

27-17-22E

April 29, 1950

Deep Rock Oil Corporation
Atlas Life Building
Tulsa, Oklahoma

Att: Mr. T. F. Lawry

Gentlemen:

Enclosed herewith is the report of the analysis made on the 2 1/2 inch Rotary core taken from the Lloyd Lease, Well No. Q-3, Miami County, Kansas, and submitted to our laboratory on April 24, 1950.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:bb

C.C. to Mr. Neil Henderson

Lloyd Q-3

DEEP ROCK OIL CORPORATION

CORE ANALYSIS REPORT

LLOYD LEASE

WELL NO. C-1

MIAMI COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANDLER, KANSAS

APRIL 29, 1950

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Deep Rock Oil Corporation Lease Lloyd Well No. Q-1
 Location 440 ft. south of north line, 1760 ft. west of east line, NE1
 Section 27 Twp. 17N Rge. 22E County Miami State Kansas

Name of Sand	Poru
Top of Core	310.80
Bottom of Core	340.46
Top of ^{pay} Sand	328.60
Bottom of Sand	339.75
Total Feet of Permeable Sand	11.33

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	2.62	2.62
10 - 20	2.00	4.62
20 - 40	3.11	7.73
40 - 80	1.95	9.68
80 & above	1.65	11.33

Average Permeability, Millidarcys	52.81
Average Percent Porosity	18.24
Average Percent Oil Saturation	48.97
Average Percent Water Saturation	33.28
Average Oil Content, Bbls./A. Ft.	698.
Total Oil Content, Bbls./Acre	5,643.
Average Percent Oil Recovery by Laboratory Flooding Tests	22.27
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	306.
Aotal Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	2,279.
Total Calculated Oil Recovery, Bbls./Acre	1,650.
Packer Setting, Feet	329.00

Viscosity, Centipoises @

A. P. I. Gravity, degrees @ 60 °F

Note: The above averages are for that part of the sand section extending from the packer setting to the bottom of the core.

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,</u> <u>Feet</u>	<u>Description</u>
310.80 - 313.70	- Gray shale containing limestone inclusions.
313.70 - 314.90	- Laminated limestone and shale.
314.90 - 319.80	- Limestone containing shale laminations.
319.80 - 320.60	- Laminated shale and limestone.
320.60 - 324.30	- Gray shale containing fine limestone laminations.
324.30 - 324.50	- Laminated shaley sandstone.
324.50 - 325.30	- Laminated sandy shale.
325.30 - 326.15	- Hard brown fine grained slightly laminated micaceous shaley calcareous sandstone.
326.15 - 326.75	- Laminated sandy shale.
326.75 - 327.30	- Hard brown fine grained laminated micaceous shaley calcareous sandstone.
327.30 - 327.60	- Hard brown fine grained micaceous calcareous sandstone.
327.60 - 327.70	- Laminated shaley sandstone.
327.70 - 328.35	- Limestone.
328.35 - 328.60	- Brown fine grained laminated micaceous shaley sandstone.
328.60 - 329.20	- Brown fine grained micaceous sandstone.
329.20 - 329.67	- Brown fine grained laminated micaceous shaley sandstone.
329.67 - 329.90	- Laminated shaley sandstone.
329.90 - 330.10	- Laminated sandstone and shale.
330.10 - 330.50	- Dark brown fine grained slightly laminated micaceous shaley sandstone.
330.50 - 331.90	- Dark brown fine grained micaceous sandstone.
331.90 - 332.55	- Brown fine grained laminated micaceous shaley sandstone.

332.56 - 332.85 - Laminated sandstone and shale.
332.85 - 333.10 - Brown fine grained micaceous shaley sandstone.
333.10 - 333.60 - Laminated sandstone and shale.
333.60 - 334.20 - Dark brown fine grained micaceous sandstone.
334.20 - 334.30 - Laminated sandstone and shale.
334.30 - 336.10 - Dark brown fine grained micaceous sandstone.
336.10 - 336.40 - Dark brown fine grained micaceous calcareous sandstone.
336.40 - 337.28 - Limestone.
337.28 - 339.30 - Dark brown fine grained micaceous calcareous sandstone.
339.30 - 339.75 - Brown fine grained laminated micaceous shaley calcareous sandstone.
339.75 - 340.46 - Gray shale containing limestone inclusions.

Coring was started at a depth of 310.80 feet in gray shale containing limestone inclusions and completed at 340.46 feet in the same type of formation as above. This core shows a total of 11.23 feet of sandstone. For the most part, the sand section is made up of fine grained micaceous sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections are 2.93 and 51.71 millidarcys respectively; while that of the pay sand or that part of the sand section extending from the packer setting to the bottom of the core is 52.81 millidarcys (See Table II). By observing the data given on the coregraph, it is noticeable that the sand section has a fairly irregular permeability profile.

