



OILFIELD RESEARCH LABORATORIES

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

January 7, 1966

Jackson Brothers
514 North Main
Eureka, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Barrier Lease, Well No. 34, Greenwood County, Kansas, and submitted to our laboratory on December 30, 1965.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
Benjamin R. Pearman

BRP:rf

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Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company	Jackson Bros.	Lease	Barrier	Well No.	34
Location	SW NW SW				
Section	3	Twp.	26S	Rge.	8E
	County		Greenwood		State
	Kansas				
Name of Sand	- - - - -			U. B'ville	M. B'ville
Top of Core	- - - - -			2420.0	2486.0
Bottom of Core	- - - - -			2468.0	2503.0
Top of Sand	- - - - -			2424.5	2486.5
Bottom of Sand	- - - - -			2466.0	2500.2
Total Feet of Permeable Sand	- - - - -			41.5	5.0
Total Feet of Floodable Sand	- - - - -			31.5	0.0
Distribution of Permeable Sand:					
	Permeability Range Millidarcys	Feet	Cum. Ft.		
U. B'ville	5 - 20	14.0	14.0		
	20 - 50	13.5	27.5		
	50 - 100	11.0	38.5		
	100 & above	3.0	41.5		
M. B'ville	0 - 4	3.0	3.0		
	4 & above	2.0	5.0		
Average Permeability Millidarcys	- - - - -			45.6	20.9
Average Percent Porosity	- - - - -			19.6	16.7
Average Percent Oil Saturation	- - - - -			23.8	22.4
Average Percent Water Saturation	- - - - -			49.1	67.5
Average Oil Content, Bbls./A. Ft.	- - - - -			362.	290.
Total Oil Content, Bbls./Acre	- - - - -			15,065.	2,120.
Average Percent Oil Recovery by Laboratory Flooding Tests	- - - - -			3.3	0
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	- - - - -			51.	0
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	- - - - -			1,601.	0
Total Calculated Oil Recovery, Bbls./Acre	- (Primary & Secondary)			9,200	0
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. Since the Middle Bartlesville core did not respond very well to flood-pot tests, only the Upper Bartlesville core will be discussed below.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
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UPPER BARTLESVILLE

2420.0 - 2424.5 - Sandy shale.

2424.5 - 2466.0 - Light brown, slightly laminated, slightly shaly sandstone.

2466.0 - 2468.0 - Sandy shale.

MIDDLE BARTLESVILLE

2486.0 - 2486.5 - Sandy shale.

2486.5 - 2489.5 - Gray and light brown, shaly sandstone with a vertical fracture.

2489.5 - 2492.8 - Light brown, slightly shaly sandstone.

2492.8 - 2499.2 - Sandy shale.

2499.2 - 2500.2 - Gray shaly sandstone.

2500.2 - 2503.0 - Shale.

Coring was started at a depth of 2420.0 feet in sandy shale and completed at 2468.0 feet also in sandy shale. This core shows a total of 41.5 feet of sandstone. For the most part, the pay is made up of light brown, slightly laminated, 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 44.4 and 46.8 millidarcys respectively; the overall average being 45.6 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a somewhat irregular permeability profile. The permeability of the sand varies from 5.9 to a maximum of 172. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 23.8. The weighted average percent oil saturation of the upper and lower sections is 24.4 and 23.2 respectively. The weighted average percent water saturation of the upper and lower sections is 48.4 and 49.9 respectively; the overall average being 49.1 (See Table III). This gives an overall weighted average total fluid saturation of 72.9 percent. This low total fluid saturation indicates considerable fluid was lost during coring most of which was probably oil.

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 considerable flushing occurred.

The weighted average oil content of the upper and lower sections is 374 and 352 barrels per acre foot respectively; the overall average being 362. The total oil content, as shown by this core, is 15,065 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,601 barrels of oil per acre was obtained from 31.5 feet of sand. The weighted average percent oil saturation was reduced from 25.1 to 21.8, or represents an average recovery of 3.3 percent. The weighted average effective permeability of the samples is 2.66 millidarcys, while the average initial fluid production pressure is 22.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 41 samples tested, all produced water and 31 oil. This indicates that approximately 76 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 9,200 barrels of oil per acre or an average of 252 barrels per acre foot from the 36.5 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.23
Reservoir water saturation, percent	38.0
Average porosity, percent	19.9
Oil saturation after flooding, percent	21.8
Performance factor, percent	50.0
Net floodable pay sand, feet	36.5

