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

JOHN R. LAVENS, JR. - REGISTERED ENGINEERS - CARL L. PATE

OIL FIELD RESEARCH LABORATORIES

1028 S. SANTA FE TELEPHONE 728

CHANUTE, KANSAS

February 22, 1951

The Ohio Oil Company
Thompson Building
Tulsa, Oklahoma

Attention: Mr. R. E. McMillen

Gentlemen:

Enclosed herewith is the report of the analysis of the 2½" Rotary core taken from the Martindell Lease, Well No. W-29, Greenwood county, Kansas, and submitted to our laboratory on February 6, 1951.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Clayton A. Nattier

CAN:pmd

THE OHIO OIL COMPANY

CORE ANALYSIS REPORT

MARTINDELL LEASE WELL NO. W-29

GREENWOOD COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANUTE, KANSAS

FEBRUARY 22, 1951

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company The Ohio Oil Company Lease Martindell Well No. W-29

Location

Section 31 Twp. 23 Rge. 10 County Greenwood State Kansas

Name of Sand	Bartlesville
Top of Core	2276.00
Bottom of Core	2336.00
Top of Sand (According to log.)	2271.00
Bottom of Sand	?
Total Feet of Permeable Sand	54.20

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 2	12.90	12.90
2 - 4	10.00	22.90
4 - 8	8.75	31.65
8 - 12	7.40	39.05
12 - 24	9.45	48.50
24 - 48	2.45	50.95
48 & above	3.25	54.20

Average Permeability Millidarcys	11.70
Average Percent Porosity	16.28
Average Percent Oil Saturation	29.12
Average Percent Water Saturation	51.25
Average Oil Content, Bbls./A. Ft.	371.
Total Oil Content, Bbls./Acre	20,458.
Average Percent Oil Recovery by Laboratory Flooding Tests	3.99
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	53.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,890.
Total Calculated Oil Recovery, Bbls./Acre	2,100.
Casing Point ~~Packer Setting~~, Feet ($4\frac{1}{2}$")	2,273.00
Viscosity, Centipoises @	-
A. P. I. Gravity, degrees @ 60 °F	-
Elevation	1,389.0

Fresh water was used in making up the circulating fluid used in the coring of the sand in this well.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
2271.00 - 2276.00	According to log, sand (Discarded at well).
2276.00 - 2276.80	Light brown fine grained micaceous shaley sandstone.
2276.80 - 2280.82	Light brown fine grained micaceous slightly shaley sandstone.
2280.82 - 2283.60	Light brown fine grained micaceous sandstone.
2283.60 - 2284.20	Light brown fine grained micaceous slightly shaley sandstone.
2284.20 - 2284.85	Gray laminated shaley sandstone.
2284.85 - 2289.10	Light brown fine grained micaceous slightly shaley sandstone.
2289.10 - 2289.50	Light brown fine grained micaceous shaley sandstone.
2289.50 - 2293.60	Light brown fine grained micaceous slightly shaley sandstone.
2293.60 - 2294.80	Light brown fine grained micaceous sandstone.
2294.80 - 2295.25	Brownish gray fine grained laminated micaceous shaley sandstone.
2295.25 - 2295.50	Light brown fine grained micaceous sandstone.
2295.50 - 2296.00	Loss.
2296.00 - 2296.20	Light brown fine grained micaceous sandstone.
2296.20 - 2297.10	Brownish gray fine grained laminated micaceous shaley sandstone.
2297.10 - 2299.45	Brown fine grained micaceous sandstone.
2299.45 - 2299.75	Light brown fine grained micaceous shaley sandstone.
2299.75 - 2300.90	light brown fine grained micaceous sandstone.
2300.90 - 2301.50	Brownish gray fine grained micaceous shaley sandstone.

2301.50 - 2309.80 - Light brown fine grained micaceous sandstone.

2309.80 - 2310.30 - Brown fine grained micaceous sandstone.

2310.30 - 2314.00 - Light brown fine grained micaceous sandstone.

2314.00 - 2316.00 - Loss.

2316.00 - 2316.75 - Light brown fine grained micaceous sandstone.

