

OILFIELD RESEARCH LABORATORIES

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

October 11, 1967

Jackson Brothers
514 North Main
Eureka, Kansas 67045

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the G.K. Jackson Heirs Lease, Well No. 19, Greenwood County, Kansas, and submitted to our laboratory on October 1, 1967.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
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BRP:bjo

6 c. - Eureka, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Jackson Brothers Lease G.K. Jackson Heirs Well No. 19

Location 330' SNL & 330' WEL, NE, NE, NW

Section 23 Twp. 25S Rge. 8E County Greenwood State Kansas

Name of Sand - - - - - Bartlesville

Top of Core - - - - - 2352.0

Bottom of Core - - - - - 2384.0

Top of Sand - - - - - 2363.6

Bottom of Sand - - - - - 2379.8

Total Feet of Permeable Sand - - - - - 13.9

Total Feet of Floodable Sand - - - - - 7.9

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 1	2.0	2.0
1 - 5	7.8	9.8
5 - 10	1.1	10.9
25 - 43	3.0	13.9

Average Permeability Millidarcys - - - - - 8.7

Average Percent Porosity - - - - - 17.7

Average Percent Oil Saturation - - - - - 26.5

Average Percent Water Saturation - - - - - 60.4

Average Oil Content, Bbls./A. Ft. - - - - - 363.

Total Oil Content, Bbls./Acre - - - - - 5,885

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 6.0

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 83.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 659.

Total Calculated Oil Recovery, Bbls./Acre - (Primary & Secondary - 1,960.

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:

<u>Depth Interval, Feet</u>	<u>Description</u>
2352.0 - 2363.6	Gray sandy shale.
2363.6 - 2368.7	Grayish light brown shaly sandstone.
2368.7 - 2374.0	Light brown shaly sandstone.
2374.0 - 2374.4	Gray shaly sandstone.
2374.4 - 2376.8	Light brown shaly sandstone.
2376.8 - 2379.8	Light brown sandstone.
2379.8 - 2384.0	Shale.

Coring was started at a depth of 2352.0 feet in sandy shale and completed at 2384.0 feet in shale. This core shows a total of 16.2 feet of sandstone. For the most part, the pay is made up of light brown shaly sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper and lower sections is 1.3 and 14.4 millidarcys respectively; the overall average being 8.7 (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 43 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 26.5. The weighted average percent oil saturation of the upper and lower sections is 28.0 and 25.2 respectively. The weighted average percent water saturation of the upper and lower sections is 63.0 and 57.9 respectively; the overall average being 60.4 (See Table III). This gives an overall weighted average total fluid saturation of 86.9 percent.

In an effort to determine whether or not any flushing of the sand occurred during coring, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VI and VII. From the data given in these tables and on the coregraph, it is evident that some flushing did occur. The lower portion of the core has the higher permeability and the lower chloride content.

The weighted average oil content of the upper and lower sections is 379 and 348 barrels per acre foot respectively; the overall average being 363. The total oil content, as shown by this core, is 5,885 barrels per acre of which 2,788 barrels are in the pay sand section (See Table III).

LABORATORY FLOODING TESTS

The lower portion of the sand in this core responded to laboratory flooding tests, as a total recovery of 659 barrels of oil per acre was obtained from 7.9 feet of sand. The weighted average percent oil saturation was reduced from 25.2 to 19.2, or represents an average recovery of 6.0 percent. The weighted average effective permeability of the samples is 1.45 millidarcys, while the average initial fluid production pressure is 31.4 pounds per square inch (See Table V).

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By observing the data given in Table IV, you will note that of the 16 samples tested, 8 produced water and 7 oil. This indicates that approximately 44 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 1,960 barrels of oil per acre or an average of 248 barrels per acre foot from the 7.9 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.22
Reservoir water saturation, percent	38.0
Average porosity, percent	18.2
Oil saturation after flooding, percent	19.2
Performance factor, percent	50.0
Net floodable pay sand, feet	7.9

This core shows a pay sand section (2371.5 - 2379.8) having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water. Any primary oil already recovered from the area represented by this core should be subtracted from the above recovery values.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Jackson Brothers Lease G. K. Jackson Heirs Well No. 19

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	2364.1	16.8	26	72	98	339	Imp.	0.9	0.9	305	0.00
2	2365.1	18.1	27	68	95	379	0.47	1.0	1.9	379	0.47
3	2366.1	18.8	20	65	85	292	1.3	1.0	2.9	292	1.30
4	2367.1	15.7	25	70	95	305	Imp.	1.0	3.9	305	0.00
5	2368.1	18.1	25	60	85	351	2.0	1.2	5.1	421	2.40
6	2369.1	17.7	33	59	92	453	1.9	0.8	5.9	362	1.52
7	2370.1	16.7	30	59	89	389	0.48	1.0	6.9	389	0.48
8	2371.1	17.9	39	52	91	542	1.5	1.0	7.9	542	1.50
9	2372.1	16.2	20	66	86	251	1.8	1.0	8.9	251	1.80
10	2373.1	16.8	27	60	87	352	1.8	1.5	10.4	528	2.70
11	2374.1	12.7	27	64	91	266	Imp.	0.4	10.8	106	0.00
12	2375.1	19.1	25	57	82	370	8.3	1.1	11.9	407	9.13
13	2376.1	16.3	29	64	93	367	3.1	1.3	13.2	476	4.03
14	2377.1	18.3	25	59	84	355	29.	0.7	13.9	248	20.30
15	2378.1	19.3	25	46	71	374	43.	1.0	14.9	374	43.00
16	2379.1	21.6	23	50	73	385	25.	1.3	16.2	500	32.50

