

33-20-21E
Kretzmer 30

November 13, 1950

Keweenaw Oil Company
Kennedy Building
P. O. Box 2239
Tulsa 1, Oklahoma

Gentlemen:

Enclosed herewith is the report of the analysis of the No. 6 Baker barrel core taken from the Kretzmer-100 Acres Lease, Well No. 30, Anderson County, Kansas, and submitted to our laboratory on October 14, 1950.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:cc

c.c. to Mr. H. T. Harris
Garnett, Kansas

Keweenaw Oil Company
Shidler, Oklahoma

Kewanee Oil Company

Core Analysis Report

Kretzmer-100 Acres Lease

Well No. 30

Anderson County, Kansas

Oil Field Research Laboratories

Chanute, Kansas

November 13, 1950

Oil Field Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Keweenaw Oil Company Lease Kretzmer-100 Acres Well No. 30

Location _____

Section 33 Twp. 20S Rge. 21E County Anderson State Kansas

Name of Sand	Squirrel
Top of Core	596.00
Bottom of Core	631.30
Top of Sand	608.98
Bottom of Sand	625.60
Total Feet of Permeable Sand	7.70

Distribution of Permeable Sand:

Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 20	2.55	2.55
20 - 40	1.75	4.30
40 - 60	2.55	6.85
60 & above	0.85	7.70

Average Permeability, Millidarcys	36.49
Average Percent Porosity	18.85
Average Percent Oil Saturation	39.06
Average Percent Water Saturation	50.78
Average Oil Content, Bbls./A. Ft.	571.
Total Oil Content, Bbls./Acre	5,395.
Average Percent Oil Recovery by Laboratory Flooding Tests	14.49
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	219.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,579.
Total Calculated Oil Recovery, Bbls./Acre	1,800.

Packer Setting, Feet 609.00

Viscosity, Centipoises @

A. P. I. Gravity, degrees @ 60 °F

Note: The above averages are for that part of the sand section extending from the packer setting to the top of the cement plug.

Water was used as a circulating fluid in the coring of the sand in this well.

FORMATION CORRECTION

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
596.00 - 608.40	- According to log, gray shale (discarded at well).
608.40 - 608.98	- Laminated sandy shale.
608.98 - 609.70	- Light brown fine grained micaceous sandstone.
609.70 - 611.60	- Gray sandy shale.
611.60 - 612.25	- Light brown fine grained micaceous sandstone.
612.25 - 613.15	- Light brown fine grained laminated micaceous shaley sandstone.
613.15 - 613.45	- Light brown fine grained micaceous sandstone.
613.45 - 613.80	- Laminated shaley sandstone.
613.80 - 614.10	- Laminated sandy shale.
614.10 - 614.25	- Light brown fine grained laminated micaceous shaley sandstone.
614.25 - 614.40	- Light brown fine grained micaceous sandstone.
614.40 - 614.80	- Light brown fine grained laminated micaceous shaley sandstone.
614.80 - 615.55	- Light brown fine grained slightly laminated micaceous shaley sandstone.
615.55 - 615.70	- Laminated shaley sandstone.
615.70 - 616.75	- Light brown fine grained slightly laminated micaceous shaley sandstone.
616.75 - 616.90	- Light brown fine grained micaceous sandstone.
616.90 - 617.15	- Light brown fine grained slightly laminated micaceous shaley sandstone.
617.15 - 617.50	- Light brown fine grained micaceous sandstone.
617.50 - 620.85	- Gray sandy shale.

- 620.85 - 621.30 - Light brown fine grained slightly laminated micaceous shaley sandstone.
- 621.30 - 621.60 - Light brown fine grained micaceous sandstone.
- 621.60 - 622.55 - Light brown fine grained slightly laminated micaceous shaley sandstone.
- 622.55 - 622.85 - Light brown fine grained micaceous sandstone.
- 622.85 - 623.86 - Gray sandy shale.
- 623.85 - 625.60 - Brown fine grained micaceous sandstone.
- 625.60 - 626.35 - Gray shale.
- 626.35 - 631.30 - According to log, gray shale (discarded at well).

Coring was started at a depth of 596.00 feet in gray shale and completed at 631.30 feet in gray shale. This core shows a total of 9.57 feet of oil sand. For the most part, the pay sand is made up of fine grained micaceous to shaley sandstone. The sand section is also broken by layers of sandy shale.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections are 22.84 and 50.85 millidarcys respectively while that of the pay sand, or that part of the cored section extending from the packer setting to the top of the cement plug, is 36.49 (See Table II). By observing the data given on the coregraph, it is noticeable that the sand has a fairly irregular permeability profile.

PERCENT SATURATION & OIL CONTENT

The pay sand in this core shows a fairly good weighted average percent oil saturation, namely, 39.06. The weighted average percent oil saturation of the upper and lower sections are 32.78 and 39.49 respectively.

