

OIL FIELD RESEARCH LABORATORIES
CHANUTE, KANSAS

August 22, 1951

Deep Rock Oil Corporation
Atlas Life Building
Tulsa, Oklahoma

Attention: Mr. T. F. Lawry

Gentlemen:

Enclosed herewith is the report of the analysis of the 2½" Rotary core taken from the Gingrich Lease, Well No. 8-7, Franklin County, Kansas, and submitted to our laboratory on August 11, 1951.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Clayton A. Mattier

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c.c.

DEEP ROCK OIL CORPORATION

CORE ANALYSIS REPORT

GINGRICH LEASE

WELL NO. 8-7

FRANKLIN COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANDLER, KANSAS

AUGUST 21, 1951

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Deep Rock Oil Corporation Lease Gingrich Well No. 8-7
 Location 660' South of North Line & 660' East of West Line, SW1
 Section 28 Twp. 16 Rge. 23 County Franklin State Kansas
 Name of Sand 21? **Squirrel**
 Top of Core **623.96**
 Bottom of Core **660.58**
 Top of Sand **625.81**
 Bottom of Sand **659.97**
 Total Feet of Permeable Sand **(Analyzed) 24.98**
 Total Feet of Floodable Sand **(Analyzed) 21.29**
 Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
<u>0 - 10</u>	<u>1.33</u>	<u>1.33</u>
10 - 20	4.33	5.66
20 - 40	8.30	13.96
40 - 80	4.85	18.81
80 - 120	4.75	23.56
120 - 160	1.32	24.88
160 & above	1.64	26.52
Average Permeability Millidarcys		63.04
Average Percent Porosity		21.05
Average Percent Oil Saturation		40.32
Average Percent Water Saturation		41.08
Average Oil Content, Bbls./A. Ft.		659.
Total Oil Content, Bbls./Acre		16,531.
Average Percent Oil Recovery by Laboratory Flooding Tests		13.30
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.		222.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre		4,788.
Total Calculated Oil Recovery, Bbls./Acre		3,650.
Packer Setting, Feet		631.00
Viscosity, Centipoises @		
A. P. I. Gravity, degrees @ 60 °F		
Elevation, Feet		

The above averages are for that part of the cored section extending from the bottom of the cement to the bottom of the sand.

Salt water was used as a circulating fluid in the coring of the sand in this well.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
623.96 - 624.15	- Gray sandy shale.
624.15 - 625.81	- Gray sandy shale containing limestone inclusions.
625.81 - 626.90	- Brown fine grained micaceous sandstone.
626.90 - 627.07	- Brown fine grained micaceous shaley sandstone.
627.07 - 627.60	- Brown fine grained micaceous sandstone.
627.60 - 627.90	- Brown fine grained micaceous shaley sandstone.
627.90 - 628.00	- Sandy limestone.
628.00 - 629.25	- Brown fine grained micaceous sandstone.
629.25 - 629.50	- Brown fine grained micaceous shaley sandstone.
629.50 - 633.90	- Dark brown fine grained micaceous sandstone.
633.90 - 635.70	- Brown fine grained micaceous sandstone.
635.70 - 642.85	- Dark brown fine grained micaceous sandstone.
642.85 - 647.22	- Brown fine grained micaceous sandstone.
647.22 - 647.85	- Dark fine grained micaceous carbonaceous slightly shaley sandstone.
647.85 - 648.40	- Gray sandy shale.
648.40 - 649.10	- Brown fine grained laminated micaceous shaley sandstone.
649.10 - 649.55	- Brown fine grained slightly laminated micaceous shaley sandstone.
649.55 - 649.85	- Laminated sandstone and shale containing a sand streak.

