

OILFIELD RESEARCH LABORATORIES

- REGISTERED ENGINEERS -

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November 16, 1961

A. K. McMillan
2805 Sarah Jane Lane
Ft. Worth, Texas

Dear Sir:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Adam Kahler Lease, Well No. 1, Neosho County, Kansas, and submitted to our laboratory on November 10, 1961.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Benjamin R. Pearman

BRP:rf

5 c.

Fresh water mud was used as the circulating fluid in coring this well. The core was sampled and the samples sealed in cans by a representative of Oilfield Research Laboratories. The well was drilled in virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
493.0 - 495.3	Brown slightly shaley sandstone.
495.3 - 505.8	Shale.
505.8 - 513.0	Brown shaley sandstone.
513.0 - 517.0	Brown to dark slightly carbonaceous slightly shaley sandstone.
517.0 - 518.0	Dark carbonaceous sandstone.
518.0 - 519.0	Shale.

Coring was started at a depth of 493.0 feet in slightly shaley sandstone and completed at 519.0 feet in shale. This core shows a total of 14.5 feet of sandstone. For the most part, the pay is made up of brown shaley sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 19.7, 43.5 and 14.2 millidarcys respectively; the overall average being 34.8 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a rather irregular permeability profile. The permeability of the sand varies from 0.40 to a maximum of 113. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 38.7. The weighted average percent oil saturation of the upper, middle and lower sections is 41.9, 36.0 and 46.0

respectively. The weighted average percent water saturation of the upper, middle and lower sections is 37.0, 37.3 and 32.8 respectively; the overall average being 36.5 (See Table III). This gives an overall weighted average total fluid saturation of 75.2 percent. This low total fluid saturation indicates considerable fluid was lost during coring most of which probably was oil.

The weighted average oil content of the upper, middle and lower sections is 541, 516 and 657 barrels per acre foot respectively; the overall average being 544. The total oil content, as shown by this core, is 7,879 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Portions of the sand in this core responded rather well to laboratory flooding tests, as a total recovery of 765 barrels of oil per acre was obtained from 9.3 feet of sand. The weighted average percent oil saturation was reduced from 38.0 to 32.2, or represents an average recovery of 5.8 percent. The weighted average effective permeability of the samples is 2.18 millidarcys, while the average initial fluid production pressure is 37.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 15 samples tested, 12 produced water and 10 oil. This indicates that approximately 67 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

Based on the results of the laboratory tests, it appears that efficient primary and secondary operations, in the vicinity of this well, should recover approximately 1,150 and 2,150 barrels of oil per acre respectively.

The following data and assumptions were used in calculating the above recovery values:

Original formation volume factor	1.04
Reservoir water saturation, percent	30.0
Estimated primary recovery, percent	6.0
Average porosity, percent	18.5
Oil saturation after water-flooding, percent	32.2
Performance factor, percent	55.0
Net floodable pay sand, feet	9.3

