

OILFIELD RESEARCH LABORATORIES

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November 4, 1959

Weiner Petroleum Company
904 South Evergreen
Chanute, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis
of the Cable Tool core taken from the L. W. Hammann
Lease, Well No. W-5, Allen County, Kansas, and sub-
mitted to our laboratory on October 30, 1959.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Carl L. McElrea
Carl L. McElrea

CLM:cs

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23-26-18E

L.W. Hammann W-5

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company	Weiner Petroleum Company	Lease	L. W. Hammann	Well No.	W-5
Location	440' W. of E. Line & 880' S. of N. Line, SE $\frac{1}{4}$				
Section	23	Twp.	26S	Rge.	18E
		County	Allen		State Kansas
Name of Sand					Bartlesville
Top of Core					795.5
Bottom of Core					819.2
Top of Sand					802.0
Bottom of Sand					817.7
Total Feet of Permeable Sand					18.3
Total Feet of Floodable Sand					7.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.	
0 - 5	6.2	6.2	
5 - 10	6.1	12.3	
10 - 20	2.4	14.7	
20 - 40	2.3	17.0	
40 & above	1.3	18.3	
Average Permeability Millidarcys			17.5
Average Percent Porosity			18.0
Average Percent Oil Saturation			28.6
Average Percent Water Saturation			55.4
Average Oil Content, Bbls./A. Ft.			400.
Total Oil Content, Bbls./Acre			8,897.
Average Percent Oil Recovery by Laboratory Flooding Tests			6.3
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.			94.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre			592.
Total Calculated Oil Recovery, Bbls./Acre			1,130.
Packer Setting, Feet			
Viscosity, Centipoises @			
A. P. I. Gravity, degrees @ 60 °F			
Elevation, Feet			

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Weiner Petroleum Company Lease L. W. Hammann Well No. W-5

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
795.5 - 801.0	5.0	4.8	24.21
801.0 - 807.0	6.0	9.0	54.02
807.0 - 817.7	7.3	33.1	241.55
795.5 - 817.7	18.3	17.5	319.78

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
795.5 - 801.0	5.5	16.5	23.5	58.6	300	1,649
801.0 - 807.0	6.0	18.8	27.4	52.9	397	2,385
807.0 - 817.7	10.7	18.3	31.9	55.2	454	4,863
795.5 - 817.7	22.2	18.0	28.6	55.4	400	8,897

The sand was cored in fresh water.

Samples were taken from the core and sealed in cans by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
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795.5 - 806.4	- Light brown laminated shaley sandstone.
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806.4 - 808.0	- Brown slightly shaley sandstone.
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808.0 - 814.5	- Brown laminated shaley sandstone.
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814.5 - 817.7	- Brown to dark carbonaceous sandstone.
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817.7 - 819.2	- Dark carbonaceous sandstone.
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Coring was started at a depth of 795.5 feet in light brown laminated shaley sandstone and completed at 819.2 feet in dark carbonaceous sandstone. This core shows a total of 22.2 feet of sandstone. For the most part, the pay is made up of laminated shaley sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 4.8, 9.0 and 33.1 millidarcys respectively; the overall average being 17.5 (See Table III). By observing the data given on the core-graph, it is noticeable that the sand has an irregular permeability profile. The permeability of the sand varies from 1.3 to a maximum of 197 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 28.6. The weighted average percent oil saturation of the upper, middle and lower sections is 23.5, 27.4 and 31.9 respectively.

The weighted average percent water saturation of the upper, middle and lower sections is 58.6, 52.9 and 55.2 respectively; the overall average being 55.4 (See Table III). This gives an overall weighted average total fluid saturation of 84.0 percent.

The weighted average oil content of the upper, middle and lower sections is 300, 397 and 454 barrels per acre foot respectively; the overall average being 400. The total oil content, as shown by this core, is 8,897 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

Part of the sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 592 barrels of oil per acre was obtained from 6.3 feet of sand. The weighted average percent oil saturation was reduced from 34.3 to 28.0, or represents an average recovery of 6.3 percent. The weighted average effective permeability of the samples is 1.24 millidarcys, while the average initial fluid production pressure is 31.4 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 21 samples tested, 9 produced water and 7 oil. This indicates that approximately 43 percent of the sand represented by these samples will take water. The tests also show that the sand has a rather wide variation in effective permeability.

