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

OILFIELD RESEARCH LABORATORIES

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November 15, 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 "A" Lease, Well No. K-15, Wilson County, Kansas, and submitted to our laboratory on November 9, 1962.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

BRP:rf

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Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Schermerhorn Oil Corp. Lease Freidline "A" Well No. K-15

Location 330' East of West line & 660' South of North line, NW NE

Section 20 Twp. 28S Rge. 17E County Wilson State Kansas

Name of Sand	Bartlesville
Top of Core	920.0
Bottom of Core	940.0
Top of Sand	920.0
Bottom of Sand	940.0
Total Feet of Permeable Sand	19.5
Total Feet of Floodable Sand	10.3

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	3.8	3.8
10 - 30	9.1	12.9
30 - 100	3.6	16.5
100 & above	3.0	19.5

Average Permeability Millidarcys	43.6
Average Percent Porosity	17.3
Average Percent Oil Saturation	39.4
Average Percent Water Saturation	38.0
Average Oil Content, Bbls./A. Ft.	541.
Total Oil Content, Bbls./Acre	10,816.
Average Percent Oil Recovery by Laboratory Flooding Tests	16.0
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	242.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	2,490.
Total Calculated Oil Recovery, Bbls./Acre	3,100.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Fresh water was used as the circulating fluid while taking this core. The core was sampled and the samples sealed in cans by a representative of Oilfield Research Laboratories. The well was drilled in non-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
920.0 - 924.0	Light brown, laminated, shaly sandstone.
924.0 - 924.5	Laminated sandstone and shale.
924.5 - 927.0	Brown, laminated, shaly sandstone.
927.0 - 929.0	Brown, laminated, slightly shaly sandstone.
929.0 - 932.0	Laminated sandstone and shale.
932.0 - 937.3	Brown, slightly shaly sandstone.
937.3 - 939.0	Brown, laminated, shaly sandstone.
939.0 - 940.0	Dark carbonaceous, shaly sandstone.

Coring was started at a depth of 920.0 feet in shaly sandstone and completed at 940.0 feet in carbonaceous sandstone. For the most part, the pay is made up of brown slightly shaly 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 29.8 and 63.5 millidarcys respectively; the overall average being 43.6 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has an irregular permeability profile. The permeability of the sand varies from 1.7 to a maximum of 164. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 39.4. The weighted average percent oil saturation of

the upper and lower sections is 36.0 and 44.4 respectively. The weighted average percent water saturation of the upper and lower sections is 40.0 and 34.9 respectively; the overall average being 38.0 (See Table III). This gives an overall weighted average total fluid saturation of 77.4 percent. This low total fluid saturation indicates considerable fluid was lost during coring most of which probably was oil.

The weighted average oil content of the upper and lower sections is 481 and 629 barrels per acre foot respectively; the overall average being 541. The total oil content, as shown by this core, is 10,816 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Portions of the sand in this core responded well to laboratory flooding tests, as a total recovery of 2,490 barrels of oil per acre was obtained from 10.3 feet of sand. The weighted average percent oil saturation was reduced from 43.6 to 27.6, or represents an average recovery of 16.0 percent. The weighted average effective permeability of the samples is 0.644 millidarcys, while the average initial fluid production pressure is 28.2 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 20 samples tested, 11 produced water and 11 oil. This indicates that approximately 55 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 to water.

CONCLUSION

The results of the laboratory tests indicate that an efficient water-flood in the vicinity of this well should recover approximately 3,100 barrels of oil per acre or 302 barrels per acre foot from the 10.3 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.06
Present formation volume factor	1.02
Reservoir water saturation, percent	25.0
Primary recovery, estimated, percent	4.0
Present oil saturation, percent	68.1
Average porosity, percent	19.6
Oil saturation after flooding, percent	27.6
Performance factor, percent	50.0
Net floodable pay sand, feet	10.3

The core shows a slightly shaly pay sand section having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Schermerhorn Oil Corp. Lease Freidline "A" Well No. K-15

