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GENERAL INFORMATION & SUMMARY

Company Jackson Brothers Lease Hull Well No. 1

Location NW, SW, SW

Section 35 Twp. 25S Rge. 8E County Greenwood State Kansas

Name of Sand	Bartlesville
Top of Core	2405.0
Bottom of Core	2430.0
Top of Sand	2405.2
Bottom of Sand	2415.4
Total Feet of Permeable Sand	10.2
Total Feet of Floodable Sand	10.2

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	0.8	0.8
10 - 20	3.2	4.0
20 - 30	4.0	8.0
30 & above	2.2	10.2

Average Permeability Millidarcys	20.1
Average Percent Porosity	18.4
Average Percent Oil Saturation	28.4
Average Percent Water Saturation	45.8
Average Oil Content, Bbls./A. Ft.	406.
Total Oil Content, Bbls./Acre	4,143.
Average Percent Oil Recovery by Laboratory Flooding Tests	4.7
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	68.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	554.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	2,459
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

A fresh water mud was used as a circulating fluid in the coring of the sand in this well. This well was drilled in a virgin area. The core was sampled and sealed in tin cans by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
2405.0 - 2405.2	Gray sandy shale.
2405.2 - 2408.8	Light brown fine grained micaceous slightly laminated shaly sandstone.
2408.8 - 2415.4	Light brown fine grained micaceous slightly laminated carbonaceous slightly shaly sandstone.
2415.4 - 2415.7	Coal.
2415.7 - 2416.4	Dark shale.
2416.4 - 2430.0	Gray sandy shale.

Coring was started at a depth of 2405.0 feet in gray sandy shale and completed at 2430.0 feet in same type of material. This core shows a total of 10.2 feet of sandstone. For the most part, the pay is made up of light brown fine grained micaceous and slightly shaly and carbonaceous sandstone.

PERMEABILITY

The weighted average permeability of the cored section is 20.1 millidarcys (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a comparatively uniform permeability. The permeability of the sand varies from 8.9 to a maximum

of 34 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly low weighted average percent oil saturation, namely, 28.4. The weighted average percent water saturation of the cored section is 45.8 (See Table III). This gives an overall weighted average total fluid saturation of 74.2 percent. This fairly low total fluid saturation indicates some fluid was lost during coring 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 very little flushing of the sand, in the core, occurred during the cutting of same. Chances are, most of the oil lost during coring, was due to the expansion of gas carried in solution by the oil.

The weighted average oil content of the cored section is 406 barrels per acre foot; while the total oil content, as shown by this core, is 4,143 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

When taking into consideration that the sand in the core has a fairly low oil saturation, it responded rather will to laboratory flooding tests, as a total recovery of 554 barrels of oil per acre was obtained from 8.2 feet of sand. The weighted av-

erage percent oil saturation was reduced from 29.9 to 25.2, or represents an average recovery of 4.7 percent. The weighted average effective permeability of the samples is 0.66 millidarcys, while the average initial fluid production pressure is 28.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 10 samples tested, all produced water and 8 oil. This indicates that approximately 80 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a fairly uniform effective permeability.

CONCLUSION

On the basis of the above data, we estimate that approximately 2,459 barrels of oil per acre or an average of 241 barrels per acre-foot can be recovered from the area, represented by this core, by efficient primary and waterflood operations. The following data and assumptions were used in calculating the above oil recovery value:

Original formation volume factor	1.22
Irreducible water saturation, percent	35.0
Primary recovery, estimated, percent	None
Present oil saturation, percent	53.3
Average porosity, percent	18.4
Oil saturation after flooding, percent	25.2
Performance factor, percent	60.0
Net floodable pay sand, feet	10.2

This core shows a rather clean sand section having a fairly low oil saturation, a moderate water saturation, and a farily good porosity and permeability.

Because of the coal layer, special care should be exercised in completing this well.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Jackson Brothers Lease Hull Well No. 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	2405.5	20.1	25	41	66	390	34.	0.8	0.8	312	27.20
2	2406.5	19.6	32	41	73	487	20.	1.0	1.8	487	20.00
3	2407.5	18.1	23	45	68	323	10.	1.0	2.8	323	10.00
4	2408.5	17.7	24	49	73	330	8.9	0.8	3.6	264	7.12
5	2409.5	16.9	36	56	92	472	14.	1.2	4.8	566	16.80
6	2410.5	18.9	22	42	64	323	21.	1.0	5.8	323	21.00
7	2411.5	16.6	28	51	79	361	20.	1.0	6.8	361	20.00
8	2412.5	18.5	27	45	72	388	13.	1.0	7.8	388	13.00
9	2413.5	18.9	28	45	73	411	25.	1.0	8.8	411	25.00
10	2414.5	19.2	34	42	76	506	32.	1.4	10.2	708	44.80

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Jackson Brothers Lease Hull Well No. 1

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
2405.2 - 2415.4	10.2	20.1	205.22

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
2405.2 - 2415.4	10.2	18.4	28.4	45.8	406	4,143

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Jackson Brothers Lease Hull Well No. 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	2405.5	20.3	25	394	5	79	20	73	315	56	1.00	20
2	2406.5	19.2	32	477	8	119	24	64	358	37	0.78	30
3	2407.5	17.7	21	289	0	0	21	68	289	15	0.40	35
4	2408.5	17.9	24	334	2	28	22	74	306	19	0.40	30
5	2409.5	17.3	36	483	5	67	31	68	416	12	0.30	35
6	2410.5	18.5	21	302	0	0	21	76	302	29	0.60	30
7	2411.5	16.9	28	367	3	39	25	70	328	28	0.67	30
8	2412.5	18.3	27	384	4	57	23	77	327	55	1.11	20
9	2413.5	18.5	28	402	5	72	23	72	330	43	0.89	30
10	2414.5	18.7	34	494	5	73	29	69	421	15	0.33	30

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 Hull Well No. 1

Depth Interval, Feet	2405.2 - 2415.4
Feet of Core Analyzed	8.2
Average Percent Porosity	18.3
Average Percent Original Oil Saturation	29.9
Average Percent Oil Recovery	4.7
Average Percent Residual Oil Saturation	25.2
Average Percent Residual Water Saturation	70.6
Average Percent Total Residual Fluid Saturation	95.8
Average Original Oil Content, Bbls./A. Ft.	425.
Average Oil Recovery, Bbls./A. Ft.	68.
Average Residual Oil Content, Bbls./A. Ft.	357.
Total Original Oil Content, Bbls./Acre	3,483.
Total Oil Recovery, Bbls./Acre	554.
Total Residual Oil Content, Bbls./Acre	2,929.
Average Effective Permeability, Millidarcys	0.66
Average Initial Fluid Production Pressure, p.s.i.	28.6

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 Hull Well No. 1

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	2405.5	123,600			
2	2406.5	122,250			
3	2407.5	119,500			
4	2408.5	112,500			
5	2409.5	108,300			
6	2410.5	115,200			
7	2411.5	112,900			
8	2412.5	110,600			
9	2413.5	112,100			
10	2414.5	105,200			

Note: ppm — parts per million

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SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VII

Company Jackson Brothers Lease Hull Well No. 1

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
2405.2 - 2415.4	114,527		

Note: ppm — parts per million.