OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

March 25, 1967

Homa Oil Company
3568 Mimosa Avenue
Memphis, Tennessee

Gentlemen:

Enclosed herewith are the results of tests run on the Rotary core taken from the Nighswonger Lease, Well No. 2, Bourbon County, Kansas, and submitted to our laboratory on March 22, 1967.

This core was sampled and the samples sealed in cans by a representative of Oilfield Research Laboratories. The well was drilled in virgin territory.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

BRP:rf

5 c. - Memphis, Tennessee

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Homa Oil Company Lease Nighswonger Well No. 2

Location SE NW

Section 2 Twp. 24S Rge. 25E County Bourbon State Kansas

Name of Sand	Bartlesville
Top of Core	221.4
Bottom of Core	240.8
Top of Sand (Tested)	221.4
Bottom of Sand (Tested)	233.6
Total Feet of Permeable Sand	4.6
Total Feet of Floodable Sand	3.5

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
3 - 4	0.6	0.6
21 - 37	4.0	4.6

Average Permeability Millidarcys	27.6
Average Percent Porosity	15.7
Average Percent Oil Saturation	32.3
Average Percent Water Saturation	57.9
Average Oil Content, Bbls./A. Ft.	411.
Total Oil Content, Bbls./Acre	3,789.
Average Percent Oil Recovery by Laboratory Flooding Tests	
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	
Total Calculated Oil Recovery, Bbls./Acre	
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

OILFIELD RESEARCH LABORATORIES

-LOG-

Company Homa Oil Company Lease Nighswonger Well No. 2

Depth Interval, Feet	Description
221.4 - 222.0	Gray shaly sandstone.
222.0 - 223.0	Sandy shale.
223.0 - 223.5	Light brown sandstone.
223.5 - 226.0	Brown sandstone.
226.0 - 227.0	Dark brown, carbonaceous sandstone.
227.0 - 234.5	Laminated shaly sandstone.
234.5 - 240.8	Sandy shale.

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Homa Oil Company Lease Nighswonger 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	221.5	16.4	26	63	89	330	Imp.	0.6	0.6	198	0.00
2	223.1	19.1	27	47	74	400	29.	0.5	1.1	200	14.50
3	224.1	21.0	35	49	84	569	37.	1.0	2.1	569	37.00
4	225.1	19.2	40	40	80	595	35.	1.5	3.6	892	52.50
5	226.1	16.9	57	42	99	746	21.	1.0	4.6	746	21.00
6	227.1	17.3	48	50	98	644	3.2	0.6	5.2	386	1.92
7	228.1	14.7	18	80	98	205	Imp.	1.0	6.2	205	0.00
8	229.1	10.6	24	61	85	198	Imp.	1.0	7.2	198	0.00
9	231.1	10.1	20	77	97	157	Imp.	1.0	8.2	157	0.00
10	233.1	12.3	25	72	97	238	Imp.	1.0	9.2	238	0.00
								Total		3,789	

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Homa Oil Company Lease Nighswonger Well No. 2

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
221.4 - 227.0	4.0	31.2	125.00
227.0 - 233.6	0.6	3.2	1.92
221.4 - 233.6	4.6	27.6	126.92

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
221.4 - 227.0	4.6	18.7	39.4	46.2	466	2,605
227.0 - 233.6	4.6	12.7	25.2	69.6	258	1,184
221.4 - 233.6	9.2	15.7	32.3	57.9	411	3,789

OILFIELD RESEARCH LABORATORIES
536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

March 25, 1967

Homa Oil Company
3568 Mimosa Avenue
Memphis, Tennessee

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Nighswonger Lease, Well No. 2, Bourbon County, Kansas, and submitted to our laboratory on March 22, 1967.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

BRP:rf

4 c. - Memphis, Tennessee
1 c. - Walnut, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Homa Oil Company Lease Nighswonger Well No. 2

Location SE NW

Section 2 Twp. 24S Rge. 25E County Bourbon State Kansas

Name of Sand	Bartlesville
Top of Core	221.4
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Top of Sand (Analyzed)	221.4
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Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
3 - 4	0.6	0.6
21 - 37	4.0	4.6

Average Permeability Millidarcys	27.6
Average Percent Porosity	15.7
Average Percent Oil Saturation	32.3
Average Percent Water Saturation	57.9
Average Oil Content, Bbls./A. Ft.	411.
Total Oil Content, Bbls./Acre	3,789.
Average Percent Oil Recovery by Laboratory Flooding Tests	6.7
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	94.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	328.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	720.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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:

Depth Interval, Feet	Description
221.4 - 222.0	Gray shaly sandstone.
222.0 - 223.0	Sandy shale.
223.0 - 223.5	Light brown sandstone.
223.5 - 226.0	Brown sandstone.
226.0 - 227.0	Dark brown, carbonaceous sandstone.
227.0 - 234.5	Laminated shaly sandstone.
234.5 - 240.8	Sandy shale.