The weighted average percent water saturation of the upper and lower sections are 30.39 and 30.93 respectively while that of the pay sand is 30.78 (See Table IV). This gives an overall weighted average total fluid saturation of 39.84 percent.

In an effort to get some idea of the degree of flushing of the sand during coring, all of the saturation samples were analyzed for chloride content. The results of these tests are given in Tables VII and VIII. From the data given in these tables and on the coregraph, it is evident that some flushing of the sand did occur during coring as, for the most part, the zones of higher permeability have the lower chloride content.

The weighted average oil content of the upper and lower sections are 570 and 571 barrels per acre foot respectively while that of the pay sand is 571. The total oil content, as shown by this core, is 5,461 barrels per acre of which 5,395 barrels are in the pay sand section (See Table IV).

LABORATORY FLOODING TESTS

The pay sand in this core responded very well to laboratory flooding tests as a total recovery of 1,579 barrels of oil per acre was recovered from 7.20 feet of sand. The weighted average percent oil saturation was reduced from 39.25 to 24.76, or represents an average recovery of 14.49 percent. The weighted average effective permeability of the samples is 2.83 millidarcys while the average initial fluid production pressure is 21.0 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 10 samples tested, all produced water and 9 produced oil. This indicates that all of the sand represented by these samples will take water.

CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 1,600 barrels of oil per acre, or an average of 240 barrels per acre foot. In calculating this recovery, an allowance was made for oil lost during coring and it was assumed that the true water saturation of the sand is 37 percent and that the sand represented by this core is not pressured up.

The principle drawback of this core is the fact that it contains only approximately 7.50 feet of floodable sand.

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SHOT RECOMMENDATION

Company Keweenaw Oil Company Lease Kretzmer - 100 Acres Well No. 30

Depth Interval, Feet	Feet of Sand	Size of Shell Inches	Qts./Ft.	Total Quarts
614.0 - 620.5	6.5	4.5	3.1	20.15
620.5 - 624.5	<u>4.0</u>	3.5	2.0	<u>8.00</u>
Total - -	10.5			28.15

Recommended Packer Setting - 609.0 feet
Note: Plug hole back to 625.5 feet

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 RESULTS OF PERMEABILITY TESTS
 TABLE I

Company Keweenaw Oil Company Lease Kretzmer -100 Acres Well No. 30

Sample No.	Depth, Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	609.02	15.	0.22	0.22	3.30
2	609.35	20.	0.50	0.72	10.00
3	611.93	40.	0.65	1.37	26.00
4	612.65	Imp.	0.75	2.12	0.00
5	613.40	50.	0.30	2.42	15.00
6	614.85	9.3	0.20	2.62	1.86
7	615.20	7.9	0.55	3.17	4.35
8	615.75	12.	0.50	3.67	6.00
9	616.60	42.	0.55	4.22	23.10
10	617.10	2.8	0.25	4.47	0.70
11	617.40	7.5	0.35	4.82	2.63
12	620.90	59.	0.45	5.27	26.55
13	621.40	116.	0.30	5.57	34.80
14	621.75	54.	0.40	5.97	21.60
15	622.30	48.	0.55	6.52	26.40
16	622.77	45.	0.30	6.82	13.50
17	624.10	62.	0.55	7.37	34.10
18	624.50	33.	0.55	7.92	18.15
19	625.15	24.	0.65	8.57	15.60

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SUMMARY OF PERMEABILITY TESTS

TABLE II

Company **Keweenaw Oil Company** Lease **Kretchner-100 Acres** Well No. **30**

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity, Ft. x Md.
608.98 - 617.50	4.07	22.84	98.94
620.85 - 625.60	3.75	30.88	190.70
609.00 - 625.50	7.70	36.49	280.94

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RESULTS OF SATURATION TESTS

TABLE III

Company Newman Oil Company Lease Kretchner - 100 Acres Well No. 30

Sat. No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content, Bbls./A. Ft.	Feet of Core		Total Oil Content Bbls./Acre
			Oil	Water	Total		Ft.	Cum. Ft.	
1	609.63	19.9	41.5	48.5	90.0	640	0.72	0.72	461
2	611.83	19.9	38.3	54.8	93.1	592	0.65	1.37	385
F-3	613.08	16.4	42.8	-	-	546	0.90	2.27	491
3	613.22	18.3	36.2	63.3	99.5	515	0.30	2.57	155
F-4	614.17	15.8	29.1	-	-	356	0.15	2.72	53
4	614.32	19.0	26.1	52.7	78.8	386	0.15	2.87	58
5	615.49	18.4	45.3	45.0	90.3	648	1.15	4.02	745
F-6	616.83	21.4	35.8	-	-	594	1.20	5.22	713
6	616.96	18.2	30.3	51.5	81.8	429	0.60	5.82	257
7	621.23	18.3	36.1	52.5	88.6	513	0.75	6.57	385
F-8	622.46	18.4	41.6	-	-	594	0.95	7.52	564
8	622.63	20.6	36.5	50.7	87.2	581	0.30	7.82	174
10	624.68	18.9	41.5	54.0	95.5	610	1.15	8.97	702
11	625.36	17.8	39.3	43.3	81.6	530	0.60	9.57	318
							Total	- - - -	5,461

