OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

November 28, 1966

R. L. Orr
930 West First
El Dorado, Kansas

Dear Sir:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Krusky Lease, Well No. W-1, Chautauqua County, Kansas, and submitted to our laboratory on November 22, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

BRP:rf

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GENERAL INFORMATION & SUMMARY

Company R. L. Orr Lease Krusky Well No. W-1

Location SW Corner NE¼

Section 18 Twp. 32S Rge. 13E County Chautauqua State Kansas

Name of Sand	Wiser
Top of Core	1053.0
Bottom of Core	1074.0
Top of Sand (Analyzed)	1053.0
Bottom of Sand	1066.3
Total Feet of Permeable Sand	13.3
Total Feet of Floodable Sand	6.7

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 3	3.7	3.7
12 - 20	5.6	9.3
20 - 44	4.0	13.3

Average Permeability Millidarcys	17.0
Average Percent Porosity	16.7
Average Percent Oil Saturation	23.2
Average Percent Water Saturation	58.1
Average Oil Content, Bbls./A. Ft.	298.
Total Oil Content, Bbls./Acre	3,979.
Average Percent Oil Recovery by Laboratory Flooding Tests	4.5
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	60.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	399.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	1,510.
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
1053.0 - 1056.6	Gray and brown, laminated, shaly sandstone.
1056.6 - 1063.3	Brown, slightly shaly sandstone.
1063.3 - 1066.3	Grayish light brown, laminated, shaly sandstone.
1066.3 - 1074.0	Gray sandy shale.

Coring was started at a depth of 1053.0 feet in shaly sandstone and completed at 1074.0 feet in sandy shale. This core shows a total of 13.3 feet of sandstone. 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 three sections. The weighted average permeability of the upper, middle and lower sections is 6.9, 27.1 and 6.6 millidarcys respectively; the overall average being 17.0 (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 0.60 to a maximum of 44. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent

oil saturation, namely, 23.2. The weighted average percent oil saturation of the upper, middle and lower sections is 27.6, 28.4 and 6.8 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 49.9, 49.4 and 87.1 respectively; the overall average being 58.1 (See Table III). This gives an overall weighted average total fluid saturation of 81.3 percent.

The weighted average oil content of the upper, middle and lower sections is 336, 374 and 87 barrels per acre foot respectively; the overall average being 298. The total oil content, as shown by this core, is 3,979 barrels per acre of which 2,542 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 399 barrels of oil per acre was obtained from 6.7 feet of sand. The weighted average percent oil saturation was reduced from 28.5 to 24.0, or represents an average recovery of 4.5 percent. The weighted average effective permeability of the samples is 1.26 millidarcys, while the average initial fluid production pressure is 21.4 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 14 samples tested, 11 produced water and 7 oil. This indicates that approximately 50 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a rather 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 1,510 barrels of oil per acre or an average of 225 barrels per acre foot from the 6.7 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.07
Reservoir water saturation, percent	40.0
Average porosity, percent	17.3
Oil saturation after flooding, percent	24.0
Performance factor, percent	50.0
Net floodable pay sand, feet	6.7

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

Any oil already recovered from the area represented by this core should be subtracted from the above calculated recovery values.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company R. L. Orr Lease Krusky Well No. W-1

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	1053.1	16.4	24	51	75	305	12.	0.6	0.6	183	7.20
2	1054.1	14.5	32	43	75	360	2.2	1.0	1.6	360	2.20
3	1055.1	16.6	30	52	82	387	1.3	1.0	2.6	387	1.30
4	1056.1	15.7	23	54	77	280	14.	1.0	3.6	280	14.00
5	1057.1	15.5	28	61	89	337	18.	1.0	4.6	337	18.00
6	1058.1	17.0	25	49	74	330	44.	1.0	5.6	330	44.00
7	1059.1	17.7	25	47	72	343	27.	1.0	6.6	343	27.00
8	1060.1	18.1	24	48	72	337	37.	1.0	7.6	337	37.00
9	1061.1	18.5	30	45	75	384	12.	1.0	8.6	384	12.00
10	1062.1	17.2	30	46	76	400	31.	1.0	9.6	400	31.00
11	1063.1	17.4	40	50	90	540	18.	0.7	10.3	378	12.60
12	1064.1	16.9	4	88	92	52	13.	1.3	11.6	68	16.90
13	1065.1	17.0	11	85	96	145	2.6	1.0	12.6	145	2.60
14	1066.1	14.3	6	89	95	67	0.60	0.7	13.3	47	0.42
								Total		3,979	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company R. L. Orr Lease Krusky Well No. W-1

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
1053.0 - 1056.6	3.6	6.9	24.70
1056.6 - 1063.3	6.7	27.1	181.60
1063.3 - 1066.3	3.0	6.6	19.92
1053.0 - 1066.3	13.3	17.0	226.22

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
1053.0 - 1056.6	3.6	15.7	27.6	49.9	336	1,210
1056.6 - 1063.3	6.7	17.4	28.4	49.4	374	2,509
1063.3 - 1066.3	3.0	16.3	6.8	87.1	87	260
1053.0 - 1066.3	13.3	16.7	23.2	58.1	298	3,979

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company R. L. Orr Lease Krusky Well No. W-1

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	1053.1	16.6	25	322	0	0	25	65	322	3	0.200	50
2	1054.1	14.4	33	368	0	0	33	45	368	0	Imp.	-
3	1055.1	16.3	30	379	0	0	30	54	379	0	Imp.	-
4	1056.1	15.5	23	276	0	0	23	63	276	12	0.300	40
5	1057.1	15.5	28	336	3	36	25	68	300	9	0.300	50
6	1058.1	17.1	25	332	2	26	23	66	306	50	0.900	30
7	1059.1	18.1	25	351	2	28	23	67	323	118	2.20	10
8	1060.1	17.9	24	333	2	28	22	58	305	93	2.00	10
9	1061.1	18.0	30	419	6	84	24	64	335	39	0.700	20
10	1062.1	17.3	30	402	5	67	25	67	335	103	1.90	10
11	1063.1	17.0	40	527	14	185	26	66	342	25	0.625	20
12	1064.1	16.7	3	39	0	0	3	96	39	47	0.900	20
13	1065.1	17.5	11	149	0	0	11	87	149	71	1.20	20
14	1066.1	13.9	5	54	0	0	5	92	54	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 R. L. Orr Lease Krusky Well No. W-1

Depth Interval, Feet	1056.6 - 1063.3
Feet of Core Analyzed	6.7
Average Percent Porosity	17.3
Average Percent Original Oil Saturation	28.5
Average Percent Oil Recovery	4.5
Average Percent Residual Oil Saturation	24.0
Average Percent Residual Water Saturation	65.1
Average Percent Total Residual Fluid Saturation	89.1
Average Original Oil Content, Bbls./A. Ft.	380.
Average Oil Recovery, Bbls./A. Ft.	60.
Average Residual Oil Content, Bbls./A. Ft.	320.
Total Original Oil Content, Bbls./Acre	2,542.
Total Oil Recovery, Bbls./Acre	399.
Total Residual Oil Content, Bbls./Acre	2,143.
Average Effective Permeability, Millidarcys	1.26
Average Initial Fluid Production Pressure, p.s.i.	21.4

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