Coring was started at a depth of 221.4 feet in sandstone and completed at 240.8 feet in sandy shale. 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 31.2 and 3.2 millidarcys respectively; the overall average being 27.6 (See Table III). By observing the data given on the coregraph, it is noticeable that the pay sand has a regular permeability profile. The permeability of the sand varies from impermeable to a maximum of 37. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 32.3. The weighted average percent oil saturation of the upper and lower sections is 39.4 and 25.2 respectively. The weighted average percent water saturation of the upper and lower sections is 46.2 and 69.6 respectively; the overall average being 57.9 (See Table III). This gives an overall weighted average total fluid saturation of 90.2 percent.

The weighted average oil content of the upper and lower sections is 566 and 258 barrels per acre foot respectively; the overall average being 411. The total oil content, as shown by this core, is 3,789 barrels per acre of which 2,205 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 328 barrels of oil per acre was obtained from 3.5 feet of sand. The weighted average percent oil satutation was reduced from 43.5 to 36.8, or represents an average recovery of 6.7 percent. The weighted average effective permeability of the samples is 1.71 millidarcys, while the average initial fluid production pressure is 26.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 10 samples tested, 4 produced water and 3 oil. This indicates that approximately 30 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 720 barrels of oil per acre or an average of 205 barrels per acre foot from the 3.5 feet of floodable pay sand analyzed in this core. These recovery values were calculated using the following data and assumptions:

Original formation volume factor	1.02
Reservoir water saturation, percent	35.0
Average porosity, percent	19.1
Oil saturation after flooding, percent	36.8
Performance factor, percent	50.0
Net floodable pay sand, feet	3.5

This core shows a pay sand section having a good oil saturation, a moderate water saturation and a wide variation in effective permeability to water. The above recovery values were calculated assuming that satisfactory water injection rates will be maintained throughout the flood life of the property.

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Homa Oil Company Lease Nighswonger 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	221.5	16.4	26	63	89	330	Imp.	0.6	0.6	198	0.00
2	223.1	19.1	27	47	74	400	29.	0.5	1.1	200	14.50
3	224.1	21.0	35	49	84	569	37.	1.0	2.1	569	37.00
4	225.1	19.2	40	40	80	595	35.	1.5	3.6	892	52.50
5	226.1	16.9	57	42	99	746	21.	1.0	4.6	746	21.00
6	227.1	17.3	48	50	98	644	3.2	0.6	5.2	386	1.92
7	228.1	14.7	18	80	98	205	Imp.	1.0	6.2	205	0.00
8	229.1	10.6	24	61	85	198	Imp.	1.0	7.2	198	0.00
9	231.1	10.1	20	77	97	157	Imp.	1.0	8.2	157	0.00
10	233.1	12.3	25	72	97	238	Imp.	1.0	9.2	238	0.00
								Total		3,789	

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Homa Oil Company Lease Nighswonger Well No. 2

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
221.4 - 227.0	4.0	31.2	125.00
227.0 - 233.6	0.6	3.2	1.92
221.4 - 233.6	4.6	27.6	126.92

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
221.4 - 227.0	4.6	18.7	39.4	46.2	566	2,605
227.0 - 233.6	4.6	12.7	25.2	69.6	258	1,184
221.4 - 233.6	9.2	15.7	32.3	57.9	411	3,789

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Homa Oil Company Lease Nighswonger Well No. 2

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	221.5	16.1	25	312	0	0	25	62	312	0	Imp.	-
2	223.1	18.8	27	394	0	0	27	63	394	147	2.61	20
3	224.1	20.8	35	564	3	48	32	55	516	217	3.79	20
4	225.1	19.6	40	609	5	76	35	56	533	60	1.14	20
5	226.1	16.5	57	728	13	166	44	54	562	21	0.490	40
6	227.1	17.1	49	650	0	0	49	48	650	0	Imp.	-
7	228.1	14.7	16	182	0	0	16	82	182	0	Imp.	-
8	229.1	10.8	22	184	0	0	22	65	184	0	Imp.	-
9	231.1	10.0	20	155	0	0	20	78	155	0	Imp.	-
10	233.1	11.9	24	221	0	0	24	75	221	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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Homa Oil Company Lease Nighswonger Well No. 2

Depth Interval, Feet	223.5 - 227.0
Feet of Core Analyzed	3.5
Average Percent Porosity	19.1
Average Percent Original Oil Saturation	43.5
Average Percent Oil Recovery	6.7
Average Percent Residual Oil Saturation	36.8
Average Percent Residual Water Saturation	55.1
Average Percent Total Residual Fluid Saturation	91.9
Average Original Oil Content, Bbls./A. Ft.	630.
Average Oil Recovery, Bbls./A. Ft.	94.
Average Residual Oil Content, Bbls./A. Ft.	536.
Total Original Oil Content, Bbls./Acre	2,205.
Total Oil Recovery, Bbls./Acre	328.
Total Residual Oil Content, Bbls./Acre	1,877.
Average Effective Permeability, Millidarcys	1.71
Average Initial Fluid Production Pressure, p.s.i.	26.7

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