PERCENT SATURATION AND OIL CONTENT

The pay sand in this core shows a good weighted average percent oil

saturation, namely, 48.97. The weighted average percent oil saturation for the upper and lower sections are 42.59 and 49.13 respectively. The weighted average percent water saturation of the upper and lower sections are 39.29 and 33.37 respectively; while that of the pay sand is 33.28 (See Table IV). This gives an overall weighted average total fluid saturation (for the pay sand) of 82.25 percent.

In order to get some idea of the degree of flushing of the sand during coring, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VII and VIII. From the data given in these tables and on the coregraph, it is evident that very little flushing of the sand did occur during coring. This would indicate that most of the oil lost during coring was caused by the expansion of gas carried in solution by the oil.

The weighted average oil content of the upper and lower sections are 412 and 702 barrels per acre foot respectively; while that of the pay sand is 698. The total oil content, as shown by this core, is 8,656 barrels per acre of which 8,643 barrels is in the pay sand section (See Table IV).

LABORATORY FLOODING TESTS

The sand in this core responded very well to laboratory flooding tests as a total recovery of 2,279 barrels per acre was obtained from 7.45 feet of sand. The weighted average percent oil saturation was reduced from 49.69 to 27.42, or represents an average recovery of 22.27 percent. The weighted average effective permeability of the samples is 2.64 millidarcys while the average initial fluid production pressure is 15.7 pounds per square inch (See Table VI). The above averages are for the pay sand section.

From the data given in Table V, you will note that of the 11 samples

tested, 7 produced oil and 8 took water. This would indicate that most of the sand represented by these samples is floodable. You will also note that there is considerable variation in the effective permeability of the sand.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 1,650 barrels of oil per acre. In calculating this recovery, an allowance was made for oil lost during coring and it is assumed that the true water saturation of the sand is 33 percent.

The principle drawback of this core is the fact that the pay sand section contains only approximately 7.45 feet of floodable sand and that there is considerable variation in the permeability of the sand.

Oil Field Research Laboratories

SHOT RECOMMENDATION

Company Deep Rock Oil Corporation Lease Lloyd Well No. Q-3

Depth Interval, Feet	Feet of Sand	Size of Shell Inches	Qts./Ft.	Total Quarts
334.00 - 338.00	4	4	2.5	10.0

Recommended Packer Setting - 329.00 feet.

Oil Field Research Laboratories
RESULTS OF PERMEABILITY TESTS
TABLE I

Company Deep Rock Oil Corporation Lease Lloyd Well No. Q-3

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	324.45	0.90	0.20	0.20	0.18
A	325.95	1.6	0.85	1.05	1.36
2	326.33	Imp.	0.60	1.65	0.00
3	326.78	6.0	0.55	2.20	3.30
4	327.65	1.4	0.10	2.30	0.14
5	328.50	39.	0.25	2.55	9.75
6	329.15	35.	0.60	3.15	21.00
B	329.40	16.	0.37	3.52	5.92
7	329.85	18.	0.33	3.85	5.94
8	330.38	26.	0.40	4.25	10.40
9	331.12	70.	0.80	5.05	56.00
10	331.45	67.	0.60	5.65	40.20
11	332.38	21.	0.66	6.31	13.86
12	333.05	29.	0.25	6.56	7.25
13	333.50	2.8	0.50	7.06	1.40
C	334.05	115.	0.60	7.66	69.00
14	334.34	66.	0.15	7.81	9.90
15	334.51	93.	0.45	8.26	41.85
16	335.25	93.	0.60	8.86	55.80
17	335.70	52.	0.40	9.26	20.80
18	336.10	32.	0.20	9.46	6.40
19	337.40	9.5	0.42	9.88	3.99
20	337.99	17.	0.40	10.28	90.40
21	338.28	23.	0.50	10.78	11.50
22	338.95	13.	0.70	11.48	9.10
23	339.35	10.	0.20	11.68	2.00
24	339.65	22.	0.25	11.93	5.50

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SUMMARY OF PERMEABILITY TESTS

TABLE II

Company Deep Rock Oil Corporation Lease Lloyd Well No. 9-3

Depth Interval Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
324.30 - 327.70	1.70	2.93	4.98
328.35 - 339.75	9.63	51.71	497.96
329.00 - 339.75	8.98	52.81	474.21

