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GENERAL INFORMATION & SUMMARY

Company Jackson Brothers Lease Teichgraber Well No. 3

Location 990' FEL & 330' FSL, SW¼ (SW, SE, SW)

Section 14 Twp. 25S Rge. 8E County Greenwood State Kansas

Name of Sand	Bartlesville
Top of Core	2347.0
Bottom of Core	2370.0
Top of Pay Sand	2348.6
Bottom of Sand	2357.5
Total Feet of Permeable Sand	10.5
Total Feet of Floodable Sand	8.9

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	2.6	2.6
10 - 25	4.0	6.6
25 - 50	2.0	8.6
50 & Above	1.9	10.5

Average Permeability Millidarcys	41.6
Average Percent Porosity	16.8
Average Percent Oil Saturation	33.0
Average Percent Water Saturation	45.5
Average Oil Content, Bbls./A. Ft.	433.
Total Oil Content, Bbls./Acre	4,547.
Average Percent Oil Recovery by Laboratory Flooding Tests	11.2
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	158.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,405.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	2,723.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Jackson Brothers Lease Teichgraber Well No. 3

Depth Interval, Feet	2348.6 - 2357.5
Feet of Core Analyzed	8.9
Average Percent Porosity	17.3
Average Percent Original Oil Saturation	33.6
Average Percent Oil Recovery	11.2
Average Percent Residual Oil Saturation	22.4
Average Percent Residual Water Saturation	69.6
Average Percent Total Residual Fluid Saturation	92.0
Average Original Oil Content, Bbls./A. Ft.	451.
Average Oil Recovery, Bbls./A. Ft.	158.
Average Residual Oil Content, Bbls./A. Ft.	293.
Total Original Oil Content, Bbls./Acre	4,015.
Total Oil Recovery, Bbls./Acre	1,405.
Total Residual Oil Content, Bbls./Acre	2,610.
Average Effective Permeability, Millidarcys	2.49
Average Initial Fluid Production Pressure, p.s.i.	34.6

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

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SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VII

Company Jackson Bros. Lease Teichgraber Well No. 3

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
2347.0 - 2348.6	100,406		
2348.6 - 2357.5	87,629		
2347.0 - 2357.5	89,576		

Note: ppm — parts per million.

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 an employee of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
2347.0 - 2348.6	Grayish light brown, shaly sandstone.
2348.6 - 2357.5	Light brown, fine grained, slightly shaly sandstone.
2357.5 - 2370.0	Shale.

Coring was started at a depth of 2347.0 feet in grayish light brown, shaly sandstone and completed at 2370.0 feet in shale. This core shows a total of 10.5 feet of sandstone. For the most part, the pay is made up of light brown, fine grained, 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 6.2 and 47.9 millidarcys respectively; the overall average being 41.6 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from 4.8 to a maximum of 166. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fair weighted average percent oil saturation, namely, 33.0. The weighted average percent oil saturation of the upper and lower sections is 30.5 and 33.5 respectively. The weighted average percent water saturation of the upper and lower sections is 53.2 and 44.2 respectively; the overall average being 45.5 (See Table

III). This gives an overall weighted average total fluid saturation of 78.5 percent. This fairly low total fluid saturation indicates considerable 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 some flushing of the sand did occur during coring, especially in the lower section.

The weighted average oil content of the upper and lower sections is 348 and 449 barrels per acre foot respectively; the overall average being 433. The total oil content, as shown by this core, is 4,547 barrels per acre of which 3,990 barrels are in the pay sand section (See Table III). The tests indicate the pay sand section extends from a depth of 2348.6 to 2357.5 feet.

LABORATORY FLOODING TESTS

Most of the sand in this core responded very well to laboratory flooding tests, as a total recovery of 1,405 barrels of oil per acre was obtained from 8.9 feet of sand. The weighted average percent oil saturation was reduced from 33.6 to 22.4, or represents an average recovery of 11.2 percent. The weighted average effective permeability of the samples is 2.49 millidarcys, while the average initial fluid production pressure is 34.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 11 samples tested, 9 produced water and oil. This indicates that approximately 82 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.