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	920.1	19.5	43	30	73	650	63.	0.6	0.6	390	37.80
2	921.1	19.3	29	39	68	434	113.	1.0	1.6	434	113.00
3	922.1	18.2	27	48	75	381	63.	1.0	2.6	381	63.00
4	923.1	17.6	41	36	77	559	8.1	1.4	4.0	782	11.34
5	924.1	11.9	30	64	94	277	Imp.	0.5	4.5	139	0.00
6	925.1	17.3	42	31	73	564	29.	1.1	5.6	620	31.90
7	926.1	18.8	46	27	73	670	21.	1.4	7.0	937	29.40
8	927.1	18.7	43	37	80	623	30.	0.6	7.6	374	18.00
9	928.1	19.0	44	25	69	648	13.	1.4	9.0	906	18.20
10	929.1	13.4	34	47	81	353	14.	0.6	9.6	212	8.40
11	930.1	12.8	29	55	84	288	1.7	1.0	10.6	288	1.70
12	931.1	13.1	22	58	80	224	7.7	1.4	12.0	314	10.78
13	932.1	17.4	41	33	74	553	12.	0.6	12.6	332	7.20
14	933.1	19.3	42	38	80	628	53.	1.0	13.6	628	53.00
15	934.1	20.2	47	27	74	736	43.	1.0	14.6	736	43.00
16	935.1	19.8	44	31	75	675	164.	1.0	15.6	675	164.00
17	936.1	19.6	46	27	73	699	156.	1.0	16.6	699	156.00
18	937.1	21.4	54	28	82	895	24.	0.7	17.3	626	16.80
19	938.1	13.5	32	51	83	335	24.	1.7	19.0	570	40.80
20	939.1	16.9	59	30	89	773	27.	1.0	20.0	773	27.00
								Total	-------	-10,816	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Schermerhorn Oil Corp. Lease Freidline "A" Well No. K-15

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
920.0 - 932.0	11.5	29.8	343.52
932.0 - 940.0	8.0	63.5	507.80
920.0 - 940.0	19.5	43.6	851.32

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
920.0 - 932.0	12.0	16.8	36.0	40.0	481	5,777
932.0 - 940.0	8.0	18.0	44.4	34.9	629	5,039
920.0 - 940.0	20.0	17.3	39.4	38.0	541	10,816

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Schermerhorn Oil Corp. Lease Freidline "A" Well No. K-15

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	920.1	19.8	43	660	18	276	25	69	384	160	3.42	30
2	921.1	19.6	29	441	6	91	23	68	350	47	1.04	30
3	922.1	18.6	25	360	0	0	25	57	360	4	0.167	50
4	923.1	17.5	42	569	0	0	42	36	569	0	Imp.	-
5	924.1	11.8	30	275	0	0	30	60	275	0	Imp.	-
6	925.1	17.4	40	540	0	0	40	33	540	0	Imp.	-
7	926.1	18.9	46	674	19	278	27	61	396	2	0.170	40
8	927.1	19.0	43	633	17	250	26	61	383	30	0.619	20
9	928.1	19.3	44	658	13	194	31	57	464	10	0.354	40
10	929.1	13.7	31	329	0	0	31	51	329	0	Imp.	-
11	930.1	13.0	31	312	0	0	31	54	312	0	Imp.	-
12	931.1	13.4	24	250	0	0	24	54	250	0	Imp.	-
13	932.1	17.8	41	566	9	124	32	60	442	0	0.015	50
14	933.1	19.8	42	644	16	246	26	60	398	16	0.360	20
15	934.1	20.5	47	747	17	270	30	59	477	12	0.334	20
16	935.1	20.0	44	682	17	264	27	61	418	11	0.530	20
17	936.1	19.9	46	709	16	246	30	59	463	35	0.759	20
18	937.1	21.2	54	886	28	460	26	59	426	30	0.650	20
19	938.1	13.7	30	318	0	0	30	53	318	0	Imp.	-
20	939.1	17.0	60	790	0	0	60	30	790	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.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Schermerhorn Oil Corp. Lease Freidline "A" Well No. K-15

Depth Interval, Feet	920.0 - 932.0	932.0 - 940.0	920.0 - 940.0
Feet of Core Analyzed	5.0	5.3	10.3
Average Percent Porosity	19.3	19.9	19.6
Average Percent Original Oil Saturation	41.8	45.6	43.6
Average Percent Oil Recovery	14.8	17.2	16.0
Average Percent Residual Oil Saturation	27.0	28.4	27.6
Average Percent Residual Water Saturation	62.2	59.7	60.9
Average Percent Total Residual Fluid Saturation	89.2	88.1	88.5
Average Original Oil Content, Bbls./A. Ft.	637.	707.	662.
Average Oil Recovery, Bbls./A. Ft.	234.	268.	242.
Average Residual Oil Content, Bbls./A. Ft.	403.	439.	420.
Total Original Oil Content, Bbls./Acre	3,082.	3,742.	6,824.
Total Oil Recovery, Bbls./Acre	1,068.	1,422.	2,490.
Total Residual Oil Content, Bbls./Acre	2,014.	2,320.	4,334.
Average Effective Permeability, Millidarcys	0.839	0.462	0.644
Average Initial Fluid Production Pressure, p.s.i.	32.0	25.0	28.2

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