● CORE ANALYSIS ● WATER REPRESSURING ENGINEERING ● WATER ANALYSIS ● FLOODING WATER TREATMENT ● SURVEYING

OILFIELD RESEARCH LABORATORIES

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May 22, 1962

Affiliated Petroleum Corporation
207 West 4th Avenue
Caney, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Marconda Lease, Well No. 1, Montgomery County, Kansas, and submitted to our laboratory on May 17, 1962.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Fred O. Stenger

Fred O. Stenger

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GENERAL INFORMATION & SUMMARY

Company Affiliated Petroleum Corp. Lease Marconda Well No. 1

Location N½ SE¼

Section 8 Twp. 35S Rge. 14E County Montgomery State Kansas

Name of Sand	Bartlesville
Top of Core	1355.0
Bottom of Core	1374.0
Top of Sand (Good)	1357.0
Bottom of Sand (Good)	1364.0
Total Feet of Permeable Sand	9.3
Total Feet of Floodable Sand	7.0

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 20	3.0	3.0
20 - 50	5.3	8.3
50 & above	1.0	9.3

Average Permeability Millidarcys	30.3
Average Percent Porosity	16.9
Average Percent Oil Saturation	28.2
Average Percent Water Saturation	47.3
Average Oil Content, Bbls./A. Ft.	382.
Total Oil Content, Bbls./Acre	3,552.
Average Percent Oil Recovery by Laboratory Flooding Tests	5.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. F	79.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	556.
Total Calculated Oil Recovery, Bbls./Acre	1,120.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Fresh water mud was used as the circulating fluid in the coring of the sand in this well. The well was drilled in a non-virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
1355.0 - 1357.0	Brown, laminated, shaly sandstone.
1357.0 - 1364.0	Brown sandstone.
1364.0 - 1364.3	Dark carbonaceous sandstone.
1364.3 - 1374.0	Shale.

Coring was started at a depth of 1355.0 feet in brown laminated, shaly sandstone and completed at 1374.0 feet in shale. This core shows a total of 9.3 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 25.1 and 34.4 millidarcys respectively; the overall average being 30.3 (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 3.5 to a maximum of 50 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly low weighted average percent oil saturation, namely, 28.2. The weighted average percent oil saturation of the upper and lower sections is 27.4 and 28.9 respectively. The weighted average percent water saturation of the upper and lower sections is 46.0 and 48.2 respectively; the overall average being 47.3 (See Table III). This gives an overall weighted average total fluid saturation of 75.5 percent. This low total fluid saturation indicates considerable

fluid was lost during coring which probably was oil.

The weighted average oil content of the upper and lower sections is 360 and 405 barrels per acre foot respectively; the overall average being 382. The total oil content, as shown by this core, is 3,552 barrels per acre of which 1,931 barrels are in the lower sand section (See Table III).

LABORATORY FLOODING TESTS

The sand in this core did not respond too well to laboratory flooding tests, as a total recovery of 556 barrels of oil per acre was obtained from 7.0 feet of sand. The weighted average percent oil saturation was reduced from 30.1 to 24.2, or represents an average recovery of 5.9 percent. The weighted average effective permeability of the samples is 2.67 millidarcys, while the average initial fluid production pressure is 24.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 10 samples tested, 8 produced water and 7 oil. This indicates that approximately 70 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a fairly good effective permeability to water.

CONCLUSION

Based on the results of the above laboratory tests, it is believed that an efficiently operated water-flood within the vicinity of this well should produce 1,120 barrels of oil per acre or an average of 160 barrels per acre foot from the 7.0 feet of floodable pay sand analyzed. In calculating the above recovery values the following facts and assumptions were used:

Original formation volume factor	1.10
Present formation volume factor	1.02
Reservoir water saturation, percent	39.
Primary recovery, estimated, percent	10.