CONCLUSION

It is evident from the enclosed data that an efficient water-flood within the vicinity of this well will recover approximately 1,130 barrels of oil per acre, provided the sand will take the required volume of water satisfactorily. This represents an average recovery of 145 barrels of oil per acre foot from the 7.8 feet of floodable pay sand analyzed. The following factors and assumptions were used in calculating this recovery:

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Original formation volume factor	1.06
Present formation volume factor	1.03
True water saturation, percent	45.0
Primary oil recovery, percent	7.0
Calculated present oil saturation, percent	46.4
Porosity, percent	19.0
Oil saturation at abandonment, percent	28.0
Performance factor, percent	55.0

The analysis results show 7.8 feet of floodable sand in the interval extending from 802.0 to 817.7 feet. The floodable sand has fairly good oil and rather high water saturations. The pay sand has a rather wide variation in permeability with much of the pay being comparatively tight for the depth.

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RESULTS OF PERMEABILITY TESTS
TABLE I

Company Weiner Petroleum Company Lease L. W. Hammann Well No. W-5

Sample No.	Depth Feet	Permeability Millidarcys	Feet of Core		Permeability Capacity Ft. x Md.
			Ft.	Cum. Ft.	
1	796.0	5.9	0.7	0.7	4.13
2	796.5	7.2	0.7	1.4	5.04
3	797.3	8.0	0.6	2.0	4.80
4	797.8	4.3	0.5	2.5	2.15
5	798.2	2.7	0.5	3.0	1.35
6	798.8	Imp.	0.5	3.5	0.00
7	799.1	1.4	0.5	4.0	0.70
8	799.8	1.7	0.5	4.5	0.85
9	800.2	5.3	0.5	5.0	2.65
10	800.7	4.8	0.4	5.4	1.92
11	801.1	6.2	0.5	5.9	3.10
12	801.7	4.3	0.6	6.5	2.58
13	802.2	7.6	0.5	7.0	3.80
14	802.7	10.	0.7	7.7	7.00
15	803.7	4.0	0.8	8.5	3.20
16	804.2	14.	0.8	9.3	11.20
17	805.3	3.7	0.7	10.0	2.59
18	805.8	5.7	0.5	10.5	2.85
19	806.2	5.3	0.4	10.9	2.12
20	806.8	27.	0.6	11.5	16.20
21	807.2	26.	0.5	12.0	13.00
22	807.8	30.	0.5	12.5	15.00
23	808.3	3.7	0.6	13.1	2.22
24	808.9	1.3	0.5	13.6	0.65
25	809.3	15.	0.5	14.1	7.50
26	809.8	17.	0.4	14.5	6.80
27	810.2	8.5	0.5	15.0	4.25
28	810.7	25.	0.7	15.7	17.50
29	811.7	Imp.	0.8	16.5	0.00
30	812.2	8.1	0.5	17.0	4.05
31	812.8	Imp.	0.6	17.6	0.00
32	814.2	9.2	0.7	18.3	6.44
33	814.7	Imp.	0.5	18.8	0.00
34	815.2	Imp.	0.8	19.6	0.00
35	816.1	3.9	0.6	20.2	2.34
36	816.6	67.	0.4	20.6	26.80
37	817.1	197.	0.6	21.2	118.20
38	817.6	56.	0.3	21.5	16.80