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649.85 - 650.00 - Brown fine grained laminated micaceous shaley sandstone.
650.00 - 652.00 - Laminated sandstone and shale containing sand streaks.
652.00 - 652.39 - Laminated shaley sandstone.
652.39 - 652.53 - Brown fine grained micaceous sandstone.
652.53 - 653.30 - Laminated shaley sandstone.
653.30 - 653.44 - Laminated sandstone and shale.
653.44 - 653.66 - Brown fine grained micaceous sandstone.
653.66 - 653.90 - Laminated sandstone and shale.
653.90 - 656.60 - Brown fine grained micaceous sandstone.
656.60 - 657.00 - Dark fine grained micaceous carbonaceous sandstone.
657.00 - 658.05 - Brown fine grained micaceous carbonaceous sandstone.
658.05 - 658.32 - Brown fine grained micaceous sandstone.
658.32 - 658.85 - Laminated shale and sandstone.
658.85 - 659.20 - Brown fine grained slightly laminated micaceous shaley sandstone.
659.20 - 659.30 - Laminated sandstone and shale.
659.30 - 659.97 - Dark fine grained micaceous carbonaceous sandstone.
659.97 - 660.58 - Gray shale.

Coring was started at a depth of 623.96 feet in gray sandy shale and completed at 660.58 feet in gray shale. This core shows a total of 30.60 feet of sandstone of which 27.64 feet are in the pay sand section. The pay sand, for the most part, is composed of dark 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 107.70, 34.80 and 77.26 millidarcys respectively; while that of the pay

sand, or that part of the cored section extending from the bottom of the cement to the bottom of the sand, is 63.04 millidarcys (See Table II). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile.

PERCENT SATURATION & OIL CONTENT

The pay sand in this core shows a good weighted average percent oil saturation, namely, 40.32. The weighted average percent oil saturation of the upper, middle and lower sections is 36.20, 42.87 and 37.22 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 40.87, 40.57 and 41.54 respectively; while that of the pay sand is 41.08 (See Table IV). This is a weighted average total fluid saturation of 81.40 percent for the pay sand.

Since salt water was used as a circulating fluid in the coring of the sand in this well, no chloride determinations were made as the results would not indicate the degree of flushing that occurred.

The weighted average oil content of the upper, middle and lower sections is 643, 665 and 641 barrels per acre foot respectively; while that of the pay sand is 659 barrels per acre foot. The total oil content, as shown by this core, is 17,953 barrels per acre of which 16, 531 are in the pay sand section.

LABORATORY FLOODING TESTS

This core responded very well to laboratory flooding tests in that a total oil recovery of 4,788 barrels per acre was obtained from 21.54 feet of sand represented. The weighted average percent oil saturation was reduced from 40.47 to 27.17, or represents an average recovery of 13.30 percent. The weighted average effective permeability of the samples

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is 5.40 millidarcys while the average initial fluid production pressure is 18.3 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 31 samples tested, 26 produced water and 26 oil. This indicates that most of the sand represented by these samples is floodable. The tests also show that the sand 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 3,650 barrels of oil per acre. This is an average recovery of 172 barrels of oil per acre foot from the 21.29 feet of floodable sand analyzed. In calculating this recovery, an allowance was made for oil lost during coring. It was assumed that the true water saturation of the sand is 38 percent and that the sand is not pressured up. Due to the wide variation in effective permeability, the calculated recovery is lower than that obtained by laboratory flooding tests.

Oil Field Research Laboratories

SHOT RECOMMENDATION

Company Deep Rock Oil Corporation Lease Gingrich Well No. 5-7

Depth Interval, Feet	Feet of Sand	Size of Shell Inches	Qts./Ft.	Total Quarts
631.00 - 634.00	3.0	3.0	1.5	4.5
634.00 - 658.00	<u>24.0</u>	4.0	2.5	<u>60.0</u>
	27.0			64.5

Recommended Packer Setting 626.00 feet
Note: Plug hole back to 659.00 feet

Note: The above shot was figured after core analysis. The shot used is shown on the coregraph.

