OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

March 11, 1966

Ray Linnen Oil Production Company
3382 Riverdale Road
Wichita, Kansas

Gentlemen:

Enclosed herewith is a report of the analysis of the Rotary core taken from the Davis "B" Lease, Well No. 6, Chautauqua County, Kansas, and submitted to our laboratory on March 8, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

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GENERAL INFORMATION & SUMMARY

Company Ray Linnen Oil Production, Inc. Lease Davis "B" Well No. 6

Location NW NW SW

Section 18 Twp. 34S Rge. 13E County Chautauqua State Kansas

Name of Sand	Wiser
Top of Core	1118.0
Bottom of Core	1147.0
Top of Sand (Analyzed)	1118.0
Bottom of Sand	1139.0
Total Feet of Permeable Sand	18.6
Total Feet of Floodable Sand	7.6

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 1	2.0	2.0
1 - 5	5.0	7.0
5 - 10	2.0	9.0
10 - 20	3.0	12.0
20 - 40	6.6	18.6

Average Permeability Millidarcys	13.8
Average Percent Porosity	15.8
Average Percent Oil Saturation	21.4
Average Percent Water Saturation	51.2
Average Oil Content, Bbls./A. Ft.	268.
Total Oil Content, Bbls./Acre	5640.
Average Percent Oil Recovery by Laboratory Flooding Tests	4.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	64.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	484.
Total Calculated Oil Recovery, Bbls./Acre (Secondary)	2290.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Fresh 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 non-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
1118.0 - 1133.0	Brown, slightly shaly sandstone.
1133.0 - 1136.6	Brown and gray, laminated, shaly sandstone.
1136.6 - 1139.0	Gray shaly sandstone.
1139.0 - 1147.0	Sandy shale.

Coring was started at a depth of 1118.0 feet in sandstone and completed at 1147.0 feet in shale. For the most part, the pay is made up of brown, slightly shaly 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 21.4 and 3.8 millidarcys respectively; the overall average being 13.8 (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 impermeable to a maximum of 40. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 21.4. The weighted average percent oil saturation of the upper and lower sections is 25.4 and 17.6 respectively. The

weighted average percent water saturation of the upper and lower sections is 41.7 and 61.0 respectively; the overall average being 51.2 (See Table III). This gives an overall weighted average total fluid saturation of 72.6 percent. This low total fluid saturation indicates considerable fluid was lost during coring most of which was probably oil.

The weighted average oil content of the upper and lower sections is 330 and 206 barrels per acre foot respectively; the overall average being 268. The total oil content, as shown by this core, is 5,640 barrels per acre of which 2,677 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 484 barrels of oil per acre was obtained from 7.6 feet of sand. The weighted average percent oil saturation was reduced from 27.3 to 22.4, or represents an average recovery of 4.9 percent. The weighted average effective permeability of the samples is 1.19 millidarcys, while the average initial fluid production pressure is 30.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 21 samples tested, 13 produced water and 8 oil. This indicates that approximately 38 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 an efficient

water-flood in the vicinity of this well should recover approximately 2,290 barrels of oil per acre or an average of 216 barrels per acre foot from the 10.6 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.08
Present formation volume factor	1.04
Reservoir water saturation, percent	30.0
Primary recovery, estimated, percent	10.0
Present oil saturation, percent	57.4
Average porosity, percent	16.6
Oil saturation after flooding, percent	22.4
Performance factor, percent	50.0
Net floodable pay sand, feet	10.6