Present oil saturation, percent	46.5
Average porosity, percent	17.2
Oil saturation after flooding, percent	24.2
Performance factor, percent	55.
Net floodable pay sand, feet	7.0

This core shows a sand section with a somewhat low oil saturation but a fairly good effective and air permeability which should, therefore, respond favorably to water flooding.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Affiliated Petroleum Corp. Lease Marconda 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	1355.1	16.3	33	48	81	416	4.7	0.6	0.6	250	2.82
2	1356.1	15.4	24	46	70	286	3.5	1.4	2.0	400	4.90
3	1357.1	18.3	34	41	75	482	50.	0.5	2.5	241	25.00
4	1358.1	13.5	33	45	78	346	45.	1.0	3.5	346	45.00
5	1359.1	16.5	30	49	79	384	39.	1.0	4.5	384	39.00
6	1360.1	18.6	26	48	74	375	7.3	1.0	5.5	375	7.30
7	1361.1	18.7	38	50	88	551	39.	1.0	6.5	551	39.00
8	1362.1	16.6	27	48	75	347	43.	1.0	7.5	347	43.00
9	1363.1	18.5	26	49	75	373	46.	1.5	9.0	559	69.00
10	1364.1	15.2	28	39	67	330	20.	0.3	9.3	99	6.00
								Total	-------	3,552	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Affiliated Petroleum Corp. Lease Marconda Well No. 1

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
1355.0 - 1359.5	4.5	25.1	116.72
1359.5 - 1364.3	4.8	34.4	164.30
1355.0 - 1364.3	9.3	30.3	281.02

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
1355.0 - 1359.5	4.5	15.7	27.4	46.0	360	1,621
1359.5 - 1364.3	4.8	18.0	28.9	48.2	405	1,931
1355.0 - 1364.3	9.3	16.9	28.2	47.3	382	3,552

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Affiliated Petroleum Corp. Lease Marconda 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	1355.1	16.3	33	416	0	0	33	48	416	0	Imp.	50+
2	1356.1	15.4	24	286	0	0	24	46	286	0	Imp.	50+
3	1357.1	18.4	34	486	7	100	27	65	386	222	3.79	20
4	1358.1	13.6	33	348	5	53	28	63	295	63	1.47	20
5	1359.1	16.4	30	382	3	38	27	61	344	15	0.233	40
6	1360.1	18.5	26	373	4	57	22	70	316	37	0.834	30
7	1361.1	18.6	38	548	12	173	26	69	375	149	3.51	20
8	1362.1	16.5	27	346	6	77	21	76	269	89	2.64	20
9	1363.1	18.6	26	375	5	72	21	68	303	210	5.41	20
10	1364.1	15.1	28	328	0	0	28	59	328	14	0.319	40

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 Affiliated Petroleum Corp. Lease Marconda Well No. 1

Depth Interval, Feet	1357.0 - 1359.5	1359.5 - 1364.0	1357.0 - 1364.0
Feet of Core Analyzed	2.5	4.5	7.0
Average Percent Porosity	15.7	18.1	17.2
Average Percent Original Oil Saturation	32.0	28.8	30.1
Average Percent Oil Recovery	4.6	6.6	5.9
Average Percent Residual Oil Saturation	27.4	22.2	24.2
Average Percent Residual Water Saturation	62.6	70.4	67.6
Average Percent Total Residual Fluid Saturation	90.0	92.6	91.8
Average Original Oil Content, Bbls./A. Ft.	385.	406.	399.
Average Oil Recovery, Bbls./A. Ft.	56.	92.	79.
Average Residual Oil Content, Bbls./A. Ft.	329.	314.	320.
Total Original Oil Content, Bbls./Acre	963.	1,830.	2,793.
Total Oil Recovery, Bbls./Acre	141.	415.	556.
Total Residual Oil Content, Bbls./Acre	822.	1,415.	2,237.
Average Effective Permeability, Millidarcys	1.44	3.35	2.67
Average Initial Fluid Production Pressure, p.s.i.	28.0	22.2	24.3

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