CONCLUSION

From a study of the above data, we estimate that approximately 1,433 barrels of oil per acre can be recovered from the area, represented by this core, by efficient primary production methods. An additional recovery of 1,290 barrels per acre can be expected from efficient waterflooding. The following data and assumptions were used in calculating the above oil recovery values:

Original formation volume factor	1.20
Present formation volume factor	1.03
Irreducible water saturation, percent	34.0
Primary recovery, estimated, percent	None.
Present oil saturation, percent	56.7
Average porosity, percent	17.3
Oil saturation after flooding, percent	22.4
Performance factor, percent	55.0
Net floodable pay sand, feet	8.9

This core shows a thin slightly shaly sand section having a fair oil saturation, a rather high water saturation and a good average permeability for its depth. No doubt, some flushing of the sand occurred during the cutting of the core.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Jackson Brothers Lease Teichgraber Well No. 3

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	2347.1	14.4	28	57	85	312	4.8	0.6	0.6	187	2.88
2	2348.1	14.9	32	51	83	370	7.0	1.0	1.6	370	7.00
3	2349.1	18.5	29	44	73	416	13.	1.0	2.6	416	13.00
4	2350.1	16.8	35	42	77	456	12.	1.0	3.6	456	12.00
5	2351.1	14.3	29	44	73	321	17.	1.0	4.6	321	17.00
6	2352.1	13.6	32	47	79	338	20.	1.0	5.6	338	20.00
7	2353.1	17.2	32	44	76	426	7.1	1.0	6.6	426	7.10
8	2354.1	16.0	36	44	80	446	44.	1.0	7.6	446	44.00
9	2355.1	19.7	31	44	75	473	42.	1.0	8.6	473	42.00
10	2356.1	18.0	39	47	86	544	122.	1.0	9.6	544	122.00
11	2357.1	20.9	39	41	80	633	166.	0.9	10.5	570	149.50

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Jackson Brothers Lease Teichgraber Well No. 3

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
2347.0 - 2348.6	1.6	6.2	9.88
2348.6 - 2357.5	8.9	47.9	426.60
2347.0 - 2357.5	10.5	41.6	436.48

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
2347.0 - 2348.6	1.6	14.7	30.5	53.2	348	557
2348.6 - 2357.5	8.9	17.2	33.5	44.2	449	3,990
2347.0 - 2357.5	10.5	16.8	33.0	45.5	433	4,547

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Jackson Brothers Lease Teichgraber Well No. 3

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	2347.1	14.0	25	271	0	0	25	62	271	0	Imp.	-
2	2348.1	14.4	30	305	0	0	30	55	305	0	Imp.	-
3	2349.1	18.1	29	407	8	112	21	69	295	13	0.40	30
4	2350.1	16.4	35	445	11	140	24	68	305	5	0.20	40
5	2351.1	14.6	29	328	3	34	26	65	294	9	0.40	40
6	2352.1	14.1	32	350	5	55	27	68	295	14	0.40	40
7	2353.1	17.5	32	435	10	136	22	76	299	36	1.10	40
8	2354.1	16.5	36	461	11	141	25	67	320	63	1.70	40
9	2355.1	19.2	31	462	13	194	18	73	268	35	0.90	40
10	2356.1	18.4	39	557	18	257	21	69	300	323	11.80	20
11	2357.1	20.9	39	633	23	373	16	72	260	161	5.80	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 WATER DIFFERENTIATION TESTS

TABLE VI

Company Jackson Bros. Lease Teichgraber Well No. 3

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		
			Connate	Drilling & Foreign	Total
1	2347.1	90,600			
2	2348.1	106,300			
3	2349.1	90,600			
4	2350.1	106,800			
5	2351.1	103,000			
6	2352.1	104,700			
7	2353.1	56,800			
8	2354.1	100,400			
9	2355.1	79,000			
10	2356.1	87,250			
11	2357.1	57,050			

Note: ppm — parts per million