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KENNY KEAS, ET AL
CORE ANALYSIS REPORT ~~TT~~
UMBARGER LEASE WELL NO. 2-A
WILSON COUNTY, KANSAS K-9
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OILFIELD RESEARCH LABORATORIES

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Chanute, Kansas

December 28, 1964

Kenny Keas, et al
P.O. Box 556
Chanute, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Umbarger Lease, Well No. 2-A, Wilson County, Kansas, and submitted to our laboratory on December 22, 1964.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
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GENERAL INFORMATION & SUMMARY

Company Kenny Keas, et al Lease Umbarger Well No. 2-A

Location SW NE SW

Section 36 Twp. 28S Rge. 16E County Wilson State Kansas

Name of Sand	- Squirrel	B'ville
Top of Core	640.0	782.0
Bottom of Core	671.0	817.0
Top of Sand	650.6	-
Bottom of Sand	665.6	-
Total Feet of Permeable Sand	14.0	
Total Feet of Floodable Sand	13.0	

Distribution of Permeable Sand:
Permeability Range
Millidarcys

	Feet	Cum. Ft.
0 - 10	3.0	3.0
10 - 20	2.0	5.0
20 - 50	3.0	8.0
50 - 100	3.0	11.0
100 & above	3.0	14.0

Average Permeability Millidarcys	68.0
Average Percent Porosity	19.1
Average Percent Oil Saturation	45.6
Average Percent Water Saturation	30.4
Average Oil Content, Bbls./A. Ft.	685.
Total Oil Content, Bbls./Acre	10,270.
Average Percent Oil Recovery by Laboratory Flooding Tests	8.4
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	130.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,695.
Total Calculated Oil Recovery, Bbls./Acre	3,120.
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 non-virgin territory. Only the Squirrel sand core was analyzed.

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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SQUIRREL

640.0 - 648.0 - Shale.

648.0 - 651.6 - Laminated sandy shale.

651.6 - 652.6 - Hard, brown, calcareous sandstone.

652.6 - 657.6 - Brown, slightly shaly sandstone.

657.6 - 665.6 - Brown, laminated, shaly sandstone.

665.6 - 668.0 - Laminated sandy shale.

668.0 - 671.0 - Loss.

BARTLESVILLE

782.0 - 797.8 - Brownish gray sandstone.

797.8 - 800.0 - Sandy shale.

800.0 - 801.0 - Shale.

801.0 - 817.0 - Loss.

Coring was started at a depth of 640.0 feet in shale and completed at 671.0 feet, the bottom of the core being lost. For the most part, the pay is made up of brown, more or less shaly, 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 130.3 and 21.4 millidarcys respectively; the overall average being

68.0 (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 230 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 45.6. The weighted average percent oil saturation of the upper and lower sections is 42.3 and 48.6 respectively. The weighted average percent water saturation of the upper and lower sections is 34.2 and 27.0 respectively; the overall average being 30.4 (See Table III). This gives an overall weighted average total fluid saturation of 76.0 percent. This low total fluid saturation indicates some fluid was lost during coring most of which was probably oil.

The weighted average oil content of the upper and lower sections is 690 and 679 barrels per acre foot respectively; the overall average being 685. The total oil content, as shown by this core, is 10,270 barrels per acre of which 9,616 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 1,695 barrels of oil per acre was obtained from 13.0 feet of sand. The weighted average percent oil saturation was reduced from 48.2 to 39.8, or represents an average recovery of 8.4 percent. The weighted average effective permeability of the samples is 4.86 millidarcys, while the average initial fluid production pressure is 23.1 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 15 samples tested, 13 produced water and oil. This indicates that approx-

imately 87 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 an efficient water-flood in the vicinity of this well should recover approximately 3,120 barrels of oil per acre or an average of 240 barrels per acre foot from the 13.0 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
Present formation volume factor	1.02
Reservoir water saturation, percent	18.0
Primary recovery, estimated, percent	8.0
Present oil saturation, percent	71.6
Average porosity, percent	19.9
Oil saturation after flooding, percent	39.8
Performance factor, percent	50.0
Net floodable pay sand, feet	13.0

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.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Kenny Keas, et al Lease Umbarger Well No. 2-A T7

