



OILFIELD RESEARCH LABORATORIES

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

October 24, 1966

Goering & Hedrick
P.O. Box 366
Newton, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Wingrave Lease, Well No. 11, Greenwood County, Kansas, and submitted to our laboratory on October 17, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:rf

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GENERAL INFORMATION & SUMMARY

Company Goering & Hedrick Lease Wingrave Well No. 11

Location SE $\frac{1}{4}$

Section 16 Twp. 28S Rge. 11E County Greenwood State Kansas

Name of: Lime - - - - - Kansas City

Top of Core - - - - - 1118.0

Bottom of Core - - - - - 1146.5

Top of Formation (Cored) - - - - - 1118.0

Bottom of Formation (Cored) - - - - - 1146.5

Total Feet of Permeable Lime - - - - - 4.1

Total Feet of Floodable Lime - - - - - -

Distribution of Permeable Lime Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 4	1.7	1.7
4 & above	2.4	4.1

Average Permeability Millidarcys - - - - - 4.2

Average Percent Porosity - - - - - 9.8

Average Percent Oil Saturation - - - - - 38.8

Average Percent Water Saturation - - - - - 50.4

Average Oil Content, Bbls./A. Ft. - - - - - 273.

Total Oil Content, Bbls./Acre - - - - - 3,579.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 5.0

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 57.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 40.

Total Calculated Oil Recovery, Bbls./Acre - - - - - -

Packer Setting, Feet - - - - - -

Viscosity, Centipoises @ - - - - - -

A. P. I. Gravity, degrees @ 60 - - - - - -

Elevation, Feet - - - - - -

A fresh water mud was used as a circulating fluid in the coring of the Kansas City lime formation in this well. The core was sampled by an employee of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
1118.0 - 1118.7	- Gray and light brown, shaly sandstone.
1118.7 - 1119.0	- Gray sandy shale.
1119.0 - 1119.4	- Dark calcareous shale.
1119.4 - 1122.0	- Gray and light brown dolomite.
1122.0 - 1122.6	- Dark shale.
1122.6 - 1125.0	- Gray fractured limestone.
1125.0 - 1132.5	- Gray limestone (discarded at well).
1132.5 - 1137.0	- Shale.
1137.0 - 1138.7	- Gray fractured limestone.
1138.7 - 1139.4	- Brown and gray dolomite.
1139.4 - 1141.5	- Brownish gray fractured limestone.
1141.5 - 1146.1	- Grayish brown limestone.
1146.1 - 1146.5	- Brown limestone.

Coring was started at a depth of 1118.0 feet in gray and light brown, shaly sandstone and completed at 1146.5 feet in brown dolomite. For the most part, the pay is made up of dolomite and fractured limestone. A total of 13.9 feet of the cored section was analyzed.

PERMEABILITY

For the sake of distribution, the core was divided into two

sections. The weighted average permeability of the upper and lower sections is 4.2 millidarcys (See Table III). By observing the data given on the coregraph, it is noticeable that most of the cored section is impermeable. The permeability of the sand varies from impermeable to a maximum of 10. millidarcys.

PERCENT SATURATION & OIL CONTENT

The lime in this core shows a fair weighted average percent oil saturation, namely, 38.8. The weighted average percent oil saturation of the upper and lower sections is 34.9 and 40.7 respectively. The weighted average percent water saturation of the upper and lower sections is 51.6 and 49.9 respectively; the overall average being 50.4 (See Table III). This gives an overall weighted average total fluid saturation of 89.2 percent.

The weighted average oil content of the upper and lower sections is 261 and 279 barrels per acre foot respectively; the overall average being 273. The total oil content, as shown by this core, is 3,579 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The formation in this core did not respond very well to laboratory flooding tests, as a total recovery of only 40 barrels of oil per acre was obtained from 0.7 feet of lime. The weighted average percent oil saturation was reduced from 34.0 to 29.0, or represents an average recovery of 4.0 percent.

By observing the data given in Table IV, you will note that of the 14 samples tested, 2 produced water and 1 oil. This indicates that approximately 7 percent of the lime represented by these samples is floodable.

CONCLUSION

On the basis of the enclosed data, it is apparent that the pay formation should be acidized in order to increase the permeability so the oil can flow more freely into the well-bore. If at some future date, you decide to waterflood this reservoir, it would also be advisable to acidize the pay in the input wells so more of the section would take water, thereby increasing the performance of the water drive.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Goering & Hedrick

Lease Wingrave

Well No. 11

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbbls. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	1118.1	16.6	29	68	97	373	Imp.	0.7	0.7	261	0.00
2	1119.5	13.7	43	29	72	456	Imp.	0.6	1.3	274	0.00
3	1120.5	6.6	20	52	72	102	Imp.	1.0	2.3	102	0.00
4	1121.5	10.0	28	68	96	217	4.2	1.0	3.3	217	4.20
5	1123.1	6.2	56	37	93	269	Imp.	1.0	4.3	269	0.00
6	1138.1	6.9	44	47	91	236	Imp.	1.0	5.3	236	0.00
7	1139.1	14.0	34	63	97	369	2.3	0.7	6.0	258	1.61
8	1140.1	11.8	34	63	97	311	Imp.	1.2	7.2	373	0.00
9	1141.1	4.9	43	47	90	163	Imp.	0.9	8.1	147	0.00
10	1142.1	1.3	63	28	91	64	Imp.	1.1	9.2	70	0.00
11	1143.1	9.2	32	64	96	228	Imp.	1.0	10.2	228	0.00
12	1144.1	14.1	12	86	98	131	6.3	1.0	11.2	131	6.30
13	1145.1	12.6	60	38	98	586	1.1	1.0	12.2	586	1.10
F-14	1146.0	13.8	30	-	-	321	-	0.5	12.7	160	-
14	1146.2	15.4	56	28	84	669	10.	0.4	13.1	267	4.00
								Total		3,579	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease		Well No.
Goering & Hedrick	Wingrave		11
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
1118.0 - 1123.6	1.0	4.2	4.20
1137.7 - 1146.5	3.1	4.2	13.01
1118.0 - 1146.5	4.1	4.2	17.21

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 Bbbl./Acre
1118.0 - 1123.6	4.3	9.9	34.9	51.6	261	1,123
1137.7 - 1146.5	8.8	9.8	40.7	49.9	279	2,456
1118.0 - 1146.5	13.1	9.8	38.8	52.5	273	3,579

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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				Bbls./A. Ft.
1	1118.1	16.2	27	339	0	0	27	71	339	Imp.	-	
2	1119.5	16.3	26	329	0	0	26	57	329	Imp.	-	
3	1120.5	7.0	17	92	0	0	17	58	92	Imp.	-	
4	1121.5	12.6	21	205	0	0	21	63	205	0.20	50	
5	1123.1	6.6	50	256	0	0	50	45	256	Imp.	-	
6	1138.1	6.5	40	202	0	0	40	54	202	Imp.	-	
7	1139.1	14.8	34	390	5	57	29	67	333	0.007	50	
8	1140.1	15.0	40	466	0	0	40	60	466	0.10	50	
9	1141.1	6.2	36	173	0	0	36	57	173	Imp.	-	
10	1142.1	2.7	60	126	0	0	60	33	126	Imp.	-	
11	1143.1	8.4	35	228	0	0	35	63	228	Imp.	-	
12	1144.1	13.5	15	157	0	0	15	83	157	Imp.	-	
13	1145.1	13.4	33	343	0	0	33	66	343	Imp.	-	
14	1146.0	13.8	30	321	0	0	30	55	321	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.