3-19-22E

OILFIELD RESEARCH LABORATORIES

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

June 28, 1967

Mid-America Petroleum Company
P.O. Box 213
Lawrence, Kansas 66044

Gentlemen:

Enclosed herewith is the report of the analysis of the Cable-tool core taken from the Vaughn Lease, Well No. 1, Miami County, Kansas, and submitted to our laboratory on June 22, 1967.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

BRP:rf

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GENERAL INFORMATION & SUMMARY

Company Mid-America Petroleum Co. Lease Vaughn Well No. 1

Location NE/4

Section 3 Twp. 19S Rge. 22E County Miami State Kansas

Name of Sand	Squirrel
Top of Core	553.3
Bottom of Core	568.2
Top of Sand (Analyzed)	554.3
Bottom of Sand	566.7
Total Feet of Permeable Sand	11.7
Total Feet of Floodable Sand	4.7

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	5.0	5.0
5 - 10	2.0	7.0
10 - 20	3.7	10.7
20 & above	1.0	11.7

Average Permeability Millidarcys	9.0
Average Percent Porosity	18.6
Average Percent Oil Saturation	25.1
Average Percent Water Saturation	67.5
Average Oil Content, Bbls./A. Ft.	365.
Total Oil Content, Bbls./Acre	4,539.
Average Percent Oil Recovery by Laboratory Flooding Tests	4.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	76.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	204.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	1,180.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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

Because of the laminated nature of the core, it was not possible to obtain flood-pot samples for the entire core.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
553.3 - 554.3	Hard, gray limestone.
554.3 - 560.0	Brown sandstone.
560.0 - 563.0	Light brown, laminated, shaly sandstone.
563.0 - 566.7	Brownish gray, laminated, shaly sandstone.
566.7 - 568.2	Gray sandy shale.

Coring was started at a depth of 553.3 feet in limestone and completed at 568.2 feet in sandy shale. This core shows a total of 12.7 feet of sandstone. For the most part, the pay is made up of brown 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 15.7 and 2.7 millidarcys respectively; the overall average being 9.0 (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 impermeable to a maximum of 28. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 25.1. The weighted average percent oil saturation of the upper and lower sections is 29.6 and 21.4 respectively. The weighted average percent water saturation of the upper and lower sections is 59.8 and 73.8 respectively; the overall average being 67.5 (See Table III). This gives an overall weighted average total fluid saturation of 92.6 percent.

The weighted average oil content of the upper and lower sections is 447 and 297 barrels per acre foot respectively; the overall average being 365. The total oil content, as shown by this core, is 4,539 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand analyzed in this core responded to laboratory flooding tests, as a total recovery of 204 barrels of oil per acre was obtained from 2.7 feet of sand. The weighted average percent oil saturation was reduced from 30.6 to 25.8, or represents an average recovery of 4.8 percent. The weighted average effective permeability of the samples is 0.465 millidarcys, while the average initial fluid production pressure is 36.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 7 samples tested, 4 produced water and 3 oil. 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 1,180 barrels of oil per acre or an average of 250 barrels per acre foot from 4.7 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.05
Reservoir water saturation, percent	40.0
Average porosity, percent	19.8
Oil saturation after flooding, percent	25.8
Performance factor, percent	50.0
Net floodable pay sand, feet	4.7

This core shows a pay sand section (554.3 - 560.0) having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water.

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Mid-America Petroleum Company Lease Vaughn 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	554.5	21.3	35	578	10	165	25	73	413	39	0.900	20
2	555.5	18.1	30	421	4	56	26	67	365	3	0.320	50
4	557.5	20.5	28	444	2	32	26	70	412	10	0.307	40
7	560.5	18.7	25	363	0	0	25	71	363	2	0.105	50
8	561.5	19.2	24	357	0	0	24	67	357	0	Imp.	-
9	562.5	17.4	29	391	0	0	29	70	391	0	Imp.	-
12	565.5	16.6	23	296	0	0	23	76	296	0	Imp.	-

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 Mid-America Petroleum Company Lease Vaughn Well No. 1

Depth Interval, Feet	554.3 - 566.0
Feet of Core Analyzed	2.7
Average Percent Porosity	19.8
Average Percent Original Oil Saturation	30.6
Average Percent Oil Recovery	4.8
Average Percent Residual Oil Saturation	25.8
Average Percent Residual Water Saturation	69.7
Average Percent Total Residual Fluid Saturation	95.5
Average Original Oil Content, Bbls./A. Ft.	470.
Average Oil Recovery, Bbls./A. Ft.	76.
Average Residual Oil Content, Bbls./A. Ft.	394.
Total Original Oil Content, Bbls./Acre	1,270.
Total Oil Recovery, Bbls./Acre	204.
Total Residual Oil Content, Bbls./Acre	1,066.
Average Effective Permeability, Millidarcys	0.465
Average Initial Fluid Production Pressure, p.s.i.	36.6

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