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Jackson Brothers Lease G. K. Jackson Heirs Well No. 19

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
2363.6 - 2371.5	6.0	1.3	7.67
2371.5 - 2379.8	7.9	14.4	113.46
2363.6 - 2379.8	13.9	8.7	121.13

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
2363.6 - 2371.5	7.9	17.5	28.0	63.0	379	2,995
2371.5 - 2379.8	8.3	17.9	25.2	57.9	348	2,890
2363.6 - 2379.8	16.2	17.7	26.5	60.4	363	5,885

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Jackson Brothers Lease G. K. Jackson Heirs Well No. 19

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	2364.1	16.6	25	322	0	0	25	74	322	0	Imp.	-
2	2365.1	17.8	27	373	0	0	27	69	373	0	Imp.	-
3	2366.1	18.8	20	291	0	0	20	65	291	0	Imp.	-
4	2367.1	15.9	24	296	0	0	24	73	296	0	Imp.	-
5	2368.1	18.5	25	358	0	0	25	72	358	4	0.100	50
6	2369.1	17.5	34	461	0	0	34	60	461	0	Imp.	-
7	2370.1	16.7	30	388	0	0	30	62	388	0	Imp.	-
8	2371.1	17.6	38	519	0	0	38	52	519	0	Imp.	-
9	2372.1	16.4	20	254	4	51	16	82	203	23	0.600	30
10	2373.1	17.1	27	358	7	93	20	76	265	4	0.100	50
11	2374.1	13.0	26	262	0	0	26	66	262	0	Imp.	0
12	2375.1	18.6	25	360	2	29	23	76	331	24	0.700	30
13	2376.1	16.8	29	378	10	130	19	77	248	12	0.400	40
14	2377.1	18.5	25	358	5	72	20	79	286	19	0.500	30
15	2378.1	19.0	25	368	6	88	19	74	280	146	3.90	20
16	2379.1	21.2	23	378	6	99	17	80	279	153	4.00	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	Jackson Brothers	Lease	G. K. Jackson Heirs	Well No.	19
Depth Interval, Feet	2371.5 - 2379.8				
Feet of Core Analyzed	7.9				
Average Percent Porosity	18.2				
Average Percent Original Oil Saturation	25.2				
Average Percent Oil Recovery	6.0				
Average Percent Residual Oil Saturation	19.2				
Average Percent Residual Water Saturation	77.6				
Average Percent Total Residual Fluid Saturation	96.8				
Average Original Oil Content, Bbls./A. Ft.	353.				
Average Oil Recovery, Bbls./A. Ft.	83.				
Average Residual Oil Content, Bbls./A. Ft.	270.				
Total Original Oil Content, Bbls./Acre	2,788.				
Total Oil Recovery, Bbls./Acre	659.				
Total Residual Oil Content, Bbls./Acre	2,129.				
Average Effective Permeability, Millidarcys	1.45				
Average Initial Fluid Production Pressure, p.s.i.	31.4				

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

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RESULTS OF WATER DIFFERENTIATION TESTS

TABLE VI

Company Jackson Brothers Lease G.K. Jackson Heirs Well No. 19

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation Connate Drilling & Foreign	Total
1	2364.1	92,150		
2	2365.1	95,550		
3	2366.1	88,500		
4	2367.1	111,150		
5	2368.1	88,600		
6	2369.1	100,600		
7	2370.1	100,000		
8	2371.1	92,000		
9	2372.1	93,800		
10	2373.1	101,200		
11	2374.1	92,000		
12	2375.1	98,200		
13	2376.1	64,600		
14	2377.1	89,650		
15	2378.1	17,240		
16	2379.1	24,050		

Note: ppm — parts per million

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SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VII

Company Jackson Brothers Lease G.K. Jackson Heirs Well No. 19

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
2363.6 - 2368.7	95,900		
2368.7 - 2379.8	70,500		
2363.6 - 2379.8	82,900		

Note: ppm — parts per million.

BAKER OIL TOOLS, INC.

SERVING THE WORLD

DATE 9-30-67 WELL NO. 19 LEASE Jackson Heirs FIELD _____

2352

GRAY
SHALE

2363

SAND

2365

SAND+SHALE

2366.40

SAND

2376

SHALE

2384

CORE #1 2352-2384'

2352-2363' GRAY SHALE

2363'-2365' SAND bleeding oil

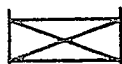
2365-2366.40 SDY SHALE GRAY w/ SAND
Laminations not bleeding oil

2366.40-2376 SAND bleeding oil

2376'-2378.80 SAND (not bleeding much
oil but good color.

2378.80-2384 SHALE

Give to Geo. Jackson.



BRIDGE PLUG



PACKER



CENTRALIZER



SCRATCHER



BASKET



PERFORATION