Oil Field Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Deep Rock Oil Corporation Lease Oingrich Well No. 8-7

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	626.04	72.	0.49	0.49	35.88
2	626.52	52.	0.60	1.09	31.20
3	627.00	119.	0.17	1.26	80.23
4	627.42	122.	0.53	1.79	64.66
5	628.01	150.	0.15	1.94	22.80
6	628.35	250.	0.45	2.39	112.50
7	628.84	109.	0.55	3.04	70.55
8	629.36	92.	0.25	3.29	23.00
9	629.88	348.	0.55	3.84	226.20
10	630.43	261.	0.45	4.29	117.45
11	630.75	122.	0.35	4.74	42.70
12	631.12	50.	0.40	5.14	20.00
13	631.56	68.	0.45	5.59	39.60
14	632.03	50.	0.50	6.09	25.00
15	632.56	38.	0.60	6.69	16.60
16	633.00	215.	0.40	6.99	86.00
17	633.38	83.	0.30	7.29	24.90
18	633.62	25.	0.40	7.69	10.00
19	633.98	4.5	0.30	7.99	1.35
20	634.45	14.	0.50	8.49	7.00
21	634.95	14.	0.55	9.04	7.70
22	635.53	40.	0.45	9.49	18.00
23	635.93	137.	0.60	10.09	82.20
24	636.63	68.	0.45	10.54	30.60
25	636.88	25.	0.30	10.84	7.50
26	637.24	33.	0.45	11.29	14.55
27	637.70	30.	0.45	11.74	13.50
28	638.17	40.	0.50	12.24	20.00
29	638.75	36.	0.55	12.79	19.80
30	639.23	36.	0.45	13.24	16.20
31	639.75	15.	0.50	13.74	7.50
32	640.16	25.	0.35	14.09	8.75
33	640.45	35.	0.30	14.39	10.50
34	640.75	18.	0.35	14.74	6.30
35	641.16	30.	0.45	15.19	13.50
36	641.64	39.	0.60	15.79	23.40
37	642.30	39.	0.55	16.34	21.45
38	642.60	37.	0.30	16.64	11.10
39	643.13	13.	0.30	17.14	6.90
40	643.55	16.	0.50	17.64	8.00

Oil Field Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Deep Rock Oil Corporation Lease Oingrich Well No. 5-7

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
41	644.12	21.	0.50	18.14	10.50
42	644.37	28.	0.50	18.64	14.00
43	645.16	34.	0.60	19.24	20.40
44	645.70	43.	0.45	19.69	19.35
45	646.10	56.	0.40	20.09	22.40
46	646.46	56.	0.40	20.49	23.20
47	646.90	23.	0.52	21.01	11.95
48	647.75	1.5	0.63	21.64	0.95
49	648.78	Imp.	0.70	22.34	0.00
50	649.25	11.	0.45	22.79	4.95
51	649.75	12.	0.11	22.90	1.32
52	650.25	10.	0.10	23.00	1.00
53	650.93	9.1	0.08	23.08	0.07
54	651.60	3.6	0.10	23.18	0.36
55	652.46	151.	0.14	23.32	25.34
56	652.80	14.	0.77	24.09	10.76
57	653.61	9.4	0.22	24.31	2.07
58	654.03	105.	0.40	24.71	42.00
59	654.63	213.	0.60	25.31	67.60
60	655.10	119.	0.50	25.81	59.50
61	655.55	85.	0.45	26.26	38.25
62	656.05	86.	0.40	26.66	35.40
63	656.47	96.	0.35	27.01	33.60
64	656.80	41.	0.40	27.41	16.40
65	657.33	97.	0.60	28.01	77.60
66	657.95	68.	0.25	28.26	17.00
67	658.76	26.	0.53	28.99	13.75
68	659.16	64.	0.35	29.34	22.40
69	659.42	56.	0.30	29.64	16.50
70	659.52	135.	0.37	30.01	49.95