2316.75 - 2316.95 - Brown fine grained micaceous sandstone.

2316.95 - 2328.00 - Light brown fine grained micaceous sandstone.

2328.00 - 2329.90 - Brown fine grained micaceous sandstone.

2329.90 - 2334.70 - Light brown fine grained micaceous sandstone.

2334.70 - 2335.00 - Light brown fine grained micaceous slightly shaley sandstone.

2335.00 - 2336.00 - Loss.

Coring was started at a depth of 2276.00 feet in fine grained micaceous shaley sandstone and completed at 2336.00 feet in sandstone. There were three losses extending from 2295.50 to 2296.00, 2314.00 to 2316.00 and 2335.00 to 2336.00 feet. Apparently, all of the loss was sandstone. This core shows a total of 55.85 feet of sand. For the most part, the pay sand is made up of fine grained micaceous to shaley 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 are 3.18, 25.21 and 16.34 millidarcys respectively; the overall average being 11.70 (See Table II). By observing the data given on the coregraph, it is noticeable that the upper part of the cored section is much tighter than the lower part and that the entire cored section has a rather wide variation in permeability.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows only a fair weighted average percent oil saturation, namely, 29.12. The weighted average percent oil saturation of the upper, middle and lower sections are 30.62, 27.87 and 24.12 respectively. The weighted average percent water saturation of the upper, middle and lower sections are 50.69, 52.09 and 51.75 respectively; the overall average being 51.25 (See Table IV). This gives an overall weighted average total fluid saturation of 80.37 percent. This comparatively low total fluid saturation indicates that an appreciable amount of 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, which in turn were used in the determination of percent connate water. The results of these tests are given in Tables VII and VIII. From the data given in the tables and on the coregraph, it is noticeable that the more permeable sand in the lower section is badly flushed.

The weighted average oil content of the upper, middle and lower sections are 379, 373 and 317 barrels per acre foot respectively; the overall average being 371. The total oil content, as shown by this core, is 20,458 barrels per acre (See Table IV).

LABORATORY FLOODING TESTS

Inasmuch as the sand in the core has a low weighted average percent oil saturation, naturally, one would expect very little oil to be recovered by laboratory flooding tests. A total recovery of 1,890 barrels of oil per acre was obtained from 35.40 feet of sand. The weighted average percent oil saturation was reduced from 28.67 to 24.68, or represents an

average recovery of 3.99 percent. The weighted average effective permeability of the samples is 1.22 millidarcys, while the average initial fluid production pressure is 29.9 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 56 samples tested, 31 produced water and 34 oil. This shows that only part of the sand represented by these samples is floodable. The tests also show that the sand is comparatively tight and has a wide variation in effective permeability.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 2,100 barrels of oil per acre, or an average of 66 barrels per acre foot, from the 31.9 feet of floodable sand analyzed. In calculating this recovery, an allowance was made for oil lost during coring, and it was assumed that the true water saturation of the sand is 38 percent. Chances are the recovery value for the area represented by this well could be greatly increased by using proper selective plugging in the later stages of the flood. By selective plugging off the approximately 5.1 feet of comparatively loose sand, then it would be possible to force water into the tighter sand.

The principle drawback of the sand in this core is the fact that it has a wide variation in permeability.

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company The Ohio Oil Company Lease Martindell Well No. W-29