Oil Field Research Laboratories

RESULTS OF SATURATION TESTS

TABLE III

Company Deep Rock Oil Corporation Lease Lloyd Well No. 6-3

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	325.55	12.3	41.8	40.4	82.2	400	0.85	0.85	360
2	327.15	10.9	45.5	37.5	83.0	386	0.55	1.40	212
F-2	327.45	15.9	40.3	-	-	498	0.30	1.70	149
3	328.75	19.1	52.4	34.7	87.1	777	0.97	2.67	754
F-3A	329.70	16.5	30.7	-	-	394	0.33	3.00	130
4	330.62	19.5	48.7	33.9	82.6	738	1.20	4.20	885
5	331.75	20.2	53.8	32.4	86.2	845	0.60	4.80	507
F-5	332.05	18.0	35.8	-	-	501	0.66	5.46	331
6	333.75	22.3	51.2	26.0	77.2	886	0.60	6.06	532
7	334.75	20.2	55.0	28.4	83.4	861	1.80	7.86	1,550
F-7A	336.22	13.1	44.4	-	-	452	0.30	8.16	136
8	337.60	13.6	51.8	37.5	89.3	548	0.82	8.98	450
9	338.50	15.7	46.5	40.5	87.0	566	1.20	10.18	680
							Total	- - - -	6,656

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SUMMARY OF SATURATION TESTS

TABLE IV

Company Deep Rock Oil Corporation Lease Lloyd Well No. 9-3

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
325.30-327.60	1.70	12.53	42.59	39.29	412	701
328.60-339.30	8.48	18.28	49.13	33.37	702	5,955
329.00-339.30	8.08	18.24	48.97	33.28	698	5,643

Oil Field Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE V

Company Deep Rock Oil Corporation

Lease Lloyd

Well No. Q-5

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.			
1	325.95	14.5	38.6	435	0.0	0	38.6	52.9	435	0	Imp.	50+
2	327.45	15.9	40.3	496	0.0	0	40.3	56.5	496	0	Imp.	50+
3	329.00	17.9	55.4	771	34.0	474	21.4	61.7	297	70	5.16	5
3A	329.70	16.5	30.7	394	0.0	0	30.7	61.3	394	0	Imp.	50+
4	330.65	19.1	49.8	739	23.7	352	25.1	66.7	387	36	2.09	10
5	332.05	18.0	35.8	501	7.2	101	28.6	65.7	400	5	0.141	35
6	334.05	21.1	51.8	649	23.5	366	28.3	59.3	463	62	6.68	10
7	335.05	17.8	55.2	737	28.1	369	25.1	69.1	348	49.5	4.31	10
7A	336.22	13.1	44.4	452	0.0	0	44.4	45.7	452	11	0.295	30
8	337.80	13.1	49.4	503	12.6	139	35.8	46.6	364	15	0.275	25
9	338.75	15.3	48.7	578	19.9	236	28.8	58.0	342	28.5	0.642	15

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 VI

Company	Deep Rock Oil Corporation		Lease	Lloyd	Well No.	G-2
Depth, Interval, Feet	328.60-339.30		329.00-339.30			
Feet of Core Analyzed	7.85		7.45			
Average Percent Porosity	17.52		17.49			
Average Percent Original Oil Saturation	49.99		49.69			
Average Percent Oil Recovery	22.87		22.27			
Average Percent Residual Oil Saturation	27.12		27.42			
Average Percent Residual Water Saturation	62.74		62.79			
Average Percent Total Residual Fluid Saturation	89.86		90.21			
Average Original Oil Content, Bbls./A. Ft.	682.		674.			
Average Oil Recovery, Bbls./A. Ft.	317.		306.			
Average Residual Oil Content, Bbls./A. Ft.	365.		368.			
Total Original Oil Content, Bbls./Acre	5,350.		5,421.			
Total Oil Recovery, Bbls./Acre	2,489.		2,279.			
Total Residual Oil Content, Bbls./Acre	2,861.		2,742.			
Average Effective Permeability, Millidarcys	2.75		2.64			
Average Initial Fluid Production Pressure, p.s.i.	15.7		15.7			

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

Oil Field Research Laboratories
RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VII

Company Deep Rock Oil Corporation Lease Lloyd Well No. Q-3

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Connate	Percent Water Saturation Drilling & Foreign	Total
1	325.55	15,300			
2	327.15	18,900			
3	328.75	15,100			
4	330.62	13,900			
5	331.75	13,900			
6	333.75	14,000			
7	334.75	13,100			
8	337.60	19,600			
9	338.50	13,400			
Note: ppm - parts per million.					

Oil Field Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company Deep Rock Oil Corporation Lease Lloyd Well No. Q-3

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
325.30 - 327.30	16,700		
328.60 - 339.30	15,800		
329.00 - 339.30	14,400		

Note: ppm - parts per million.