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RESULTS OF SATURATION TESTS

TABLE II

Company Weiner Petroleum Company Lease L. W. Hammann Well No. W-5

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	796.3	15.2	26	53	79	307	1.5	1.5	460
2	797.6	16.9	28	56	84	367	1.0	2.5	367
3	798.6	17.7	22	62	84	302	1.0	3.5	302
4	799.5	16.2	21	64	85	264	1.0	4.5	264
5	800.5	17.4	19	61	80	256	1.0	5.5	256
6	801.5	16.9	28	52	80	367	1.0	6.5	367
7	802.4	18.7	30	51	81	435	1.0	7.5	435
8	803.5	19.0	28	55	83	413	1.0	8.5	413
9	804.4	18.3	27	62	89	383	1.0	9.5	383
10	805.5	20.5	25	49	74	398	1.4	10.9	557
11	806.5	18.3	27	48	75	384	0.6	11.5	230
12	807.5	19.0	37	58	95	546	1.0	12.5	546
13	808.5	17.4	30	59	89	405	1.0	13.5	405
14	809.5	19.3	28	61	89	419	1.0	14.5	419
15	810.5	20.0	39	52	91	605	1.0	15.5	605
16	811.4	17.7	32	58	90	440	1.0	16.5	440
17	812.5	17.5	31	55	86	420	1.0	17.5	420
18	813.4	16.2	34	59	93	427	0.5	18.0	214
F-18	813.6	19.6	23	-	-	350	0.5	18.5	175
F-19	814.4	18.6	30	-	-	433	0.5	19.0	217
19	814.6	14.7	21	69	90	239	0.5	19.5	119
20	815.5	18.6	27	47	74	390	0.8	20.3	312
21	816.3	17.8	31	47	78	428	0.6	20.9	257
F-21	816.5	18.7	40	-	-	580	0.4	21.3	232
22	817.3	18.9	38	45	83	557	0.9	22.2	502
							Total-	- - - - -	-8,897

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Weiner Petroleum Company	Lease	L. W. Hammann	Well No.	W-5
Depth Interval, Feet	802.0 - 817.7				
Feet of Core Analyzed	6.3				
Average Percent Porosity	19.1				
Average Percent Original Oil Saturation	34.3				
Average Percent Oil Recovery	6.3				
Average Percent Residual Oil Saturation	28.0				
Average Percent Residual Water Saturation	64.1				
Average Percent Total Residual Fluid Saturation	92.1				
Average Original Oil Content, Bbls./A. Ft.	509.				
Average Oil Recovery, Bbls./A. Ft.	94.				
Average Residual Oil Content, Bbls./A. Ft.	415.				
Total Original Oil Content, Bbls./Acre	3,208.				
Total Oil Recovery, Bbls./Acre	592.				
Total Residual Oil Content, Bbls./Acre	2,616.				
Average Effective Permeability, Millidarcys	1.24				
Average Initial Fluid Production Pressure, p.s.i.	31.4				

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

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Weiner Petroleum Company Lease L. W. Hammann Well No. W-5

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	796.3	14.8	23	264	0	0	23	74	264	0	Imp.	50+
2	797.6	17.3	27	362	0	0	27	65	362	0	Imp.	50+
3	798.4	17.1	19	252	0	0	19	67	252	0	Imp.	50+
4	799.3	16.1	23	288	0	0	23	62	288	0	Imp.	50+
6	801.3	16.5	25	320	0	0	25	59	320	0	Imp.	50+
7	802.4	19.0	30	442	4	59	26	68	383	20	0.814	35
8	803.5	18.4	28	400	0	0	28	63	400	0	Imp.	50+
9	804.4	18.5	24	345	0	0	24	70	345	13	0.465	35
10	805.5	20.3	28	441	0	0	28	68	441	0	Imp.	50+
11	806.5	18.4	25	358	0	0	25	71	358	0	Imp.	50+
12	807.5	18.6	37	534	12	173	25	71	361	14	0.454	15
13	808.7	18.1	29	408	0	0	29	59	408	0	Imp.	50+
14	809.5	19.7	28	428	5	76	23	67	352	14	0.459	25
15	810.5	19.5	39	590	8	121	31	63	469	1	0.142	50
16	811.1	18.5	32	459	5	72	27	58	387	28	1.06	35
17	812.5	17.3	28	376	0	0	28	62	376	0	Imp.	50+
18	813.6	19.6	23	350	0	0	23	68	350	10	0.348	35
19	814.4	18.6	30	433	0	0	30	53	433	0	Imp.	50+
20	815.5	18.2	30	424	0	0	30	50	424	0	Imp.	50+
21	816.5	18.7	40	580	4	58	36	62	522	7	0.143	35
22	817.3	19.3	38	569	5	75	33	59	494	121	5.35	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.