OILFIELD RESEARCH LABORATORIES

REGISTERED ENGINEERS
Chanute, Kansas
Phone 1486

October 31, 1958

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

Gentlemen:

Enclosed herewith is the report of the analysis of the 2 11/12" Rotary core taken from the Wiggans Lease, Well No. 21-I, Wilson County, Kansas, and submitted to our laboratory on October 23, 1958.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. McElrea

Carl L. McElrea

CLM:cs

1 c. to Mr. Roy Williams

Well # 1
Lease # 1
Field # 1

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Schermerhorn Oil Corp. Lease Wiggans Well No. 21-I

Location 1320' South of North Line on North & South Center Line, S½

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

Name of Sand	Bartlesville
Top of Core	972.0
Bottom of Core	1014.0
Top of Pay Sand	977.5
Bottom of Pay Sand	982.5
Total Feet of Permeable Sand	13.2
Total Feet of Floodable Sand	4.6

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 1	2.6	2.6
1 - 2	4.3	6.9
2 - 10	1.7	8.6
10 - 100	2.2	10.8
100 & above	2.4	13.2

Average Permeability Millidarcys	44.7
Average Percent Porosity	16.9
Average Percent Oil Saturation	32.7
Average Percent Water Saturation	41.1
Average Oil Content, Bbls./A. Ft.	439.
Total Oil Content, Bbls./Acre	7,827.
Average Percent Oil Recovery by Laboratory Flooding Tests	8.6
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	140.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	645.
Total Calculated ____ Bbls./Acre	1,540.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ °F	
Elevation, Feet	947.7

A fresh 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 our laboratory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
972.0 - 977.5	Laminated sandstone and shale.
977.5 - 981.7	Dark brown fine grained sandstone.
981.7 - 982.1	Dark brown fine grained [illegible] shaley sandstone.
982.1 - 982.5	Dark brown fine grained [illegible] sandstone.
982.5 - 995.3	Laminated shale and sandstone.
995.3 - 1005.4	Laminated shale and carbonaceous sandstone.
1005.4 - 1014.0	Gray shale.

Coring was started at a depth of 972.0 feet in laminated sandstone and shale and completed at 1014.0 feet in gray shale. This core shows a total of 9.0 feet of sandstone. For the most part, the pay is made up of dark brown fine grained 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 125.6 and 1.5 millidarcys respectively; the overall average being 44.7 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has an irregular permeability profile. [illegible] to a maximum of [illegible]

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fair weighted average percent oil saturation, namely 32.7. The weighted average percent oil saturation of the upper and lower sections is 40.1 and 29.8 respectively. The weighted average percent water saturation of the upper and lower sections is 23.8 and 47.3 respectively; the overall average being 41.1 (See Table III). This gives an overall weighted average total fluid saturation of 73.8 percent. This low total fluid saturation indicates considerable fluid was lost during coring which was probably oil.

In an effort to determine whether or not any flushing of the sand occurred during coring, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VI and VII. From the data given in these tables and on the coregraph, it is evident that some flushing of the sand did occur during coring as the chloride content of the water in the core was lower in the section having the higher permeability.

The weighted average oil content of the upper and lower sections is 652 and 356 barrels per acre foot respectively; the overall average being 439. The total oil content, as shown by this core, is 7,827 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Part of the sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 645 barrels of oil per acre was obtained from 4.6 feet of sand. The weighted average percent oil saturation was reduced from 39.8 to 31.2, or represents an average recovery of 8.6 percent. The weighted average effective

permeability of the samples is 18.10 millidarcys, while the average initial fluid production pressure is 13.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 34 samples tested, 5 produced water and oil. This indicates that approximately 15 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a rather uniform effective permeability.

CONCLUSION

On the basis of the enclosed data, it is evident that an efficient water-flood within the vicinity of this well will recover approximately 1,540 barrels of oil per acre, or an average of 335 barrels of oil per acre foot from the 4.6 feet of floodable pay sand analyzed. In calculating this recovery the following factors and assumptions were employed:

Original formation volume factor	1.06
Present formation volume factor	1.03
True water saturation, percent	24.0
Primary oil recovery, percent	none
Calculated present oil saturation, percent	73.9
Porosity, percent	21.2
Oil saturation at abandonment, percent	32.0
Performance factor	0.50

The results of the analysis show 4.6 feet of floodable pay sand in the interval extending from a depth of 977.5 to 982.5 feet. The sand in this section of the core has a good oil saturation, a low water saturation and high effective permeability.

