

28-30s-16E

OILFIELD RESEARCH LABORATORIES

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July 7, 1959

Noble Oil Company
515 South Emporia
Wichita, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Cable Tool core taken from the Clegg Lease, Well No. 6, Wilson County, Kansas, and submitted to our laboratory on June 27, 1959.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES



Carl L. Pate

CLP:cs

1 c. to Mr. Giles Overton

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GENERAL INFORMATION & SUMMARY

Company	Noble Oil Company	Lease	Clegg	Well No.	6
Location	N $\frac{1}{2}$, NW $\frac{1}{4}$, SW $\frac{1}{4}$				
Section	28	Twp.	30S	Rge.	16E
		County	Wilson		State Kansas
Name of Sand					Bartlesville
Top of Core					773.0
Bottom of Core					791.2
Pay					
Top of Sand					776.0
Bottom of Sand					790.5
Total Feet of Permeable Sand					9.7
Good					
Total Feet of Floodable Sand					8.1
Distribution of Permeable Sand:					
Permeability Range Millidarcys	Feet	Cum. Ft.			
0 - 5	4.2	4.2			
5 - 10	3.0	7.2			
10 & above	2.5	9.7			
Average Permeability Millidarcys					
				10.2	
Average Percent Porosity					
				15.4	
Average Percent Oil Saturation					
				27.4	
Average Percent Water Saturation					
				50.1	
Average Oil Content, Bbls./A. Ft.					
				328.	
Total Oil Content, Bbls./Acre					
				5,748.	
Average Percent Oil Recovery by Laboratory Flooding Tests					
				7.9	
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.					
				99.	
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre					
				1,050.	
Total Calculated Oil Recovery, Bbls./Acre					
				1,150.	
Packer Setting, Feet					
Viscosity, Centipoises @					
A. P. I. Gravity, degrees @ 60 °F					
Elevation, Feet					

The sand was cored in water.

This core was sampled and the samples were sealed in cans by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Description Feet	
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773.0 - 776.0	- Hard grayish light brown shaley sandstone.
776.0 - 783.7	- Brown laminated shaley sandstone.
783.7 - 784.1	- Grayish light brown shaley sandstone.
784.1 - 790.5	- Brown laminated shaley sandstone.
790.5 - 791.2	- Gray soft shale.

Coring was started at a depth of 773.0 feet in hard grayish light brown shaley sandstone and completed at 791.2 feet in gray soft shale. This core shows a total of 17.5 feet of sandstone. For the most part, the pay is made up of brown laminated 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 is impermeable, 3.1 and 17.0 millidarcys respectively; the overall average being 10.2 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from 0.53 to a maximum of 36 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fair weighted average percent oil saturation, namely, 27.4. The weighted average percent oil saturation of

the upper, middle and lower sections is 22.9, 29.6 and 26.8 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 58.5, 46.9 and 50.1 respectively; the overall average being 50.1 (See Table III). This gives an overall weighted average total fluid saturation of 77.5 percent. This total fluid saturation indicates some fluid was lost during coring, part of which probably was oil.

The weighted average oil content of the upper, middle and lower sections is 227, 352 and 346 barrels per acre foot respectively; the overall average being 328. The total oil content, as shown by this core, is 5,748 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 1,050 barrels of oil per acre was obtained from 10.6 feet of sand. The weighted average percent oil saturation was reduced from 28.3 to 20.4, or represents an average recovery of 7.9 percent. The weighted average effective permeability of the samples is 2.24 millidarcys, while the average initial fluid production pressure is 32.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 18 samples tested, 13 produced water and 11 oil. This indicates that approximately 61 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a very wide variation in effective permeability.

CONCLUSION

It is evident from the enclosed data that an efficient water-flood, within the vicinity of this well, will recover approximately 1,150 barrels of oil per acre, or an average of 142 barrels of oil per acre foot from

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the 8.1 feet of good floodable pay sand analyzed. The following factors and assumptions were used in calculating this recovery:

Original formation volume factor	1.07
Present formation volume factor	1.02
True water saturation, percent	39.0
Primary oil recovery, percent	10.0
Calculated present oil saturation, percent	48.2
Porosity, percent	16.0
Oil saturation at abandonment, percent	25.0
Performance factor	0.50

This core shows a rather shaley sand section having fair oil and rather high water saturations and a wide variation in effective permeability. The analysis results indicate that the good floodable pay sand extends from 778.6 to 787.6 feet.

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RESULTS OF PERMEABILITY TESTS
TABLE I

Company Noble Oil Company Lease Clegg Well No. 6

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	773.4	Imp.	0.6	0.6	0.00
2	773.9	Imp.	0.6	1.2	0.00
3	774.4	Imp.	0.4	1.6	0.00
4	774.7	Imp.	0.6	2.2	0.00
5	775.4	Imp.	0.5	2.7	0.00
6	775.9	Imp.	0.3	3.0	0.00
7	776.4	1.2	0.6	3.6	0.72
8	776.9	1.0	0.6	4.2	0.60
9	777.4	Imp.	0.5	4.7	0.00
10	777.9	Imp.	0.5	5.2	0.00
11	778.4	3.1	0.5	5.7	1.55
12	778.9	Imp.	0.5	6.2	0.00
13	779.4	7.8	0.5	6.7	3.90
14	779.9	5.9	0.5	7.2	2.95
15	780.4	1.2	0.5	7.7	0.60
16	780.9	Imp.	0.5	8.2	0.00
17	781.4	Imp.	0.5	8.7	0.00
18	781.9	4.4	0.5	9.2	2.20
19	782.4	Imp.	0.5	9.7	0.00
20	782.9	Imp.	0.5	10.2	0.00
21	783.4	3.4	0.5	10.7	1.70
22	783.9	0.53	0.5	11.2	0.26
23	784.4	7.8	0.5	11.7	3.90
24	784.9	15.	0.5	12.2	7.50
25	785.4	27.	0.5	12.7	13.50
26	785.9	8.1	0.5	13.2	4.05
27	786.4	29.	0.5	13.7	14.50
28	786.9	31.	0.5	14.2	15.50
29	787.4	Imp.	0.5	14.7	0.00
30	787.9	36.	0.5	15.2	18.00
31	788.4	7.6	0.5	15.7	3.80
32	788.9	5.9	0.5	16.2	2.95
33	789.4	2.4	0.5	16.7	1.20
34	789.9	Imp.	0.5	17.2	0.00
35	790.4	Imp.	0.3	17.5	0.00