This core indicates a reservoir, more or less shaley in character, having a fairly good oil saturation, a moderate water saturation and a wide variation in effective permeability. The above secondary recovery value was calculated on the assumption that satisfactory injection rates can be established.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company A. K. McMillan Lease Adam Kahler 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			Ft.	Cum. Ft.		
1	493.1	16.8	38	36	496	20.	0.6	0.6	298	12.00
2	494.1	17.8	39	35	539	20.	1.0	1.6	539	20.00
3	495.1	18.4	41	32	585	19.	0.7	2.3	409	13.30
4	506.1	15.9	40	40	494	22.	0.8	3.1	395	17.60
5	507.1	20.0	30	38	466	22.	1.0	4.1	466	22.00
6	508.1	17.1	29	40	399	35.	1.0	5.1	399	35.00
7	509.1	17.8	32	41	441	61.	1.0	6.1	441	61.00
8	510.1	18.6	32	40	461	23.	1.0	7.1	461	23.00
9	511.1	17.9	41	34	570	36.	1.0	8.1	570	36.00
10	512.1	17.9	39	36	541	37.	1.4	9.5	758	51.80
11	513.1	17.6	40	39	546	22.	0.6	10.1	328	13.20
12	514.1	19.6	37	34	563	53.	1.0	11.1	563	53.00
13	515.1	20.7	42	33	675	113.	1.0	12.1	675	113.00
14	516.1	18.5	43	44	618	24.	1.4	13.5	866	33.60
15	517.1	18.3	50	17	711	0.40	1.0	14.5	711	0.40
							Total	-----	7,879	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	A. K. McMillan	Lease	Adam Kahler	Well No.	1			
Depth Interval, Feet	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbl./Acre
493.0 - 495.3	493.0 - 495.3	2.3	19.7	45.30	41.9	37.0	541	1,246
505.8 - 515.6	505.8 - 515.6	9.8	43.5	425.60	36.0	37.3	516	5,056
515.6 - 518.0	515.6 - 518.0	2.4	14.2	34.00	46.0	32.8	657	1,577
493.0 - 518.0	493.0 - 518.0	14.5	34.8	504.90	38.7	36.5	544	7,879
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbl./Acre			
493.0 - 495.3	2.3	17.7	41.9	541	1,246			
505.8 - 515.6	9.8	18.4	36.0	516	5,056			
515.6 - 518.0	2.4	18.4	46.0	657	1,577			
493.0 - 518.0	14.5	18.3	38.7	544	7,879			

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company A. K. McMillan Lease Adam Kahler Well No. 1

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volumes of Water Recovered cc ^a	Effective Permeability Millidarcys ^b	Initial Yield Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
1	493.1	16.9	38	499	14	184	24	53	7	0.225	50
2	494.1	18.0	39	545	10	140	29	57	8	0.245	50
3	495.1	18.7	41	595	9	131	32	54	14	0.425	40
4	506.1	16.0	36	447	0	0	36	47	0	Imp.	-
5	507.1	19.8	30	461	0	0	30	40	9	0.333	50
6	508.1	18.0	29	405	0	0	29	67	181	5.75	30
7	509.1	18.0	32	447	3	42	29	65	71	2.04	30
8	510.1	18.4	32	457	2	29	30	57	18	0.490	40
9	511.1	18.1	41	576	8	112	33	65	89	2.60	30
10	512.1	18.2	39	551	2	28	37	60	74	2.16	30
11	513.1	17.7	40	550	7	96	33	61	29	0.695	30
12	514.1	19.2	37	551	2	30	35	56	15	0.409	40
13	515.1	20.8	42	678	7	113	35	60	264	10.60	30
14	516.1	18.1	45	632	0	0	45	43	0	Imp.	-
15	517.1	18.6	52	750	0	0	52	18	0	Imp.	-

Note: cc—cubic centimeter.

^a—Volume of water recovered at the time of maximum oil recovery.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	A. K. McMillan		Lease	Adam Kahler		Well No.	1
Depth Interval, Feet	493.0 - 495.3	505.8-515.6	493.0 - 515.6				
Feet of Core Analyzed	2.3	7.0	9.3				
Average Percent Porosity	17.9	18.6	18.5				
Average Percent Original Oil Saturation	39.3	37.4	38.0				
Average Percent Oil Recovery	10.7	4.1	5.8				
Average Percent Residual Oil Saturation	28.6	33.3	32.2				
Average Percent Residual Water Saturation	55.0	60.5	59.3				
Average Percent Total Residual Fluid Saturation	83.6	93.8	91.5				
Average Original Oil Content, Ebls./A. Ft.	548.	544.	546.				
Average Oil Recovery, Ebls./A. Ft.	149.	60.	82.				
Average Residual Oil Content, Ebls./A. Ft.	399.	484.	464.				
Total Original Oil Content, Ebls./Acre	1,260.	3,809.	5,069.				
Total Oil Recovery, Ebls./Acre	342.	423.	765.				
Total Residual Oil Content, Ebls./Acre	918.	3,386.	4,304.				
Average Effective Permeability, Millidarcys	0.295	2.80	2.18				
Average Initial Fluid Production Pressure, p.s.i.	46.7	32.8	37.0				

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