It was recommended that the pipe be perforated from a depth of 978.5 to 981.5 feet.

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RESULTS OF PERMEABILITY TESTS

TABLE I

Company Schermerhorn Oil Corp. Lease Wiggans Well No. 21-I

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	977.9	98.	0.7	0.7	68.60
2	978.4	248.	0.5	1.2	124.00
3	978.9	182.	0.5	1.7	91.00
4	979.4	94.	0.5	2.2	47.00
5	979.9	53.	0.5	2.7	26.50
6	980.4	155.	0.5	3.2	77.50
7	980.9	117.	0.5	3.7	58.50
8	981.4	61.	0.5	4.2	30.50
9	981.9	Imp.	0.4	4.6	0.00
10	982.4	135.	0.4	5.0	54.00
11	982.9	1.9	0.7	5.7	1.33
12	983.4	Imp.	0.5	6.2	0.00
13	985.9	0.49	0.6	6.8	0.29
14	986.4	1.0	0.5	7.3	0.50
15	986.9	1.0	0.5	7.8	0.50
16	987.4	0.58	0.5	8.3	0.29
17	987.9	2.0	0.5	8.8	1.00
18	988.4	1.4	0.5	9.3	0.70
19	988.9	1.1	0.5	9.8	0.55
20	989.4	1.8	0.5	10.3	0.90
21	989.9	0.78	0.5	10.8	0.39
22	990.4	Imp.	0.5	11.3	0.00
23	990.9	Fractured	0.5	11.8	-
24	991.4	0.95	0.5	12.3	0.48
25	991.9	5.0	0.5	12.8	2.50
26	992.4	0.68	0.5	13.3	0.34
27	993.4	2.1	0.7	14.0	1.47
28	993.9	1.2	0.5	14.5	0.60
29	994.4	Imp.	0.5	15.0	0.00
30	994.9	1.4	0.6	15.6	0.84

17.0

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RESULTS OF SATURATION TESTS

TABLE II

Company Schermerhorn Oil Corp. Lease Wiggans Well No. 21-I

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.	
7	978.1	20.2	45	19	64	705	1.1	1.1	776
8	979.1	22.4	37	25	62	643	1.0	2.1	643
9	980.1	22.8	37	27	64	655	1.0	3.1	655
10	981.1	20.8	41	21	62	661	1.1	4.2	727
11	982.0	17.3	44	33	77	591	0.4	4.6	236
F-11	982.2	20.2	36	-	-	564	0.4	5.0	226
12	983.1	14.0	42	37	79	456	1.1	6.1	501
13	984.1	15.1	29	57	86	340	1.0	7.1	340
14	985.1	13.1	15	73	88	152	1.0	8.1	152
15	986.1	14.7	25	50	75	285	1.0	9.1	285
16	987.1	13.6	29	57	86	306	1.0	10.1	306
17	988.1	15.8	29	47	76	356	1.0	11.1	356
18	989.1	15.5	23	48	71	276	1.0	12.1	276
19	990.1	16.6	24	46	70	310	1.0	13.1	310
20	991.1	16.8	33	41	74	430	1.0	14.1	430
21	992.1	17.5	38	39	77	516	1.0	15.1	516
22	993.1	17.6	36	36	72	492	1.0	16.1	492
23	994.1	13.9	33	48	81	356	1.0	17.1	356
24	995.1	15.0	30	34	64	349	0.7	17.8	244
							Total	- - - - -	7,827

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Schermerhorn Oil Corp. Lease Wiggans Well No. 21-I

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
977.5 - 982.5	4.6	125.6	577.60
982.5 - 995.3	8.6	1.5	12.68
977.5 - 995.3	13.2	44.7	590.28

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
977.5 - 982.5	5.0	21.1	40.1	23.8	652	3,263
982.5 - 995.3	12.8	15.3	29.8	47.3	356	4,564
977.5 - 995.3	17.8	16.9	32.7	41.1	439	7,827

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Schermerhorn Oil Corp. Lease Wiggans Well No. 21-I

