



OILFIELD RESEARCH LABORATORIES

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

September 20, 1966

CRA, Incorporated
P.O. Box 98
Wellington, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Lormor Lease, Well No. 2, Bourbon County, Kansas, and submitted to our laboratory on September 15, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Benjamin R. Pearman

BRP:rf

3 c. - Wellington, Kansas
1 c. - Muskogee, Oklahoma
1 c. - Independence, Kansas

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GENERAL INFORMATION & SUMMARY

Company	CRA, Incorporated	Lease	Lormor	Well No.	2
Location	1000' NSL & 150' EWL, SE $\frac{1}{4}$				
Section	1	Twp	25S	Rge.	21E
		County	Bourbon		State
					Kansas
Name of Sand	-				Bartlesville
Top of Core	-				654.0
Bottom of Core	-				680.5
Top of Sand	(Analyzed)				654.6
Bottom of Sand	-				672.8
Total Feet of Permeable Sand	-				10.3
Total Feet of Floodable Sand	-				8.4
Distribution of Permeable Sand:					
	Permeability Range Millidarcys	Feet	Cum. Ft.		
	6 - 21	4.8	4.8		
	50 - 100	2.0	6.8		
	120 - 190	3.5	10.3		
Average Permeability Millidarcys	-				70.4
Average Percent Porosity	-				20.6
Average Percent Oil Saturation	-				40.8
Average Percent Water Saturation	-				36.4
Average Oil Content, Bbls./A. Ft.	-				657.
Total Oil Content, Bbls./Acre	-				6,768.
Average Percent Oil Recovery by Laboratory Flooding Tests	-				14.2
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	-				244.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	-				2,055.
Total Calculated Oil Recovery, Bbls./Acre	(Primary & Secondary)				3,020.
Packer Setting, Feet	-				
Viscosity, Centipoises @	-				
A. P. I. Gravity, degrees @ 60 °F	-				
Elevation, Feet	-				1062.7

Fresh water mud was used as the circulating fluid while taking this core. 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>
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654.0 - 658.8	- Grayish light brown, laminated, shaly sandstone.
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658.8 - 660.3	- Light brown, shaly sandstone.
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660.3 - 661.3	- Gray shale.
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661.3 - 664.5	- Grayish light brown, laminated, shaly sandstone.
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664.5 - 669.0	- Brown, slightly shaly sandstone.
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669.0 - 671.9	- Brown, laminated, shaly sandstone.
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671.9 - 672.8	- Light brown, shaly sandstone.
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672.8 - 673.1	- Coal.
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673.1 - 680.5	- Shale.
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Coring was started at a depth of 654.0 feet in shaly sandstone and completed at 680.5 feet in shale. For the most part, the pay is made up of brown, slightly shaly sandstone.

PERMEABILITY

The weighted average permeability of the core is 70.4 millidarcys (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 6.7 to a maximum of 181. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 40.8. The weighted average percent water saturation is 36.4 (See Table III). This gives an overall weighted average total fluid saturation of 77.2 percent. This low total fluid saturation indicates considerable fluid was lost during coring, most of which was probably oil.

The weighted average oil content of the core is 657 barrels per acre foot. The total oil content, as shown by this core, is 6,768 barrels per acre of which 5,955 barrels are in the pay sand section (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2,055 barrels of oil per acre was obtained from 8.4 feet of sand. The weighted average percent oil saturation was reduced from 42.6 to 28.4, or represents an average recovery of 14.2 percent. The weighted average effective permeability of the samples is 4.04 millidarcys, while the average initial fluid production pressure is 20.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 10 samples tested, 9 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 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 3,020 barrels of oil per acre or an average of 359 barrels per acre foot from the 8.4 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.06
Reservoir water saturation, percent	25.0
Average porosity, percent	21.1
Oil saturation after flooding, percent	28.4
Performance factor, percent	50.0
Net floodable pay sand, feet	8.4

This core shows a pay sand section (664.5 to 671.9) having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company CRA, Inc. Lease Lormor Well No. 2

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	655.1	17.9	22	49	71	306	6.8	1.0	1.0	306	6.80
2	659.1	19.1	31	36	67	459	17.	1.0	2.0	459	17.00
3	665.1	22.5	39	35	74	680	145.	1.1	3.1	748	159.50
4	666.1	21.6	33	39	72	553	90.	1.0	4.1	553	90.00
5	667.1	21.9	55	27	82	934	181.	1.0	5.1	934	181.00
6	668.1	21.5	41	32	73	683	121.	1.4	6.5	955	169.40
7	669.1	19.9	56	33	89	864	19.	0.6	7.1	513	11.40
8	670.1	22.2	47	29	76	809	57.	1.0	8.1	809	57.00
9	671.1	19.1	50	41	91	740	21.	1.3	9.4	962	27.30
10	672.1	20.5	37	40	77	587	6.7	0.9	10.3	529	6.03
								Total		6,768	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease	Lormor	Well No.
CRA, Inc.			2
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
654.6 - 672.8	10.3	70.4	725.43
Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Oil Content Bbl./A. Ft.
654.6 - 672.8	10.3	20.6	657
		Average Percent Water Saturation	Total Oil Content Bbls./Acre
		40.8	6,768

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc ^e	Effective Permeability Millidarcys ^{ee}	Initial Fluid Production Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
1	655.1	17.6	23	314	0	0	23	56	6	0.200	50
2	659.1	19.1	31	459	1	15	30	44	26	0.600	40
3	665.1	22.0	39	666	6	103	33	65	53	1.30	20
4	666.1	22.0	33	563	4	68	29	67	294	9.00	20
5	667.1	22.3	55	951	24	415	31	68	335	8.80	10
6	668.1	22.0	41	700	17	290	24	67	291	8.80	10
7	669.1	20.2	56	876	30	470	26	64	46	1.10	20
8	670.1	22.0	47	802	20	342	27	66	23	0.500	20
9	671.1	18.7	50	725	22	319	28	65	21	0.500	20
10	672.1	20.1	37	576	0	0	37	42	0	Imp.	-

Company CRA, Inc.

Lease

Lormor

Well No.

2

Notes: cc—cubic centimeter.

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

ee.—Determined by passing water through sample which still contains residual oil.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	CRA, Inc.	Lease	Lormor	Well No.	2
Depth Interval, Feet	658.8 - 671.9				
Feet of Core Analyzed	8.4				
Average Percent Porosity	21.1				
Average Percent Original Oil Saturation	42.6				
Average Percent Oil Recovery	14.2				
Average Percent Residual Oil Saturation	28.4				
Average Percent Residual Water Saturation	63.5				
Average Percent Total Residual Fluid Saturation	91.9				
Average Original Oil Content, Bbls./A. Ft.	709.				
Average Oil Recovery, Bbls./A. Ft.	244.				
Average Residual Oil Content, Bbls./A. Ft.	465.				
Total Original Oil Content, Bbls./Acre	5,955.				
Total Oil Recovery, Bbls./Acre	2,055.				
Total Residual Oil Content, Bbls./Acre	3,900.				
Average Effective Permeability, Millidarcys	4.04				
Average Initial Fluid Production Pressure, p.s.i.	20.0				

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