OILFIELD RESEARCH LABORATORIES
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December 20, 1966

F & L Oil Company
P.O. Box 528
Eureka, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Trefethen Lease, Well No. 2, Labette County, Kansas, and submitted to our laboratory on December 15, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

BRP:rf

5 c. - Eureka, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company F & L Oil Company Lease Trefethen Well No. 2

Location 495' NSL & 165' EWL, NE¼

Section 14 Twp. 33S Rge. 17E County Labette State Kansas

Name of Sand	Bartlesville
Top of Core	661.0
Bottom of Core	715.5
Top of Sand (Analyzed)	682.6
Bottom of Sand (Analyzed)	710.0
Total Feet of Permeable Sand	24.1
Total Feet of Floodable Sand	11.5

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
1 - 5	4.3	4.3
5 - 10	4.8	9.1
10 - 20	2.4	11.5
20 - 47	12.6	24.1

Average Permeability Millidarcys	21.3
Average Percent Porosity	18.1
Average Percent Oil Saturation	25.8
Average Percent Water Saturation	56.7
Average Oil Content, Bbls./A. Ft.	366.
Total Oil Content, Bbls./Acre	8,818.
Average Percent Oil Recovery by Laboratory Flooding Tests	6.0
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	85.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	981.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	2,940.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Salt water mud 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 virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
661.0 - 665.6	Light gray sandstone (No show).
665.6 - 669.0	Light gray, calcareous sandstone (No show).
669.0 - 681.0	Light gray sandstone (No show).
681.0 - 685.9	Light gray, laminated, slightly shaly sandstone.
685.9 - 694.3	Brown sandstone.
694.3 - 696.6	Gray, laminated, shaly sandstone.
696.6 - 703.4	Light brown and gray, laminated, shaly sandstone.
703.4 - 706.0	Light brown, slightly shaly sandstone.
706.0 - 710.0	Brown sandstone.
710.0 - 712.0	Gray shaly sandstone.
712.0 - 715.2	Sandy shale.
715.2 - 715.5	Shale.

Coring was started at a depth of 661.0 feet in light gray sandstone and completed at 715.5 feet in shale. For the most part, the pay is made up of brown 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 25.9, 9.5 and 26.9 millidarcys respectively; the

overall average being 21.3 (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 47. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 25.8. The weighted average percent oil saturation of the upper, middle and lower sections is 26.8, 19.5 and 32.0 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 55.0, 64.9 and 47.2 respectively; the overall average being 56.7 (See Table III). This gives an overall weighted average total fluid saturation of 82.5 percent.

The weighted average oil content of the upper, middle and lower sections is 395, 272 and 424 barrels per acre foot respectively; the overall average being 366. The total oil content, as shown by this core, is 8,818 barrels per acre of which 5,498 barrels are in the pay sand section (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 981 barrels of oil per acre was obtained from 11.5 feet of sand. The weighted average percent oil satutation was reduced from 33.2 to 27.2, or represents an average recovery of 6.0 percent. The weighted average effective permeability of the samples is 2.72 millidarcys, while the average initial fluid production pressure is 17.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of

the 24 samples tested, all produced water and 11 oil. This indicates that approximately 46 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 efficient primary and secondary operations in the vicinity of this well should recover approximately 2,940 barrels of oil per acre or an average of 224 barrels per acre foot from the 13.1 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
Reservoir water saturation, percent	40.0
Average porosity, percent	18.7
Oil saturation after flooding, percent	27.2
Performance factor, percent	50.0
Net floodable pay sand, feet	13.1

This core shows two pay zones (686.8 - 694.3 and 704.6 - 710.0) having good oil saturations, moderate water saturations and wide variations in effective permeability to water.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company F & L Oil Company Lease Trefethen Well No. 2

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	683.1	16.0	10	78	88	124	2.5	1.0	1.0	124	2.50
2	684.1	16.1	14	74	88	175	2.8	1.0	2.0	175	2.80
3	685.1	17.1	18	65	83	238	2.9	1.3	3.3	309	3.77
4	686.1	19.5	20	56	76	302	47.	0.7	4.0	212	32.90
5	687.1	20.4	33	48	81	522	42.	1.0	5.0	522	42.00
6	688.1	19.7	32	47	79	489	45.	1.0	6.0	489	45.00
7	689.1	19.0	28	50	78	412	24.	1.0	7.0	412	24.00
8	690.1	20.0	34	52	86	526	33.	1.0	8.0	526	33.00
9	691.1	20.2	36	44	80	563	37.	1.0	9.0	563	37.00
10	692.1	18.8	32	49	81	466	11.	1.0	10.0	466	11.00
11	693.1	19.1	31	48	79	459	38.	1.0	11.0	459	38.00
12	694.1	18.1	37	44	81	520	44.	0.7	11.7	364	30.80
13	697.1	17.3	15	69	84	201	5.6	1.0	12.7	201	5.60
14	699.1	16.4	20	68	88	254	5.9	1.0	13.7	254	5.90
15	700.1	17.6	20	61	81	273	8.8	1.0	14.7	273	8.80
16	701.1	18.8	26	54	80	378	8.5	1.0	15.7	378	8.50
17	702.1	18.0	14	82	96	196	1.7	1.0	16.7	196	1.70
18	703.1	18.3	22	56	78	312	8.8	0.8	17.5	250	7.04
19	704.1	18.7	20	63	83	290	24.	1.2	18.7	348	28.80
20	705.1	18.1	32	57	89	449	14.	1.4	20.1	629	19.60
21	706.1	18.0	27	49	76	377	23.	0.6	20.7	226	13.80
22	707.1	19.4	29	43	72	436	32.	1.0	21.7	436	32.00
23	708.1	16.9	27	40	67	353	34.	1.0	22.7	353	34.00
24	709.1	15.0	40	45	85	466	33.	1.4	24.1	653	46.10
								Total		8,818	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company F & L Oil Company Lease Trefethen Well No. 2