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SUMMARY OF SATURATION TESTS

TABLE IV

Company Kewanee Oil Company Lease Kretzner - 100 Acres Well No. 30

Depth Interval, Feet	Feet of Core Analyzed	Average Percent Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbls./A. Ft.	Total Oil Content Bbls./Acre
608.98-617.50	5.82	19.00	39.78	50.39	570	3,318
620.65-625.60	3.75	16.61	39.49	50.93	571	2,143
609.00-625.50	9.45	16.85	39.06	50.76	571	5,395

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RESULTS OF LABORATORY FLOODING TESTS

TABLE V

Company Kownee Oil Company

Lease Kretchner 100 Acres

Well No. 30

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.
			Percent	Bbls./A. Ft.	Percent	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	609.45	19.9	40.1	619	15.1	255	85.0	69.1	366	50	1.84	20
2	611.65	20.5	36.9	588	11.1	177	85.8	64.6	411	45	2.57	15
3	613.08	19.4	42.8	546	0.0	0	42.8	58.4	346	4	0.162	30
4	614.17	13.8	29.1	356	3.2	54	29.3	61.9	322	2	0.125	45
5	615.32	17.5	46.9	657	17.5	256	29.4	69.8	399	16	0.640	20
6	616.83	21.4	35.3	594	14.1	234	21.7	70.7	360	69	3.20	15
7	621.05	20.7	35.4	553	12.8	206	21.6	75.8	347	79.5	4.40	15
8	622.48	18.4	41.6	594	16.6	257	25.0	67.0	357	71.5	2.87	15
10	624.52	19.9	39.6	612	18.7	269	20.9	73.8	323	162	6.11	10
11	625.52	18.0	26.0	517	4.2	59	32.8	56.6	459	27	0.589	25

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 VI

Company	Lease	Kratzmer-100 Acres	Well No.
			30
Depth Interval, Feet	608.98 - 617.50	620.85 - 625.60	609.00 - 625.50
Feet of Core Analyzed	3.87	3.45	7.20
Average Percent Porosity	19.61	19.30	19.49
Average Percent Original Oil Saturation	39.82	38.55	39.25
Average Percent Oil Recovery	14.37	14.32	14.49
Average Percent Residual Oil Saturation	25.45	24.23	24.76
Average Percent Residual Water Saturation	68.66	68.87	68.93
Average Percent Total Residual Fluid Saturation	94.11	93.10	93.69
Average Original Oil Content, Bbls./A. Ft.	601.	577.	591.
Average Oil Recovery, Bbls./A. Ft.	216.	216.	219.
Average Residual Oil Content, Bbls./A. Ft.	383.	361.	372.
Total Original Oil Content, Bbls./Acre	2,327.	1,990.	4,254.
Total Oil Recovery, Bbls./Acre	843.	746.	1,579.
Total Residual Oil Content, Bbls./Acre	1,484.	1,244.	2,675.
Average Effective Permeability, Millidarcys	1.82	3.88	2.83
Average Initial Fluid Production Pressure, p.s.i.	24.2	16.3	21.0

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

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RESULTS OF WATER DIFFERENTIATION TESTS
TABLE VII

Company Keweenaw Oil Company Lease Kretzner-100 Acres Well No. 30

Sample No.	Depth, Feet	Chloride Content of Brine in Sand ppm	Percent Water Saturation		Total
			Connate	Drilling & Foreign	
1	609.63	7,100			
2	611.83	4,200			
3	613.22	6,100			
4	614.32	5,200			
5	615.49	9,700			
6	616.98	9,000			
7	621.23	11,500			
8	622.63	6,500			
10	624.66	8,300			
11	625.36	14,200			

Note: ppm = parts per million

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SUMMARY OF WATER DIFFERENTIATION TESTS

TABLE VIII

Company Keweenaw Oil Company Lease Kretchner-100 Acres Well No. 30

Depth Interval, Feet	Chloride Content of Brine in Sand, ppm	Average Percent Connate Water	Average Percent Drilling & Foreign Water
608.98-617.50	7,733		
620.85-625.60	10,830		
609.00-625.50	8,741		

Note: ppm - parts per million