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 vicinity of this well, by primary operations, should be subtracted from the above calculated recovery.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

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.		
						-UPPER BARTLESVILLE-					
1	2425.1	20.6	27	44	71	432	31.	1.0	1.0	432	31.00
2	2426.1	18.0	24	47	71	335	11.	1.0	2.0	335	11.00
3	2427.1	19.6	23	47	70	350	8.0	1.0	3.0	350	8.00
4	2428.1	19.1	27	49	76	400	35.	1.0	4.0	400	35.00
5	2429.1	19.0	27	47	74	398	19.	1.0	5.0	398	19.00
6	2430.1	19.6	19	44	63	289	8.8	1.0	6.0	289	8.80
7	2431.1	18.6	22	52	74	318	20.	1.0	7.0	318	20.00
8	2432.1	20.2	20	49	69	314	14.	1.0	8.0	314	14.00
9	2433.1	18.2	23	51	74	325	32.	1.0	9.0	325	32.00
10	2434.1	21.3	26	46	72	430	81.	1.0	10.0	430	81.00
11	2435.1	19.6	20	52	72	304	65.	1.0	11.0	304	65.00
12	2436.1	18.0	19	51	70	266	90.	1.0	12.0	266	90.00
13	2437.1	21.4	31	43	74	515	39.	1.0	13.0	515	39.00
14	2438.1	17.9	22	54	76	306	18.	1.0	14.0	306	18.00
15	2439.1	18.6	22	55	77	318	7.5	1.0	15.0	318	7.50
16	2440.1	14.3	19	58	77	211	72.	1.0	16.0	211	72.00
17	2441.1	21.0	32	43	75	522	27.	1.0	17.0	522	27.00
18	2442.1	21.9	29	43	72	493	11.	1.0	18.0	493	11.00
19	2443.1	22.5	27	44	71	472	128.	1.0	19.0	472	128.00
20	2444.1	22.9	28	49	77	498	172.	1.0	20.0	498	172.00
21	2445.1	23.8	24	48	72	443	114.	1.0	21.0	443	114.00
22	2446.1	22.8	27	53	80	478	17.	1.0	22.0	478	17.00
23	2447.1	16.6	20	59	79	258	5.9	1.0	23.0	258	5.90

Company Jackson Bros.

Lease

Barrier

Well No. 34

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Jackson Bros. Lease Barrier Well No. 34

