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

OILFIELD RESEARCH LABORATORIES

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May 16, 1962

Langdon & Finch
309 East 5th
Ottawa, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Cable Tool core taken from the Lester Kalb Lease, Well No. 6, Douglas County, Kansas, and submitted to our laboratory on May 10, 1962.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Fred O. Stenger

Fred O. Stenger

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GENERAL INFORMATION & SUMMARY

Company Langdon & Finch Lease Lester Kalb Well No. 6

Location E½ NE NE

Section 1 Twp. 15S Rge. 20E County Douglas State Kansas

Name of Sand	Squirrel
Top of Core	830.5
Bottom of Core	848.2
Top of Sand	?
Bottom of Sand	842.0
Total Feet of Permeable Sand (Analyzed)	8.6
Total Feet of Floodable Sand (Analyzed)	6.6

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	1.0	1.0
5 - 50	1.6	2.6
50 & above	6.0	8.6

Average Permeability Millidarcys	56.3
Average Percent Porosity	19.2
Average Percent Oil Saturation	32.8
Average Percent Water Saturation	55.8
Average Oil Content, Bbls./A. Ft.	514.
Total Oil Content, Bbls./Acre	5,403.
Average Percent Oil Recovery by Laboratory Flooding Tests	10.3
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	171.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,126.
Total Calculated Oil Recovery, Bbls./Acre	1,580.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	1,071.4

Primary = 647
W.F. = 933
1,580.

This core was taken with a Cable Tool core barrel in a virgin formation. The core was sampled and the samples sealed in cans by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
830.5 - 838.0	Brown, slightly laminated, slightly shaly sandstone.
838.0 - 842.0	Gray and brown shaly sandstone.
842.0 - 848.2	Sandy shale.

Coring was started at a depth of 830.5 feet in brown, slightly laminated, slightly shaly sandstone and completed at 848.2 feet in sandy shale. This core shows a total of 11.5 feet of sandstone. For the most part, the pay is made up of slightly shaly to shaly, slightly laminated, brown sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections is 60.3 and 43.1 millidarcys respectively; the overall average being 56.3 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has for the most part a rather high and somewhat uniform permeability profile. The permeability of the sand varies from 2.2 to a maximum of 88. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 32.8. The weighted average percent oil saturation of the upper and lower sections is 39.0 and 22.4 respectively. The weighted average percent water saturation of the upper and lower sections is 46.3 and 72.0 respectively; the overall average being 55.8 (See Table III). This gives an overall weighted average total fluid saturation of 88.6 percent. This low total fluid saturation indicates some fluid was

lost during coring which was probably oil.

The weighted average oil content of the upper and lower sections is 648 and 289 barrels per acre foot respectively; the overall average being 514. The total oil content, as shown by this core, is 5,403 barrels per acre of which 4,276 barrels are in the upper sand section (See Table III).

LABORATORY FLOODING TESTS

The upper portion of the sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 1,126 barrels of oil per acre was obtained from 6.6 feet of sand. The weighted average percent oil saturation was reduced from 39.1 to 28.8, or represents an average recovery of 10.3 percent. The weighted average effective permeability of the samples is 1.87 millidarcys, while the average initial fluid production pressure is 31.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 9 samples tested, 7 produced water and 7 oil. This indicates that approximately 78 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a fair effective permeability and that the upper part should take water fairly well.

CONCLUSION

Based on the results of the above laboratory tests and assuming an efficient water-flood operation, within the vicinity of this well, it is believed that this well should recover approximately 1,580 barrels of oil per acre or an average of 240 barrels per acre foot from the 6.6 feet of floodable sand analyzed. In calculating this oil recovery value the following facts and assumptions were used:

Original formation volume factor	1.08
Present formation volume factor	1.02
Reservoir water saturation, percent	38.

Primary recovery, estimated, percent	None.
Present oil saturation, percent	58.5
Average porosity, percent	19.2
Oil saturation after flooding, percent	28.8
Performance factor, percent	55.
Net floodable pay sand, feet	6.6

This core shows a slightly laminated and slightly shaly pay sand section with a fair effective permeability to water in the upper portion.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Langdon & Finch **Lease** Lester Kalb **Well No.** 6

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	830.6	20.6	33	53	86	527	12.	0.6	0.6	316	7.20
2	831.6	20.8	38	47	85	613	88.	1.0	1.6	613	88.00
3	832.6	20.1	35	48	83	546	38.	1.0	2.6	546	38.00
4	833.6	22.4	43	47	90	748	62.	1.0	3.6	748	62.00
5	834.6	22.0	36	41	77	614	50.	1.0	4.6	614	50.00
6	835.6	22.1	39	41	80	669	86.	1.0	5.6	669	86.00
7	836.6	21.1	47	50	97	770	67.	1.0	6.6	770	67.00
8	837.6	20.5	37	55	92	588	-	0.9	7.5	529	-
9	838.6	14.7	20	77	97	228	2.2	1.0	8.5	228	2.20
10	840.6	13.6	17	73	90	179	84.	1.0	9.5	179	84.00
11	841.6	14.5	17	81	98	191	-	1.0	10.5	191	-
								Total	-------	5,403	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Langdon & Finch Lease L. Kalb Well No. 6

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
830.5 - 847.1	6.6	60.3	398.20
838.0 - 841.0	2.0	43.1	86.20
830.5 - 841.0	8.6	56.3	484.40

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
830.5 - 837.1	6.6	21.3	39.0	46.3	648	4,276
837.1 - 842.0	3.9	15.7	22.4	72.0	289	1,127
830.5 - 842.0	10.5	19.2	32.8	55.8	514	5,403

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Langdon & Finch Lease L. Kalb Well No. 6

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	830.6	20.7	33	530	3	48	30	62	482	8	0.481	40
2	831.6	20.7	38	610	13	208	25	70	402	35	0.958	30
3	832.6	20.2	35	549	10	157	25	71	392	93	2.80	20
4	833.6	22.5	43	750	13	227	30	64	523	32	0.800	30
5	834.6	22.1	36	617	6	103	30	67	514	142	5.34	30
6	835.6	22.2	39	672	7	122	32	62	550	30	1.52	30
7	836.6	21.2	47	774	17	280	30	60	494	20	0.622	40
8	837.6	20.5	37	588	-	-	-	-	-	-	-	-
9	838.6	14.8	20	230	0	0	20	71	230	0	Imp.	50+
10	840.6	13.7	17	181	0	0	17	76	181	-	Imp.	50+
11	841.6	14.5	17	191	-	-	-	-	-	-	-	-

Notes: cc—cubic centimeter.

*—Volume of water recovered at the time of maximum oil recovery.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Langdon & Finch Lease L. Kalb Well No. 6

Depth Interval, Feet	830.5 - 837.1
Feet of Core Analyzed	6.6
Average Percent Porosity	21.4
Average Percent Original Oil Saturation	39.1
Average Percent Oil Recovery	10.3
Average Percent Residual Oil Saturation	28.8
Average Percent Residual Water Saturation	65.5
Average Percent Total Residual Fluid Saturation	94.3
Average Original Oil Content, Bbls./A. Ft.	648.
Average Oil Recovery, Bbls./A. Ft.	171.
Average Residual Oil Content, Bbls./A. Ft.	477.
Total Original Oil Content, Bbls./Acre	4,260.
Total Oil Recovery, Bbls./Acre	1,126.
Total Residual Oil Content, Bbls./Acre	3,134.
Average Effective Permeability, Millidarcys	1.87
Average Initial Fluid Production Pressure, p.s.i.	31.0

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