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	2276.30	2.0	0.50	0.50	1.00
2	2276.66	1.3	0.30	0.80	0.39
3	2277.14	0.79	0.55	1.35	0.43
4	2277.54	1.6	0.35	1.70	0.56
5	2277.88	2.4	0.40	2.10	0.96
6	2278.35	1.6	0.40	2.50	0.64
7	2278.63	2.0	0.30	2.80	0.60
8	2278.90	2.3	0.30	3.10	0.69
9	2279.27	2.2	0.40	3.50	0.88
10	2279.70	3.0	0.40	3.90	1.20
11	2280.05	1.9	0.35	4.25	0.67
12	2280.43	1.2	0.57	4.82	0.68
13	2280.86	0.65	0.28	5.10	0;18
14	2281.30	1.2	0.50	5.60	0.60
15	2281.83	2.2	0.60	6.20	1.32
16	2282.50	0.80	0.55	6.75	0.44
17	2283.15	4.6	0.85	7.60	3.91
18	2283.64	2.8	0.60	8.20	1.68
19	2284.92	Imp.	0.25	8.45	0.00
20	2285.29	0.89	0.50	8.95	0.45
21	2285.80	0.79	0.40	9.35	0.32
22	2286.33	1.1	0.60	9.95	0.66
23	2286.85	1.2	0.40	10.35	0.48
24	2287.23	0.49	0.40	10.75	0.20
25	2287.63	0.36	0.40	11.15	0.14
26	2288.06	0.71	0.50	11.65	0.36
27	2288.52	0.87	0.45	12.10	0.39
28	2289.00	1.1	0.35	12.45	0.39
29	2289.70	0.54	0.50	12.95	0.27
30	2290.25	Imp.	0.40	13.35	0.00
31	2290.56	1.7	0.45	13.80	0.77
32	2291.13	1.4	0.45	14.25	0.63
33	2291.60	1.3	0.45	14.70	0.59
34	2291.94	1.7	0.40	15.10	0.68
35	2292.35	1.6	0.45	15.55	0.72
36	2292.85	2.1	0.40	15.95	0.84
37	2293.16	2.2	0.60	16.55	1.32
38	2293.76	1.8	0.50	17.05	0.90
39	2294.41	2.1	0.70	17.75	1.47
40	2294.90	3.1	0.20	17.95	0.62

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company The Ohio Oil Company Lease Martindell Well No. W-29

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	2295.15	3.8	0.25	18.20	0.95
42	2295.45	7.3	0.25	18.45	1.83
43	2296.10	8.9	0.20	18.65	1.78
44	2296.80	2.3	0.70	19.35	1.61
45	2297.04	0.56	0.20	19.55	0.11
46	2297.45	4.4	0.55	20.10	2.42
47	2297.83	7.7	0.40	20.50	3.08
48	2298.30	7.1	0.45	20.95	3.20
49	2298.74	7.1	0.50	21.45	3.55
50	2299.35	9.4	0.45	21.90	4.23
51	2299.82	4.4	0.25	22.15	1.10
52	2300.23	4.8	0.40	22.55	1.92
53	2300.67	3.5	0.50	23.95	1.75
54	2301.12	1.5	0.60	23.65	0.90
55	2301.55	1.5	0.25	23.90	0.38
56	2301.94	12.	0.35	24.25	4.20
57	2302.40	8.4	0.55	24.80	4.62
58	2302.95	8.4	0.45	25.25	3.78
59	2303.34	4.7	0.40	25.65	1.88
60	2303.75	2.2	0.50	26.15	1.10
61	2304.16	3.9	0.40	26.55	1.56
62	2304.60	5.5	0.40	26.95	2.20
63	2305.07	3.0	0.45	27.40	1.35
64	2305.44	5.9	0.40	27.80	2.36
65	2305.87	6.1	0.45	28.25	2.75
66	2306.30	3.3	0.35	28.60	1.16
67	2306.65	0.73	0.40	29.00	0.29
68	2307.10	4.9	0.40	29.40	1.96
69	2307.40	7.9	0.40	29.80	3.16
70	2307.85	2.3	0.55	30.35	1.27
71	2308.50	3.2	0.50	30.85	1.60
72	2308.85	8.7	0.35	31.20	3.05
73	2309.21	8.7	0.35	31.55	3.05
74	2309.65	0.91	0.40	31.95	0.36
75	2310.04	49.	0.50	32.45	24.50
76	2310.46	8.6	0.40	32.85	3.44
77	2310.94	14.	0.45	33.30	6.30
78	2311.36	65.	0.45	33.75	29.25
79	2311.80	3.0	0.40	34.15	1.20
80	2312.14	35.	0.35	34.50	12.25

