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

OILFIELD RESEARCH LABORATORIES

- REGISTERED ENGINEERS -

700 NORTH MISSION
OKMULGEE, OKLAHOMA
PHONE: 4444

Chanute, Kansas

536 N. HIGHLAND
CHANUTE, KANSAS
PHONE: HE 1-2650

July 13, 1962

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

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Freidline "C" Lease, Well No. 3, Wilson County, Kansas, and submitted to our laboratory on July 6, 1962.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:rf

1 c. - Earlton, Kansas
1 c. - Charley Murphy

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Schermerhorn Oil Corp. Lease Freidline "C" Well No. 3

Location 575' South of North line & 165' West of East line, E½ NE¼

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

Name of Sand	Bartlesville
Top of Core	958.1
Bottom of Core	985.5
Top of Pay Sand	963.3
Bottom of Pay Sand	982.4
Total Feet of Permeable Sand (Analyzed)	21.9
Total Feet of Floodable Sand (Analyzed)	14.9

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 20	1.6	1.6
20 - 40	4.6	6.2
40 - 80	3.7	9.9
80 - 140	4.8	14.7
140 - 200	4.2	18.9
200 & above	3.0	21.9

Average Permeability Millidarcys	97.7
Average Percent Porosity	19.6
Average Percent Oil Saturation	32.5
Average Percent Water Saturation	35.7
Average Oil Content, Bbls./A. Ft.	522.
Total Oil Content, Bbls./Acre	12,376.
Average Percent Oil Recovery by Laboratory Flooding Tests	9.7
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	153.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	2,286.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	5,915.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Natural drilling mud was used as a circulating fluid in the coring of the sand in this well. This well was drilled in a virgin area. The core was sampled by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
958.1 - 963.3	Gray to light brown, fine grained sandstone.
963.3 - 966.9	Brown fine grained sandstone.
966.9 - 967.4	Gray shale.
967.4 - 968.7	Alternate thin layers of shale and sandstone.
968.7 - 973.6	Dark brown fine grained sandstone.
973.6 - 977.6	Dark brown, fine grained shaly sandstone.
977.6 - 982.4	Dark brown, fine grained sandstone.
982.4 - 984.6	Dark fine grained carbonaceous sandstone.
984.6 - 985.5	Dark carbonaceous, shaly sandstone.

Coring was started at a depth of 958.1 feet in gray to light brown, fine grained sandstone and completed at 985.5 feet in dark carbonaceous, shaly sandstone. This core shows a total of 26.1 feet of sandstone. For the most part, the pay is made up of brown to dark brown, fine grained 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 129.2, 96.6 and 9.9 millidarcys respectively; the overall average being 97.7 (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 1.4 to a maximum of 424. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fair weighted average percent oil saturation, namely, 32.5. The weighted average percent oil saturation of the upper, middle and lower sections is 21.2, 33.7 and 51.9 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 51.5, 33.5 and 22.2 respectively; the overall average being 35.7 (See Table III). This gives an overall weighted average total fluid saturation of 68.2 percent. This low total fluid saturation indicates considerable fluid was lost during coring which probably was oil.

The weighted average oil content of the upper, middle and lower sections is 329, 543 and 843 barrels per acre foot respectively; the overall average being 522. The total oil content, as shown by this core, is 12,376 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Part of the sand in this core responded very well to laboratory flooding tests, as a total recovery of 2,144 barrels of oil per acre was obtained from 14.9 feet of sand. The weighted average percent oil saturation was reduced from 35.2 to 25.5, or represents an average recovery of 9.7 percent. The weighted average effective permeability of the samples is 3.43 millidarcys, while the average initial fluid production pressure is 21.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 24 samples tested, 20 produced water and 15 oil. This indicates that approximately 62 percent of the sand represented by these samples is floodable pay sand.

CONCLUSION

From a study of the above data, it is evident that approximately 1,743 barrels of oil per acre can be recovered from the area, represented by this core, by efficient primary production methods. An additional recovery of approximately 4,172 barrels of oil per acre or an average of 280 barrels per acre foot can be expected by efficient water-flooding. In calculating the above oil recovery values, the following data and assumptions were employed:

Original formation volume factor	1.06
Present formation volume factor	1.06
Irreducible water saturation, percent	30.0
Primary recovery, estimated, percent	None.
Present oil saturation, percent	66.7
Average porosity, percent	20.0
Oil saturation after flooding, percent	25.5
Performance factor, percent	55.0
Net floodable pay sand, feet	14.9

This core shows a fairly clean sand section having a fair oil and water saturation and a wide variation in permeability.

It is apparent that the sand section extending from a depth of 958.1 (top of core) to 963.3 feet is more, or less, gas sand.