Oil Field Research Laboratories

SUMMARY OF PERMEABILITY TESTS

TABLE II

Company **Deep Rock Oil Corporation** Lease **Gingrich** Well No. **2-7**

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
625.81 - 635.70	9.49	107.70	1,022.12
635.70 - 651.65	12.99	34.80	452.10
652.39 - 659.97	6.83	77.26	527.67
629.00 - 659.97	26.52	63.04	1,671.92

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Deep Rock Oil Corporation Lease Gingerich Well No. 9-7

Sat. No.	Depth, Feet	Effective Porosity Percent	Percent Saturation		Oil Content, Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acre
			Oil	Water		Ft.	Cum. Ft.	
P-1A	625.90	22.5	27.1	-	473	0.49	0.49	232
1	626.75	25.0	30.4	37.4	590	0.60	1.09	354
P-2A	627.67	21.3	30.3	-	501	0.30	1.39	150
2	628.55	27.5	37.6	37.3	685	1.25	2.64	655
3	630.22	24.2	30.6	40.6	762	1.30	4.14	1,143
4	631.80	23.6	38.4	36.4	704	1.45	5.59	1,020
5	633.15	23.6	37.4	35.5	685	1.65	7.04	992
6	634.22	20.7	33.4	55.0	536	0.85	7.89	456
7	635.25	18.6	35.1	58.7	506	0.95	8.84	481
8	636.36	22.9	46.3	28.4	824	1.20	10.04	980
9	637.45	20.1	47.0	35.6	732	1.05	11.09	769
10	638.45	19.9	47.1	36.4	726	1.25	12.34	908
11	639.95	19.6	49.8	35.5	767	1.25	13.59	959
12	640.95	19.2	48.4	34.8	720	0.95	14.54	684
P-12A	641.80	20.3	34.0	-	535	0.80	15.34	428
13	642.55	20.9	42.5	39.7	690	0.65	15.99	449
14	643.35	20.3	39.8	44.4	627	1.00	16.99	627
15	644.35	19.9	39.4	43.4	608	1.05	18.04	638
16	645.45	20.5	41.2	45.4	655	1.20	19.24	785

RESULTS OF SATURATION TESTS

Company Deep Rock Oil Corporation Lease Glennish Well No. 1-7

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Oil Field Research Laboratories

SUMMARY OF SATURATION TESTS

TABLE IV

Company	Deep Rock Oil Corporation	Lease	Olarich	Well No.	S-7	
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
625.61-635.70	8.84	22.83	36.20	40.87	643	5,655
635.70-652.39	13.49	19.96	42.67	40.57	666	8,976
652.33-659.20	5.14	21.91	37.22	41.54	641	3,292
659.00-659.20	25.08	21.05	40.32	41.08	639	16,531