Oil Field Research Laboratories

RESULTS OF PERMEABILITY TESTS

TABLE I

Company The Ohio Oil Company Lease Martindell Well No. W-29

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
81	2312.57	13.	0.50	35.00	6.50
82	2313.16	46.	0.45	35.45	20.70
83	2313.53	70.	0.40	35.85	28.00
84	2313.87	33.	0.30	36.15	9.90
85	2316.35	8.5	0.75	36.90	6.38
86	2316.83	47.	0.20	37.10	9.40
87	2317.24	22.	0.55	37.65	12.10
88	2317.73	25.	0.60	38.25	15.00
89	2318.35	19.	0.45	38.70	8.55
90	2318.78	7.7	0.55	39.25	4.24
91	2319.35	5.4	0.60	39.85	3.24
92	2320.10	12.	0.60	40.45	7.20
93	2320.55	11.	0.45	40.90	4.95
94	2320.95	8.8	0.35	41.25	3.08
95	2321.25	11.	0.40	41.65	4.40
96	2321.75	16.	0.60	42.25	9.60
97	2322.40	42.	0.55	42.80	23.10
98	2322.87	14.	0.35	43.15	4.90
99	2323.22	14.	0.40	43.55	5.60
100	2323.65	15.	0.60	44.15	9.00
101	2324.35	11.	0.60	44.75	6.60
102	2324.82	11.	0.40	45.15	4.40
103	2325.21	15.	0.40	45.55	6.00
104	2325.64	10.	0.45	46.00	4.50
105	2326.06	8.4	0.45	46.45	3.78
106	2326.45	15.	0.50	46.95	7.50
107	2327.07	9.2	0.45	47.40	4.14
108	2327.43	7.3	0.40	47.80	2.92
109	2327.84	9.2	0.35	48.15	3.22
110	2328.36	53.	0.60	48.75	31.80
111	2328.84	80.	0.50	49.25	40.00
112	2329.30	86.	0.80	50.05	68.80
113	2329.94	18.	0.30	50.35	5.40
114	2330.44	17.	0.40	50.57	6.80
115	2330.80	19.	0.40	51.15	7.60
116	2331.16	21.	0.60	51.75	12.60
117	2331.90	4.8	0.50	52.25	2.40
118	2332.40	4.0	0.60	52.85	2.40
119	2332.95	22.	0.45	53.30	9.90
120	2333.36	23.	0.45	53.75	10.35
121	2333.84	18.	0.50	54.25	9.00
122	2334.40	20.	0.60	54.85	12.00

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SUMMARY OF PERMEABILITY TESTS

TABLE II

Company The Ohio Oil Company Lease Martindell Well No. W-29

Depth Interval Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
2276.00 - 2309.80	31.30	3.18	99.54
2309.80 - 2329.90	18.10	25.21	456.24
2329.90 - 2335.00	4.80	16.34	78.45
2276.00 - 2335.00	54.20	11.70	634.23

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company The Ohio Oil Company Lease Martindell Well No. W-29

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	2276.15	14.0	23.6	64.6	88.2	257	0.80	0.80	206
2	2277.00	17.0	23.1	46.1	69.2	305	0.75	1.55	229
3	2278.15	16.7	20.7	43.4	64.1	268	1.05	2.60	282
4	2279.15	15.1	30.5	52.7	83.2	358	0.90	3.50	322
5	2279.90	15.4	34.0	55.1	89.1	406	1.32	4.82	536
6	2281.15	16.3	30.2	49.1	79.3	382	0.88	5.70	336
7	2282.15	16.0	26.7	53.0	79.7	332	0.85	6.55	282
8	2282.95	16.2	27.4	51.6	79.0	344	1.05	7.60	362
9	2284.15	15.5	23.2	54.1	77.3	279	0.60	8.20	168
10	2285.15	15.4	25.0	52.2	77.2	299	0.75	8.95	224
11	2286.10	15.9	26.6	54.0	80.6	329	1.40	10.35	460
12	2287.95	14.7	25.4	61.1	86.5	290	1.40	11.75	406
13	2288.82	16.5	27.2	61.8	89.0	348	0.70	12.45	244
14	2289.48	13.3	20.2	76.0	96.2	208	0.40	12.85	83
15	2290.05	15.4	36.8	54.5	91.3	440	1.20	14.05	528
16	2291.43	16.5	36.8	48.4	85.2	471	1.30	15.35	612
17	2292.65	16.3	35.4	44.5	79.9	447	1.10	16.45	492
18	2293.52	16.5	33.4	45.5	78.9	427	0.50	16.95	214
19	2294.72	16.4	31.0	48.1	79.1	395	1.20	18.15	474