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.		
24	2448.1	17.7	29	52	81	399	14.	1.0	24.0	399	14.00
25	2449.1	20.7	20	46	66	321	46.	1.0	25.0	321	46.00
26	2450.1	21.2	25	45	70	411	79.	1.0	26.0	411	79.00
27	2451.1	16.4	19	53	72	242	22.	1.0	27.0	242	22.00
28	2452.1	17.6	19	49	68	259	17.	1.0	28.0	259	17.00
29	2453.1	17.3	22	57	79	295	26.	1.0	29.0	295	26.00
30	2454.1	21.3	24	45	69	397	88.	1.0	30.0	397	88.00
31	2455.1	20.0	23	51	74	357	38.	1.0	31.0	357	38.00
32	2456.1	20.8	25	46	71	403	72.	1.0	32.0	403	72.00
33	2457.1	19.6	25	47	72	380	25.	1.0	33.0	380	25.00
34	2458.1	19.2	21	47	68	312	19.	1.0	34.0	312	19.00
35	2459.1	19.0	21	51	72	309	92.	1.0	35.0	309	92.00
36	2460.1	19.4	28	45	73	421	90.	1.0	36.0	421	90.00
37	2461.1	19.0	30	49	79	442	57.	1.0	37.0	442	57.00
38	2462.1	19.8	25	47	72	384	92.	1.0	38.0	384	92.00
39	2463.1	18.7	21	52	73	304	27.	1.0	39.0	304	27.00
40	2464.1	19.8	20	49	69	307	23.	1.0	40.0	307	23.00
41	2465.1	19.2	20	54	74	298	28.	1.5	41.5	447	42.00
-MIDDLE BARTLESVILLE-											
42	2487.1	18.3	21	65	86	298	28.	1.0	1.0	298	28.00
43	2488.1	16.6	20	78	98	258	0.41	1.0	2.0	258	0.41
44	2489.1	19.0	19	64	83	280	2.0	1.0	3.0	280	2.00
45	2490.1	19.2	25	61	86	372	3.2	1.0	4.0	372	3.20
46	2491.1	18.8	27	54	81	393	71.	1.0	5.0	393	71.00
47	2492.1	14.7	22	74	96	251	Imp.	1.3	6.3	326	0.00
48	2499.7	10.8	23	74	97	193	Imp.	1.0	7.3	193	0.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Jackson Bros.	Lease	Barrier	Well No.	34
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company			Jackson Bros.			Lease			Barrier			Well No.			34		
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									
			-UPPER BARTLESVILLE-														
1	2425.1	20.2	27	423	5	78	22	57	52	1.11	30						
2	2426.1	17.5	24	326	2	27	22	73	19	0.400	30						
3	2427.1	19.4	23	346	2	30	21	65	29	0.600	30						
4	2428.1	19.6	27	410	2	30	25	73	73	1.50	20						
5	2429.1	19.4	27	406	2	30	25	74	136	3.00	20						
6	2430.1	19.1	20	296	0	0	20	77	90	1.90	20						
7	2431.1	19.0	22	324	2	29	20	69	71	1.50	20						
8	2432.1	20.0	20	310	0	0	20	61	49	0.900	30						
9	2433.1	18.0	23	321	2	28	21	62	7	0.300	40						
10	2434.1	21.0	26	423	3	49	23	71	179	4.20	20						
11	2435.1	19.2	22	328	0	0	22	72	8	0.300	40						
12	2436.1	18.5	19	272	0	0	19	69	137	6.70	20						
13	2437.1	21.0	31	504	6	98	25	65	64	1.34	20						
14	2438.1	17.9	22	305	2	28	20	72	34	0.666	30						
15	2439.1	18.2	22	310	2	28	20	63	25	0.600	30						
16	2440.1	14.6	21	237	0	0	21	65	7	0.300	45						
17	2441.1	20.5	32	509	5	80	27	58	58	1.00	20						
18	2442.1	22.4	29	503	6	104	23	74	212	5.70	20						
19	2443.1	22.1	27	462	4	68	23	56	44	1.14	20						
20	2444.1	22.5	28	489	6	105	22	69	257	6.00	10						
21	2445.1	23.5	24	437	2	36	22	73	305	11.69	10						
22	2446.1	22.7	27	475	3	53	24	74	100	2.30	20						
23	2447.1	16.1	20	250	0	0	20	78	29	0.700	30						
24	2448.1	18.1	29	406	3	42	26	61	104	2.10	20						
25	2449.1	21.0	20	326	2	33	18	80	151	3.60	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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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Jackson Bros.			Lease		Barrier		Well No.		34		
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			
26	2450.1	20.8	25	403	2	32	23	73	177	4.30	20
27	2451.1	16.8	19	247	0	0	19	73	16	0.625	30
28	2452.1	18.1	20	280	0	0	20	66	37	0.800	30
29	2453.1	17.5	22	299	0	0	22	71	76	0.995	20
30	2454.1	20.9	24	389	3	49	21	75	141	3.60	20
31	2455.1	19.6	23	349	3	46	20	74	132	3.00	20
32	2456.1	20.4	25	395	3	47	22	76	215	5.60	20
33	2457.1	19.4	25	376	5	75	20	78	55	1.00	20
34	2458.1	19.0	21	309	2	29	19	69	66	1.40	20
35	2459.1	18.5	21	301	2	29	19	67	26	0.600	30
36	2460.1	19.3	28	419	4	60	24	75	263	5.80	20
37	2461.1	19.2	30	446	8	119	22	69	145	3.40	20
38	2462.1	19.3	25	374	2	30	23	69	145	3.30	20
39	2463.1	18.4	21	300	3	43	18	65	49	1.29	20
40	2464.1	19.5	20	302	0	0	20	66	30	0.666	30
41	2465.1	19.0	20	294	3	44	17	72	57	1.03	20
-MIDDLE BARTLESVILLE-											
42	2487.1	18.0	21	293	0	0	21	64	13	0.300	50
43	2488.1	16.1	22	275	0	0	22	77	0	Imp.	-
44	2489.1	18.6	20	288	0	0	20	70	8	0.300	50
45	2490.1	18.9	25	366	0	0	25	69	13	0.300	50
46	2491.1	19.3	28	419	0	0	28	69	26	0.600	40
47	2492.1	15.0	21	244	0	0	21	76	0	Imp.	-
48	2499.7	10.4	23	186	0	0	23	76	0	Imp.	-

Company Jackson Bros.