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
682.6 - 694.3	11.7	25.9	302.77
696.6 - 704.6	7.0	9.5	66.34
704.6 - 710.0	5.4	26.9	145.50
682.6 - 710.0	24.1	21.3	514.61

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
682.6 - 694.3	11.7	18.6	26.8	55.0	395	4,621
696.6 - 704.6	7.0	17.9	19.5	64.9	272	1,900
704.6 - 710.0	5.4	17.3	32.0	47.2	424	2,297
682.6 - 710.0	24.1	18.1	25.8	56.7	366	8,818

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company F & L Oil Company Lease Trefethen Well No. 2

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	683.1	15.8	10	122	0	0	10	83	122	19	0.400	20
2	684.1	15.9	13	160	0	0	13	83	160	18	0.400	30
3	685.1	16.9	16	210	0	0	16	81	210	27	0.600	30
4	686.1	19.3	20	299	0	0	20	77	299	320	7.20	10
5	687.1	20.8	33	531	7	113	26	71	418	210	5.70	10
6	688.1	19.5	32	484	7	106	25	73	378	265	6.70	10
7	689.1	19.4	28	421	2	30	26	72	391	34	0.800	20
8	690.1	19.7	34	519	8	122	26	66	397	63	1.40	20
9	691.1	20.0	36	558	10	155	26	70	403	113	2.80	20
10	692.1	18.4	32	456	4	57	28	65	399	28	0.700	30
11	693.1	18.7	31	449	2	29	29	66	420	163	3.80	10
12	694.1	18.0	37	516	8	112	29	58	404	94	2.00	20
13	697.1	17.1	17	225	0	0	17	76	225	12	0.300	40
14	699.1	16.6	19	244	0	0	19	72	244	22	0.625	30
15	700.1	17.1	20	265	0	0	20	72	265	16	0.400	30
16	701.1	19.1	26	385	0	0	26	72	385	74	1.90	20
17	702.1	17.8	16	221	0	0	16	82	221	28	0.600	20
18	703.1	18.0	22	307	0	0	22	72	307	27	0.600	20
19	704.1	18.2	19	268	0	0	19	76	268	72	1.70	10
20	705.1	18.0	32	446	4	56	28	67	390	57	1.20	10
21	706.1	17.8	28	386	0	0	28	69	386	55	1.10	20
22	707.1	19.0	29	427	2	30	27	70	397	219	4.50	20
23	708.1	17.4	27	364	0	0	27	67	364	144	2.90	20
24	709.1	15.4	40	478	11	131	29	66	347	55	1.30	20

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 F & L Oil Company Lease Trefethen Well No. 2

Depth Interval, Feet	686.6 - 694.3	704.6 - 710.0	686.6 - 710.0
Feet of Core Analyzed	7.7	3.8	11.5
Average Percent Porosity	19.4	17.3	18.7
Average Percent Original Oil Saturation	32.7	34.2	33.2
Average Percent Oil Recovery	5.9	6.1	6.0
Average Percent Residual Oil Saturation	26.8	28.1	27.2
Average Percent Residual Water Saturation	67.9	67.5	67.7
Average Percent Total Residual Fluid Saturation	94.7	95.6	94.9
Average Original Oil Content, Bbls./A. Ft.	491.	453.	478.
Average Oil Recovery, Bbls./A. Ft.	90.	77.	85.
Average Residual Oil Content, Bbls./A. Ft.	401.	376.	393.
Total Original Oil Content, Bbls./Acre	3,778.	1,720.	5,498.
Total Oil Recovery, Bbls./Acre	690.	291.	981.
Total Residual Oil Content, Bbls./Acre	3,088.	1,429.	4,517.
Average Effective Permeability, Millidarcys	3.02	2.11	2.72
Average Initial Fluid Production Pressure, p.s.i.	17.5	16.7	17.3

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