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company The Ohio Oil Company Lease Martindell Well No. W-29

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.	
20	2296.66	12.9	13.2	76.9	90.1	132	1.10	19.25	145
21	2297.32	16.3	35.0	42.2	77.2	443	0.60	19.85	266
22	2298.12	16.0	37.4	39.8	77.2	464	1.75	21.60	795
23	2299.68	16.6	25.7	71.7	97.4	331	0.30	21.90	99
24	2300.52	16.8	35.2	38.6	73.8	458	1.15	23.05	526
25	2301.44	11.8	21.6	65.6	87.2	198	0.60	23.65	119
26	2302.21	17.7	29.8	50.8	80.6	410	1.30	24.95	533
27	2303.62	16.5	38.5	41.7	80.2	493	1.40	26.35	690
28	2304.93	16.0	35.8	40.4	76.2	445	1.10	27.45	490
29	2305.72	18.3	34.4	39.7	74.1	488	1.00	28.45	488
30	2306.96	17.9	39.8	50.0	89.8	553	0.95	29.40	525
31	2307.65	12.1	35.9	45.6	81.5	338	0.95	30.35	321
32	2308.70	15.9	34.3	51.0	85.3	423	0.85	31.20	360
33	2309.40	15.9	30.2	44.6	74.8	372	0.75	31.95	279
34	2310.22	16.8	28.6	58.0	86.6	373	0.50	32.45	187
35	2311.22	17.1	24.5	59.1	83.6	325	1.45	33.90	471
36	2312.43	17.2	25.4	46.1	71.5	340	1.10	35.00	374
37	2313.40	19.2	33.2	37.4	70.6	495	1.15	36.15	570
38	2316.69	17.5	26.6	61.9	88.5	361	0.95	37.10	343

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company The Ohio Oil Company Lease Martindell Well No. W-29

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.	
39	2317.55	16.7	27.4	52.2	79.6	356	1.15	38.25	410
40	2318.55	15.7	35.0	48.1	83.1	427	0.70	38.95	299
41	2319.22	15.3	37.0	41.0	78.0	440	1.00	39.95	440
42	2320.42	16.1	28.5	55.3	83.8	356	1.20	41.15	426
43	2321.65	15.6	27.2	55.6	82.8	450	1.10	42.25	495
44	2322.72	16.8	27.6	61.1	88.7	360	1.00	43.25	360
45	2323.52	16.8	27.1	54.0	81.1	354	1.00	44.25	354
46	2324.62	16.4	29.5	50.2	79.7	376	1.00	45.25	376
47	2325.47	16.2	26.2	54.3	80.5	330	0.70	45.95	231
48	2326.30	17.0	25.8	46.2	72.0	340	1.00	46.95	340
49	2327.30	16.9	23.0	46.5	69.5	302	1.20	48.15	362
50	2328.22	17.7	22.9	53.5	76.4	315	0.70	48.85	221
51	2329.15	18.2	28.6	58.9	87.5	403	1.20	50.05	484
52	2330.25	16.9	21.0	52.5	73.5	276	0.90	50.95	248
53	2331.47	17.8	24.8	47.2	72.0	342	1.00	51.95	342
54	2332.25	16.2	25.5	48.4	73.9	320	1.20	53.15	384
55	2333.67	17.6	24.7	55.3	80.0	337	1.70	54.85	573
56	2334.92	13.8	22.4	58.0	80.4	240	0.30	55.15	72
							Total -	- - - -	20,458

Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company The Ohio Oil Company Lease Martindell Well No. W-29

Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbls./A. Ft.	Total Oil Content Bbls./Acre
2276.00-2309.80	31.95	15.84	30.62	50.69	379	12096
2309.80-2329.90	18.10	16.88	27.87	52.09	373	6743
2329.90-2335.00	5.10	16.96	24.12	51.75	317	1619
2276.00-2335.00	55.15	16.28	29.12	51.25	371	20458