Lease

Barrier

Well No. 34

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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Jackson Bros.	Lease	Barrier	Well No.	34
Depth Interval, Feet	2424.5 - 2444.5	2444.5 - 2466.0	2424.5 - 2466.0		
Feet of Core Analyzed	15.0	16.5	31.5		
Average Percent Porosity	19.9	19.9	19.9		
Average Percent Original Oil Saturation	26.0	24.1	25.1		
Average Percent Oil Recovery	3.4	3.1	3.3		
Average Percent Residual Oil Saturation	22.6	21.0	21.8		
Average Percent Residual Water Saturation	66.9	71.9	69.5		
Average Percent Total Residual Fluid Saturation	89.5	92.9	91.3		
Average Original Oil Content, Bbls./A. Ft.	404.	373.	388.		
Average Oil Recovery, Bbls./A. Ft.	54.	48.	51.		
Average Residual Oil Content, Bbls./A. Ft.	350.	325.	337.		
Total Original Oil Content, Bbls./Acre	6,061.	6,146.	12,207.		
Total Oil Recovery, Bbls./Acre	812.	789.	1,601.		
Total Residual Oil Content, Bbls./Acre	5,249.	5,357.	10,606.		
Average Effective Permeability, Millidarcys	1.94	3.30	2.66		
Average Initial Fluid Production Pressure, p.s.i.	24.0	20.0	22.0		

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

Oilfield Research Laboratories
RESULTS OF WATER DIFFERENTIATION TESTS

TABLE VI

Company Jackson Bros. Lease Barrier Well No. 34

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Connate Water Saturation Drilling & Foreign	Total
UPPER BARTLESVILLE				
1	2425.1	113,900		
2	2426.1	116,000		
3	2427.1	66,700		
4	2428.1	28,500		
5	2429.1	21,630		
6	2430.1	75,700		
7	2431.1	55,400		
8	2432.1	38,500		
9	2433.1	82,700		
10	2434.1	19,120		
11	2435.1	30,500		
12	2436.1	76,600		
13	2437.1	65,500		
14	2438.1	93,000		
15	2439.1	94,800		
16	2440.1	103,750		
17	2441.1	70,000		
18	2442.1	79,500		
19	2443.1	29,750		
20	2444.1	12,880		
21	2445.1	9,480		
22	2446.1	96,400		
23	2447.1	101,200		
24	2448.1	115,250		
25	2449.1	54,250		
26	2450.1	31,300		
27	2451.1	105,000		
28	2452.1	72,100		
29	2453.1	94,900		
30	2454.1	10,480		
31	2455.1	11,060		
32	2456.1	11,730		
33	2457.1	45,700		
34	2458.1	89,300		
35	2459.1	56,000		
36	2460.1	21,980		
37	2461.1	61,850		
38	2462.1	32,400		
39	2463.1	91,500		

Note: ppm — parts per million

Oilfield Research Laboratories
RESULTS OF WATER DIFFERENTIATION TESTS

TABLE VI

Company Jackson Bros. Lease Barrier Well No. 34

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation	
			Connate	Drilling & Foreign
40	2464.1	106,750		
41	2465.1	111,500		
		<u>MIDDLE BARTLESVILLE</u>		
42	2487.1	32,500		
43	2488.1	96,400		
44	2489.1	78,300		
45	2490.1	104,200		
46	2491.1	98,900		
47	2492.1	94,600		
48	2499.7	103,350		

Note: ppm — parts per million

Oilfield Research Laboratories

SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VII

Company Jackson Bros. Lease Barrier Well No. 34

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
<u>UPPER BARTLESVILLE</u>			
2424.5 - 2444.5	63,700		
2444.5 - 2466.0	64,900		
2424.5 - 2466.0	64,400		
<u>MIDDLE BARTLESVILLE</u>			
2486.5 - 2500.2	87,300		

Note: ppm — parts per million.