Oil Field Research Laboratories
RESULTS OF LABORATORY FLOODING TESTS

TABLE V

Company Deep Rock Oil Corporation Lease Gingrich Well No. 5-7

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.
			Percent	Bbls./A. Ft.	Percent	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1A	625.90	22.5	27.1	473	3.6	63	23.3	64.1	410	108	6.72	10
1	626.75	25.0	31.3	607	11.0	213	20.3	72.7	394	245	23.80	10
2A	627.57	21.3	30.3	501	1.2	20	29.1	67.5	481	5	0.187	35
2	628.53	23.6	38.3	708	17.4	322	20.9	74.2	388	238	13.77	10
3	630.22	24.5	39.5	751	16.7	315	22.8	66.0	433	145	17.60	10
4	631.80	23.7	36.1	701	13.6	250	24.3	66.0	451	92	14.30	15
5	633.15	23.9	37.8	701	15.5	287	22.3	71.7	414	135	13.22	10
6	634.22	20.8	34.1	550	11.4	184	22.7	75.0	366	63	2.87	20
7	635.25	18.1	35.4	497	9.4	132	26.0	70.7	365	8	0.193	25
8	636.36	23.0	46.8	835	21.6	385	25.2	63.9	450	164	8.32	10
9	637.45	20.6	46.5	743	18.2	291	28.3	67.6	452	57	1.85	15
10	638.45	20.6	46.1	736	20.2	322	25.9	67.4	414	58	2.16	10
11	639.95	19.0	50.4	742	23.1	340	27.3	69.5	402	26	0.892	15
12	640.95	19.5	47.2	714	19.3	292	27.9	69.5	422	12	0.237	15
12A	641.80	20.3	34.0	535	5.9	93	28.1	67.2	442	28	0.840	25
13	642.55	21.0	41.9	683	17.3	282	24.8	72.0	401	63	1.97	15
14	643.35	20.5	40.0	630	11.3	178	26.7	66.2	452	40	1.24	20
15	644.35	19.8	39.8	611	8.6	132	31.2	60.9	479	12	0.440	25
16	645.45	20.1	40.9	637	6.8	106	34.1	62.4	531	35	0.924	25
17	646.70	21.3	38.4	634	4.0	66	34.4	61.6	568	37	1.11	20
17A	647.64	18.4	39.1	568	0.0	0	39.1	48.1	558	0	Imp.	50
18	648.55	16.2	45.9	577	0.0	0	45.3	50.1	577	0	Imp.	50
19	650.00	17.3	35.8	480	4.7	63	31.1	63.9	417	0	0.011	50
20	652.15	17.4	33.1	446	0.0	0	33.1	61.1	446	0	Imp.	50
21	653.15	17.4	27.1	366	0.0	0	27.1	64.6	366	0	Imp.	50
22	654.36	23.7	40.2	740	12.9	238	27.3	61.3	502	149	10.99	15
23	655.33	22.1	39.2	672	9.3	165	29.7	64.0	509	143	6.01	15
24	656.30	22.3	35.1	607	7.7	133	27.4	64.2	474	138	6.09	15
25A	657.30	23.6	43.4	735	0.0	0	43.4	41.6	735	14	0.353	30
25B	658.22	22.4	27.8	483	0.2	3	27.6	61.5	480	62	2.17	15
25	658.95	21.6	32.8	350	2.7	45	30.1	62.3	505	59	0.935	25

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.

"A" & "B" Samples were taken from core after it was received in the laboratory.

Oil Field Research Laboratories
SUMMARY OF LABORATORY FLOODING TESTS

TABLE VI

Company	Deep Rock Oil Corporation	Lease	Gingrich	Well No.
Depth Interval, Feet	625.81 - 635.70	635.70 - 650.00	650.00 - 659.20	659.20 - 669.20
Feet of Core Analyzed	8.84	11.77	3.32	21.56
Average Percent Porosity	22.95	20.42	22.65	21.46
Average Percent Original Oil Saturation	36.30	43.13	36.95	40.47
Average Percent Oil Recovery	13.17	14.23	8.64	13.30
Average Percent Residual Oil Saturation	23.13	28.90	20.31	27.17
Average Percent Residual Water Saturation	69.68	65.81	62.83	66.38
Average Percent Total Residual Fluid Saturation	92.81	94.71	91.14	93.53
Average Original Oil Content, Bbls./A. Ft.	648.	653.	650.	672.
Average Oil Recovery, Bbls./A. Ft.	238.	226.	194.	222.
Average Residual Oil Content, Bbls./A. Ft.	410.	427.	456.	450.
Total Original Oil Content, Bbls./Acre	5,728.	8,641.	2,158.	14,473.
Total Oil Recovery, Bbls./Acre	2,103	2,662	510.	4,788.
Total Residual Oil Content, Bbls./Acre	3,625.	5,979.	1,648.	9,685.
Average Effective Permeability, Millidarcys	11.74	1.85	6.68	5.40
Average Initial Fluid Production Pressure, p.s.i.	16.1	20.4	17.0	18.3

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