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RESULTS OF LABORA

TAB

Company The Ohio Oil Company

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery	
			Percent	Bbls./A. Ft.	Percent	Bbls./A. F
1	2276.05	14.2	21.8	240	0.0	0
2	2276.90	16.4	25.6	326	0.0	0
3	2278.05	16.2	20.9	265	0.0	0
4	2279.05	14.8	30.4	349	1.6	18
5	2279.81	15.4	33.3	399	1.9	23
6	2281.05	16.0	30.6	380	0.7	9
7	2282.05	16.2	26.4	332	0.5	6
8	2282.85	16.0	26.7	332	0.5	6
9A	2283.85	14.8	24.2	278	0.0	0
10	2285.05	15.5	27.7	334	0.0	0
11	2286.00	15.5	26.6	320	0.0	0
12	2287.85	14.8	24.8	285	0.0	0
13	2288.69	16.3	28.9	366	0.0	0
14	2289.32	13.3	19.8	205	0.0	0
15	2289.95	15.9	34.8	429	0.0	0
16	2291.25	16.4	35.6	453	0.0	0
17	2292.52	15.9	36.4	449	0.0	0
18	2293.38	15.9	34.5	426	0.0	0
19	2294.62	16.0	30.3	376	4.1	51
20	2296.54	13.2	15.0	154	0.0	0
21	2297.16	15.8	34.4	422	8.3	102
22	2297.98	16.2	36.8	462	0.0	0
23	2299.52	16.2	26.5	333	0.0	0
24	2300.38	16.5	34.1	437	6.4	88
25	2301.28	12.9	19.0	190	0.0	0
26	2302.08	18.0	28.6	400	3.6	50
27	2303.48	17.2	37.4	500	8.0	107
28	2304.78	15.6	35.4	428	0.0	0
29	2305.58	18.1	34.2	491	12.2	172
30	2306.82	17.9	40.0	556	17.0	236
31	2307.54	12.3	35.1	335	0.0	0
32	2308.60	15.9	34.7	454	9.2	114
33	2309.30	15.8	30.8	378	1.6	20

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TORY FLOODING TESTS

LE V

Lease Martindell Well No. W-29

Residual Saturation			Volume of Water Recovered cc*	Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
% Oil	% Water	Bbls./A. Ft.			
21.8	67.6	240	0	Imp.	50
25.6	57.0	326	0	Imp.	50
20.9	63.7	265	0	Imp.	50
28.8	66.3	331	0	0.002	50
31.5	64.0	376	4	0.217	40
29.9	60.6	371	1	0.105	45
25.9	62.0	326	3	0.164	45
26.2	69.3	326	2	0.104	45
24.2	54.9	278	0	Imp.	50
27.7	62.3	334	0	Imp.	50
26.6	56.4	320	0	Imp.	50
24.8	67.1	285	0	Imp.	50
28.9	63.1	366	0	Imp.	50
19.8	75.4	205	0	Imp.	50
34.8	55.0	429	0	Imp.	50
35.6	61.0	453	0	Imp.	50
36.4	55.5	449	0	Imp.	50
34.5	54.0	426	0	Imp.	50
26.2	64.0	325	0	0.001	45
15.0	74.0	154	0	Imp.	50
26.1	63.0	320	2	0.107	30
36.8	57.5	462	0	Imp.	50
26.5	67.2	333	0	Imp.	50
27.7	64.5	355	2	0.192	35
19.0	71.6	190	0	Imp.	50
25.0	68.0	350	20	0.472	25
29.4	56.0	393	0	0.009	40
35.4	51.0	428	0	Imp.	50
22.0	67.5	319	4	0.317	30
23.0	70.6	320	11	0.300	25
35.1	50.2	335	0	Imp.	50
27.5	63.3	340	4	0.202	30
29.2	56.7	358	5	0.365	40

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RESULTS OF LABORA

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Company The Ohio Oil Company