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	972.1									0	Imp.	50+
2	973.1									0	Imp.	50+
3	974.1									0	Imp.	50+
4	975.1									0	Imp.	50+
5	976.1									0	Imp.	50+
6	977.1									0	Imp.	50+
7	978.1	20.1	45	701	11	171	34	56	530	194	21.25	15
8	979.1	22.4	37	643	6	104	31	60	539	84	14.60	15
9	980.1	22.5	37	646	8	140	29	61	506	120	22.60	5
10	981.1	20.6	41	656	11	176	30	60	480	130	13.62	15
11	982.2	20.2	36	564	3	47	33	60	517	140	19.48	15
12	983.1	14.0	39	424	0	0	39	47	424	0	Imp.	50+
13	984.1	14.9	26	300	0	0	26	67	300	0	Imp.	50+
14	985.1	13.1	17	173	0	0	17	79	173	0	Imp.	50+
15	986.1	14.5	23	259	0	0	23	69	259	0	Imp.	50+
16	987.1	13.4	28	291	0	0	28	67	291	0	Imp.	50+
17	988.1	15.5	29	349	0	0	29	68	349	0	Imp.	50+
18	989.1	15.2	22	260	0	0	22	56	260	0	Imp.	50+
19	990.1	16.4	25	318	0	0	25	58	318	0	Imp.	50+
20	991.1	16.6	31	399	0	0	31	58	399	0	Imp.	50+
21	992.1	17.2	36	480	0	0	36	53	480	0	Imp.	50+
22	993.1	17.3	35	470	0	0	35	50	470	0	Imp.	50+
23	994.1	13.7	34	362	0	0	34	50	362	0	Imp.	50+
24	995.1	15.1	32	375	0	0	32	54	375	0	Imp.	50+
25	996.1									0	Imp.	50+

Note: 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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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Schermerhorn Oil Corp. Lease Wiggans Well No. 21-I

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.			
26	997.1									0	Imp.	50+
27	998.1									0	Imp.	50+
28	999.1									0	Imp.	50+
29	1000.1									0	Imp.	50+
30	1001.1									0	Imp.	50+
31	1002.1									0	Imp.	50+
32	1003.1									0	Imp.	50+
33	1004.1									0	Imp.	50+
34	1005.1									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 Corp. Lease Wiggans Well No. 21-I

Depth Interval, Feet	977.5 - 982.5
Feet of Core Analyzed	4.6
Average Percent Porosity	21.2
Average Percent Original Oil Saturation	39.8
Average Percent Oil Recovery	8.6
Average Percent Residual Oil Saturation	31.2
Average Percent Residual Water Saturation	59.2
Average Percent Total Residual Fluid Saturation	90.4
Average Original Oil Content, Bbls./A. Ft.	654.
Average Oil Recovery, Bbls./A. Ft.	140.
Average Residual Oil Content, Bbls./A. Ft.	514.
Total Original Oil Content, Bbls./Acre	3,008.
Total Oil Recovery, Bbls./Acre	645.
Total Residual Oil Content, Bbls./Acre	2,363.
Average Effective Permeability, Millidarcys	18.10
Average Initial Fluid Production Pressure, p.s.i.	13.0

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

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RESULTS OF WATER DIFFERENTIATION TESTS

TABLE VI

Company Schermerhorn Oil Corp. Lease Wiggans Well No. 21-I

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate	Drilling & Foreign	Total
7	978.1	39,900			
8	979.1	26,800			
9	980.1	26,300			
10	981.1	36,400			
11	982.0	31,900			
12	983.1	39,200			
13	984.1	41,700			
14	985.1	37,400			
15	986.1	37,800			
16	987.1	37,400			
17	988.1	36,300			
18	989.1	36,400			
19	990.1	33,200			
20	991.1	51,400			
21	992.1	34,200			
22	993.1	37,000			
23	994.1	39,800			
24	995.1	41,100			

Note: ppm — parts per million

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SUMMARY OF WATER DESTRUCTIVE TESTS

TABLE VII

Company Schermerhorn Oil Corp. Lease Wiggans Well No. 21-I

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
977.5 - 982.1	32,550		
982.5 - 995.3	38,630		
977.5 - 995.3	37,030		

Note: ppm -- parts per million.