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RESULTS OF SATURATION TESTS

TABLE II

Company Noble Oil Company Lease Clegg Well No. 6

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.	
1	773.1	12.6	24	53	235	0.6	0.6	141
2	774.1	11.5	15	71	134	1.0	1.6	134
3	775.1	13.4	28	52	291	1.4	3.0	407
4	776.1	15.0	28	49	326	0.6	3.6	196
5	777.1	15.1	30	45	352	1.0	4.6	352
6	778.1	13.7	34	45	362	1.0	5.6	362
7	779.1	15.7	30	53	365	1.0	6.6	365
8	780.1	15.8	39	40	478	1.0	7.6	478
9	781.1	15.8	27	44	331	1.0	8.6	331
10	782.1	15.5	26	56	312	1.0	9.6	312
11	783.1	16.5	30	44	384	1.1	10.7	422
F-12	784.0	11.4	9	-	80	0.4	11.1	32
12	784.2	17.6	29	45	396	0.5	11.6	198
13	785.1	16.0	25	60	310	1.0	12.6	310
14	786.1	19.0	21	51	310	1.0	13.6	310
15	787.1	17.1	22	49	292	1.0	14.6	292
16	788.1	15.9	26	52	321	1.0	15.6	321
17	789.1	18.3	33	51	469	1.0	16.6	469
18	790.1	13.7	33	39	351	0.9	17.5	316
Total--						17.5	17.5	5,748

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Noble Oil Company		Lease	Clegg		Well No.	6
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.			
	773.0 - 776.0	0.0	Imp.	0.00			
	776.0 - 784.1	4.7	3.1	14.48			
	784.1 - 789.7	5.0	17.0	84.90			
	776.0 - 789.7	9.7	10.2	99.38			
	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
	773.0 - 776.0	3.0	12.7	22.9	58.5	227	682
	776.0 - 784.1	8.1	15.2	29.6	46.9	352	2,850
	784.1 - 790.5	6.4	16.8	26.8	50.1	346	2,216
	773.0 - 790.5	17.5	15.4	27.4	50.1	328	5,748

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

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			
1	773.1	12.3	21	200	0	0	21	58	0	Imp.	50+
2	774.1	11.9	16	148	0	0	16	61	0	Imp.	50+
3	774.9	12.9	26	260	0	0	26	55	0	Imp.	50+
4	776.1	14.6	28	317	6	68	22	74	0	0.017	40
5	777.1	14.7	30	342	3	34	27	66	3	0.155	50
6	778.1	13.8	33	354	0	0	33	53	0	Imp.	50+
7	779.1	15.4	30	359	10	120	20	67	6	0.230	35
8	780.1	16.3	39	494	21	266	18	68	22	0.672	35
9	781.1	15.9	27	333	6	74	21	67	8	0.287	40
10	782.1	16.1	26	325	5	63	21	67	74	1.79	25
11	783.1	17.0	30	395	13	171	17	74	123	9.54	15
12	784.0	11.4	9	80	0	0	9	65	0	Imp.	50+
13	785.1	16.3	25	316	2	25	23	67	29	1.18	35
14	786.1	18.8	21	306	6	87	15	72	142	7.81	15
15	787.1	17.1	22	292	7	93	15	68	38	1.01	25
16	788.1	16.1	23	288	0	0	23	65	12	0.427	35
17	789.1	17.9	33	458	0	0	33	58	5	0.190	45
18	790.1	14.2	33	364	6	66	27	64	2	0.069	45

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.

Company Noble Oil Company

Lease Clegg

Well No. 6

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Noble Oil Company	Lease	Clegg	Well No.	6
Depth Interval, Feet	776.0 - 783.7	784.6 - 790.5	776.0 - 790.5		
Feet of Core Analyzed	6.7	3.9	10.6		
Average Percent Porosity	15.8	16.6	16.1		
Average Percent Original Oil Saturation	30.1	25.0	28.3		
Average Percent Oil Recovery	9.4	5.2	7.9		
Average Percent Residual Oil Saturation	20.7	19.8	20.4		
Average Percent Residual Water Saturation	68.7	67.8	68.5		
Average Percent Total Residual Fluid Saturation	89.4	87.6	88.9		
Average Original Oil Content, Bbls./A. Ft.	369.	319.	350.		
Average Oil Recovery, Bbls./A. Ft.	117.	68.	99.		
Average Residual Oil Content, Bbls./A. Ft.	252.	251.	251.		
Total Original Oil Content, Bbls./Acre	2,478.	1,241.	3,719.		
Total Oil Recovery, Bbls./Acre	786.	264.	1,050.		
Total Residual Oil Content, Bbls./Acre	1,692.	977.	2,669.		
Average Effective Permeability, Millidarcys	2.04	2.57	2.24		
Average Initial Fluid Production Pressure, p.s.i.	34.3	30.0	32.7		

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