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery	
			Percent	Bbls./A. Ft.	Percent	Bbls./A. F
34	2310.14	17.2	28.4	379	2.2	29
35	2311.06	17.0	24.4	322	4.8	63
36	2312.28	16.9	25.3	332	4.5	59
37	2313.32	19.6	32.1	489	8.6	131
38	2316.56	17.8	25.4	351	1.5	21
39	2317.48	17.0	26.4	349	0.8	11
40	2318.45	15.7	33.9	413	0.0	0
41	2319.08	15.6	37.0	448	0.0	0
42	2320.28	16.3	27.8	351	2.3	29
43	2321.48	15.6	28.9	350	1.8	22
44	2322.58	17.2	26.8	358	1.2	16
45	2323.38	16.5	27.2	349	1.6	21
46	2324.48	16.7	28.8	374	3.2	42
47	2325.35	16.0	27.1	336	1.8	22
48	2326.20	16.8	25.0	325	1.8	23
49	2327.20	16.8	23.3	303	2.7	34
50	2328.08	17.7	23.8	328	4.7	65
51	2329.04	18.2	27.5	389	7.5	106
52	2330.15	16.9	21.8	286	2.2	29
53	2331.32	17.5	25.1	344	3.1	42
54	2332.15	16.0	26.5	329	1.7	21
55	2333.55	15.7	23.0	317	2.0	28
56	2334.85	13.4	23.4	244	0.0	0

Notes: cc - cubic centimeter.
*Volume of water recovered at the time of
**Determined by passing water through sampl
"A" sample was taken from the core after it

Field Research Laboratories

OF LABORATORY FLOODING TESTS

TABLE V

_____ Lease Martindell Well No. W-29

:overy	Residual Saturation			Volume of Water Recovered cc*	Effective Permeability, Millidarcys **	Initial Fluid Production Pressure Lbs./Sq. In.
Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
29	26.2	64.4	350	19	0.448	25
63	19.6	79.6	259	112	3.39	15
59	20.8	75.0	273	92	3.42	15
131	23.5	76.3	358	182	8.01	15
21	23.9	66.5	330	36	1.12	25
11	25.6	69.0	338	28	0.686	25
0	33.9	48.5	413	0	Imp.	50+
0	37.0	51.0	448	0	Imp.	50+
29	25.5	71.6	322	17	0.430	25
22	27.1	64.4	328	6	0.340	40
16	25.6	71.9	342	24	0.595	25
21	25.6	66.4	328	20	0.546	30
42	25.6	61.7	332	15	0.419	30
22	25.3	61.5	314	11	0.344	30
23	23.2	67.0	302	24	0.655	25
34	20.6	68.9	269	22	0.540	25
65	19.1	73.3	263	172	5.58	15
106	20.0	72.2	283	179	7.46	15
29	19.6	60.0	257	28	0.693	20
42	22.0	67.0	302	60	1.73	20
21	24.8	63.0	308	4	0.205	45
28	21.0	65.5	289	28	0.780	25
0	23.4	61.1	244	0	Imp.	50+

time of maximum oil recovery.
ugh sample which still contains residual oil.
after it was received in the laboratory.

Oil Field Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company The Ohio Oil Company Lease Martindell Well No. W-29

Depth Interval, Feet	2276.00-2309.80	2309.80-2329.90	2329.90-2335.00	2276.00-2335.00
Feet of Core Analyzed	14.20	16.40	4.80	35.40
Average Percent Porosity	16.51	17.10	17.08	16.86
Average Percent Original Oil Saturation	32.46	26.74	24.11	28.67
Average Percent Oil Recovery	5.36	3.34	2.19	3.99
Average Percent Residual Oil Saturation	27.10	23.40	21.92	24.68
Average Percent Residual Water Saturation	64.01	69.99	64.13	66.80
Average Percent Total Residual Fluid Saturation	91.11	93.39	86.05	85.83
Average Original Oil Content, Bbls./A. Ft.	417.	355.	319.	375.
Average Oil Recovery, Bbls./A. Ft.	71.	45.	29.	53.
Average Residual Oil Content, Bbls./A. Ft.	346.	310.	290.	322.
Total Original Oil Content, Bbls./Acre	5918.	5828.	1535.	13281.
Total Oil Recovery, Bbls./Acre	1004.	745.	141.	1890.
Total Residual Oil Content, Bbls./Acre	4914.	5083.	1394.	11391.
Average Effective Permeability, Millidarcys	0.182	2.25	0.818	1.22
Average Initial Fluid Production Pressure, p.s.i.	37.5	23.8	27.5	29.9

