressure, p.s.i.	15.8	17.2	20.0	17.8	

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