This core shows a pay sand section (1118.0 - 1128.6) having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Ray Linnen Oil Production, Inc. Lease Davis "B" 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	1118.1	14.8	24	43	67	276	22.	0.6	0.6	166	13.20
2	1119.1	15.8	20	35	55	245	40.	1.0	1.6	245	40.00
3	1120.1	16.9	26	36	62	341	27.	1.0	2.6	341	27.00
4	1121.1	16.1	27	44	71	337	10.	1.0	3.6	337	10.00
5	1122.1	15.4	22	52	74	263	15.	1.0	4.6	263	15.00
6	1123.1	17.2	21	43	64	280	35.	1.0	5.6	280	35.00
7	1124.1	17.3	29	41	70	389	15.	1.0	6.6	389	15.00
8	1125.1	18.2	29	36	65	410	26.	1.0	7.6	410	26.00
9	1126.1	17.6	30	41	71	410	2.2	1.0	8.6	410	2.20
10	1127.1	15.9	30	44	74	370	22.	1.0	9.6	370	22.00
11	1128.1	18.3	20	44	64	284	21.	1.0	10.6	284	21.00
12	1129.1	15.5	20	53	73	241	1.1	1.0	11.6	241	1.10
13	1130.1	14.5	18	56	74	203	14.	1.0	12.6	203	14.00
14	1131.1	15.1	20	55	75	234	5.6	1.0	13.6	234	5.60
15	1132.1	15.1	19	53	72	223	3.6	1.4	15.0	312	5.04
16	1133.1	12.4	11	69	80	106	2.8	0.6	15.6	64	1.68
17	1134.1	16.0	25	56	81	310	1.5	1.0	16.6	310	1.50
18	1135.1	15.7	20	59	79	244	0.64	1.0	17.6	244	0.64
19	1136.1	15.1	20	57	77	234	Imp.	1.0	18.6	234	0.00
20	1137.1	14.3	10	74	84	111	0.47	1.0	19.6	111	0.47
21	1138.1	14.7	12	78	90	137	Imp.	1.4	21.0	192	0.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Ray Linnen Oil Production Inc. Lease Davis "B" Well No. 6

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
1118.0 - 1128.6	10.6	21.4	226.40
1128.6 - 1139.0	8.0	3.8	30.03
1118.0 - 1139.0	18.6	13.8	256.43

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
1118.0 - 1128.6	10.6	16.7	25.4	41.7	330	3495
1128.6 - 1139.0	10.4	14.9	17.6	61.0	206	2145
1118.0 - 1139.0	21.0	15.8	21.4	51.2	268	5640

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Ray Linnen Oil Production, Inc. Lease Davis "B" 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	1118.1	15.3	24	284	2	24	22	60	260	15	0.400	40
2	1119.1	16.2	20	251	0	0	20	63	251	50	1.00	30
3	1120.1	16.6	26	334	5	64	21	62	270	85	1.70	20
4	1121.1	16.2	27	339	4	50	23	59	289	24	0.625	30
5	1122.1	16.0	22	273	1	12	21	75	261	111	2.90	20
6	1123.1	16.9	22	288	0	0	22	69	288	45	0.900	30
7	1124.1	17.0	29	383	3	40	26	61	343	47	1.20	30
8	1125.1	18.6	29	418	7	101	22	59	317	67	1.30	20
9	1126.1	17.1	30	398	8	106	22	64	292	27	0.750	30
10	1127.1	15.6	30	362	8	97	22	65	265	10	0.300	50
11	1128.1	18.0	20	279	0	0	20	64	279	39	1.00	30
12	1129.1	15.3	21	249	0	0	21	55	249	0	Imp.	-
13	1130.1	15.0	18	209	0	0	18	70	209	16	0.500	40
14	1131.1	15.0	20	232	0	0	20	56	232	0	Imp.	-
15	1132.1	15.4	20	238	0	0	20	61	238	6	0.300	50
16	1133.1	12.2	12	113	0	0	12	70	113	0	Imp.	-
17	1134.1	15.6	24	290	0	0	24	58	290	0	Imp.	-
18	1135.1	15.6	20	242	0	0	20	60	242	0	Imp.	-
19	1136.1	15.4	19	226	0	0	19	59	226	0	Imp.	-
20	1137.1	14.4	10	112	0	0	10	73	112	0	Imp.	-
21	1138.1	14.8	11	126	0	0	11	80	126	0	Imp.	-

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 Ray Linnen Oil Production Inc. Lease Davis "B" Well No. 6

Depth Interval, Feet	1118.0 - 1128.6
Feet of Core Analyzed	7.6
Average Percent Porosity	16.6
Average Percent Original Oil Saturation	27.3
Average Percent Oil Recovery	4.9
Average Percent Residual Oil Saturation	22.4
Average Percent Residual Water Saturation	63.3
Average Percent Total Residual Fluid Saturation	85.7
Average Original Oil Content, Bbls./A. Ft.	352.
Average Oil Recovery, Bbls./A. Ft.	64.
Average Residual Oil Content, Bbls./A. Ft.	288.
Total Original Oil Content, Bbls./Acre	2677.
Total Oil Recovery, Bbls./Acre	484.
Total Residual Oil Content, Bbls./Acre	2193.
Average Effective Permeability, Millidarcys	1.19
Average Initial Fluid Production Pressure, p.s.i.	30.0

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