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

Oil Field Research Laboratories

RESULTS OF WATER DIFFERENTATION TESTS

TABLE VII

Company The Ohio Oil Company Lease Martindell Well No. W-29

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	2276.15	51,500	53.0	11.6	64.6
2	2277.00	53,200	39.0	7.1	46.1
3	2278.15	53,200	36.6	6.8	43.4
4	2279.15	54,300	45.6	7.1	52.7
5	2279.90	62,300	54.6	0.5	55.1
6	2281.15	52,900	41.3	7.8	49.1
7	2282.15	46,500	39.2	13.8	53.0
8	2282.95	51,700	42.5	9.1	51.6
9	2284.15	57,300	49.4	4.7	54.1
10	2285.15	50,500	41.9	10.3	52.2
11	2286.10	52,400	45.0	9.0	54.0
12	2287.95	52,300	50.9	10.2	61.1
13	2288.82	56,900	55.9	5.9	61.8
14	2289.48	56,100	67.7	8.3	76.0
15	2290.05	54,300	47.1	7.4	54.5
16	2291.43	57,600	44.3	5.1	48.4
17	2292.65	59,000	41.8	2.7	44.5
18	2293.52	58,500	42.4	3.1	45.5
19	2294.72	49,100	37.5	10.6	48.1
20	2296.66	59,000	72.0	4.9	76.9
21	2297.32	49,700	33.4	8.8	42.2
22	2298.12	58,400	36.9	2.9	39.8
23	2299.68	53,000	60.5	11.2	71.7
24	2300.52	60,300	37.0	1.6	38.6
25	2301.44	50,300	52.5	13.1	65.6
26	2302.21	46,100	37.2	13.6	50.8
27	2303.62	49,600	32.9	8.8	41.7
28	2304.93	56,100	36.0	4.4	40.4
29	2305.72	57,100	36.0	3.7	39.7
30	2306.96	50,200	39.9	10.1	50.0
31	2307.65	58,300	42.3	3.3	45.6
32	2308.70	47,400	38.4	12.6	51.0
33	2309.40	49,200	34.9	9.7	44.6
34	2310.22	16,200	14.9	43.1	58.0
35	2311.22	10,000	9.4	49.7	59.1
36	2312.43	23,300	17.1	29.0	46.1
37	2313.40	9,700	5.8	31.6	37.4
38	2316.69	13,000	12.8	49.1	61.9
39	2317.55	19,800	16.4	35.8	52.2
40	2318.55	38,400	29.4	18.7	48.1
41	2319.22	57,800	37.7	3.3	41.0
42	2320.42	54,600	48.1	7.2	55.3

Oil Field Research Laboratories

RESULTS OF WATER DIFFERENTATION TESTS

TABLE VII

Company The Ohio Oil Company Lease Martindell Well No. W-29

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
43	2321.65	45,200	40.0	15.6	55.6
44	2322.72	10,800	10.5	50.6	61.1
45	2323.52	30,500	26.2	27.8	54.0
46	2324.62	48,900	39.1	11.1	50.2
47	2325.47	50,600	43.8	10.5	54.3
48	2326.30	43,200	31.7	14.5	46.2
49	2327.30	57,500	42.5	4.0	46.5
50	2328.22	10,400	8.9	44.6	53.5
51	2329.15	5,000	4.7	54.2	58.9
52	2330.25	35,700	29.8	22.7	52.5
53	2331.47	32,600	24.5	22.7	47.2
54	2332.25	56,000	43.1	5.3	48.4
55	2333.67	18,600	16.4	38.9	55.3
56	2334.92	53,600	49.4	8.6	58.0

Note: ppm - parts per million

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company The Ohio Oil Company Lease Martindell Well No. W-29

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
2276.00-2309.80	53,942	43.46	7.28
2309.80-2329.90	30,140	24.23	27.86
2329.90-2335.00	35,222	28.57	27.73
2276.00-2335.00	44,399	35.77	15.92

Note: ppm - parts per million