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Schermerhorn Oil Corp. Lease Freidline "C" Well No. 3

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	959.2	15.6	19	51	70	230	34.	0.6	0.6	138	20.40
F-1	959.4	17.5	21	-	-	285	-	0.4	1.0	114	-
2	960.2	19.3	21	43	64	314	198.	1.0	2.0	314	198.00
3	961.2	20.4	18	47	65	284	195.	1.0	3.0	284	195.00
4	962.2	21.1	20	53	73	327	104.	1.0	4.0	327	104.00
5	963.2	22.1	22	42	64	377	77.	0.6	4.6	226	46.20
6	964.0	21.4	28	47	75	465	103.	0.8	5.4	372	82.40
F-6	964.2	16.6	27	-	-	348	-	0.6	6.0	209	-
7	965.2	20.4	33	41	74	521	201.	1.0	7.0	521	201.00
8	966.2	22.3	31	43	74	536	318.	0.6	7.6	322	19.10
F-8	966.4	19.6	29	-	-	419	-	0.6	8.2	251	-
9	969.2	21.7	38	39	72	640	71.	1.1	9.3	704	78.10
10	970.5	18.4	37	35	72	529	164.	1.2	10.5	635	19.70
11	971.5	21.2	37	33	70	608	127.	1.0	11.5	608	127.00
12	972.5	22.0	38	37	75	648	117.	1.0	12.5	648	117.00
13	973.5	19.4	36	35	71	541	74.	0.6	13.1	325	44.40
14	974.5	20.2	39	38	77	611	41.	1.4	14.5	855	57.40
15	975.5	18.9	35	30	65	513	33.	1.0	15.5	513	33.00
16	976.5	17.4	33	48	81	445	29.	1.0	16.5	445	29.00
17	977.5	18.2	32	54	86	452	6.2	0.6	17.1	271	3.72
18	978.5	19.2	29	44	73	431	31.	1.4	18.5	604	43.40
19	979.5	18.8	33	36	69	481	124.	1.0	19.5	481	124.00
20	980.5	22.7	34	36	70	599	250.	1.0	20.5	599	250.00
21	981.5	21.7	45	32	77	756	162.	1.0	21.5	756	162.00
P-22	982.3	-	-	-	-	-	424.	0.4	21.9	-	169.70
22	982.5	22.7	57	16	75	1,004	-	0.6	22.5	602	-
23	983.5	20.4	53	26	79	840	1.4	1.0	23.5	840	1.40
24	984.5	19.7	45	22	67	686	24.	0.6	24.1	412	14.40
								Total	-------	12,376	

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Schermerhorn Oil Corp. Lease Freidline "C" Well No. 3

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
958.7 - 964.1	5.0	129.2	646.00
964.7 - 982.4	15.3	96.6	1,478.52
983.0 - 984.6	1.6	9.9	15.80
958.7 - 984.6	21.9	97.7	2,140.32

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
958.7 - 964.1	5.4	19.9	21.2	51.5	329	1,775
964.1 - 982.0	16.1	19.3	33.7	33.5	543	8,747
982.4 - 984.6	2.2	20.8	51.9	22.2	843	1,854
958.7 - 984.6	23.7	19.6	32.5	35.7	522	12,376

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Schermerhorn Oil Corp. Lease Freidline "C" Well No. 3

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	959.4	17.5	21	285	0	0	21	78	285	305	13.21	10
2	960.2	18.8	19	277	0	0	19	77	277	238	10.72	10
3	961.2	20.0	16	248	0	0	16	80	248	214	9.83	10
4	962.2	20.8	20	323	0	0	20	76	323	341	9.20	10
5	963.2	22.5	22	384	0	0	22	73	384	276	14.47	20
6	964.2	16.6	27	348	2	26	25	72	322	41	1.43	30
7	965.2	20.8	33	532	10	161	23	70	371	474	12.99	10
8	966.4	19.6	29	419	4	58	25	65	361	111	2.80	20
9	969.2	21.6	38	636	15	251	23	74	385	157	4.72	10
10	970.5	17.9	37	514	8	111	29	68	403	52	1.47	20
11	971.5	20.8	37	598	11	178	26	68	420	122	3.14	20
12	972.5	21.7	38	640	14	236	24	72	404	91	2.24	10
13	973.5	19.6	36	519	9	130	27	70	389	25	0.785	30
14	974.5	20.6	39	623	16	256	23	72	367	40	1.22	20
15	975.5	18.4	35	500	9	129	26	71	371	12	0.360	30
16	976.5	17.9	33	458	7	97	26	71	361	5	0.275	45
17	977.5	18.1	29	407	0	0	29	67	407	0	Imp.	-
18	978.5	18.8	29	423	2	29	27	70	394	32	1.02	35
19	979.5	19.2	33	491	8	119	25	71	372	100	3.00	20
20	980.5	23.1	34	609	10	179	24	70	430	259	10.50	20
21	981.5	22.0	45	768	15	256	30	63	512	168	5.40	20
22	982.5	22.8	53	938	0	0	53	35	938	0	Imp.	-
23	983.5	20.7	50	804	0	0	50	32	804	0	Imp.	-
24	984.5	19.3	43	644	0	0	43	29	644	0	Imp.	-

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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Schermerhorn Oil Corp. Lease Freidline "C" Well No. 3

Depth Interval, Feet	964.1 - 982.0
Feet of Core Analyzed	14.9
Average Percent Porosity	20.0
Average Percent Original Oil Saturation	35.2
Average Percent Oil Recovery	9.7
Average Percent Residual Oil Saturation	25.5
Average Percent Residual Water Saturation	70.4
Average Percent Total Residual Fluid Saturation	95.9
Average Original Oil Content, Bbls./A. Ft.	546.
Average Oil Recovery, Bbls./A. Ft.	153.
Average Residual Oil Content, Bbls./A. Ft.	393.
Total Original Oil Content, Bbls./Acre	8,144.
Total Oil Recovery, Bbls./Acre	2,286.
Total Residual Oil Content, Bbls./Acre	5,858.
Average Effective Permeability, Millidarcys	3.43
Average Initial Fluid Production Pressure, p.s.i.	21.7

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