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbbs. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	651.1	11.6	15	79	94	135	Imp.	1.0	1.0	135	0.00
2	652.1	16.3	50	32	82	632	30.	1.0	2.0	632	30.00
3	653.1	22.3	40	30	70	691	70.	1.0	3.0	691	70.00
4	654.1	23.4	52	25	77	944	52.	1.0	4.0	944	52.00
5	655.1	24.5	46	24	70	873	202.	1.0	5.0	873	202.00
6	656.1	23.4	46	23	69	834	198.	1.0	6.0	834	198.00
7	657.1	19.9	47	26	73	725	230.	1.0	7.0	725	230.00
8	658.1	24.4	42	24	66	794	58.	1.0	8.0	794	58.00
9	659.1	18.2	45	27	72	634	37.	1.0	9.0	634	37.00
10	660.1	19.1	52	27	79	769	15.	1.0	10.0	769	15.00
11	661.1	20.6	55	21	76	878	37.	1.0	11.0	878	37.00
12	662.1	17.2	50	21	71	666	15.	1.0	12.0	666	15.00
13	663.1	15.7	48	27	75	584	8.2	1.0	13.0	584	8.20
14	664.1	15.0	54	33	87	628	1.0	1.0	14.0	628	1.00
15	665.1	14.5	43	36	79	483	0.66	1.0	15.0	483	0.66
								Total-----		10,270	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Kenny Keas, et al Lease Umbarger Well No. 2-A

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
650.6 - 657.6	6.0	130.3	782.00
657.6 - 665.6	8.0	21.4	171.86
650.6 - 665.6	14.0	68.0	953.86

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
650.6 - 657.6	7.0	20.2	42.3	34.2	690	4,834
657.6 - 665.6	8.0	18.1	48.6	27.0	679	5,436
650.6 - 665.6	15.0	19.1	45.6	30.4	685	10,270

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Kenny Keas, et al Lease Umbarger Well No. 2-A

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	651.1	12.0	16	149	0	0	16	81	149	0	Imp.	-
2	652.1	16.0	50	620	8	99	42	53	521	6	0.500	50
3	653.1	21.9	40	679	2	34	38	61	645	33	0.777	30
4	654.1	23.9	52	963	11	204	41	58	759	252	13.50	10
5	655.1	24.1	46	860	9	168	37	59	692	362	14.48	10
6	656.1	23.0	46	820	11	196	35	57	624	390	12.00	10
7	657.1	20.2	47	736	9	141	38	50	595	228	13.50	10
8	658.1	24.1	42	785	9	168	33	54	617	105	2.60	20
9	659.1	18.7	45	652	5	73	40	52	579	47	1.00	20
10	660.1	18.8	52	758	9	131	43	53	627	76	1.50	20
11	661.1	20.1	55	856	11	171	44	52	685	87	1.80	20
12	662.1	16.8	50	651	9	117	41	53	534	19	0.500	35
13	663.1	15.9	48	591	6	74	42	54	517	20	0.500	35
14	664.1	15.4	54	645	10	119	44	48	526	24	0.600	30
15	665.1	14.3	44	488	0	0	44	48	488	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	Kenny Keas, et al		Lease	Umbarger	Well No.
			650.6 - 657.6	657.6 - 665.6	2-A
Depth Interval, Feet			650.6 - 657.6	657.6 - 665.6	650.6 - 665.6
Feet of Core Analyzed			6.0	7.0	13.0
Average Percent Porosity			21.6	18.5	19.9
Average Percent Original Oil Saturation			46.8	49.4	48.2
Average Percent Oil Recovery			8.3	8.4	8.4
Average Percent Residual Oil Saturation			38.5	41.0	39.8
Average Percent Residual Water Saturation			56.4	52.3	54.1
Average Percent Total Residual Fluid Saturation			94.9	93.3	93.9
Average Original Oil Content, Bbls./A. Ft.			779.	705.	740.
Average Oil Recovery, Bbls./A. Ft.			140.	122.	130.
Average Residual Oil Content, Bbls./A. Ft.			639.	583.	610.
Total Original Oil Content, Bbls./Acre			4,678.	4,938.	9,616.
Total Oil Recovery, Bbls./Acre			842.	853.	1,695.
Total Residual Oil Content, Bbls./Acre			3,836.	4,085.	7,921.
Average Effective Permeability, Millidarcys			9.12	1.21	4.86
Average Initial Fluid Production Pressure, p.s.i.			20.0	25.7	23.1

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