

OILFIELD RESEARCH LABORATORIES

- REGISTERED ENGINEERS -

813 EAST SIXTH
OKMULGEE, OKLAHOMA
PHONE: 4444

Chanute, Kansas

536 N. HIGHLAND
CHANUTE, KANSAS
PHONE: 728

June 14, 1961

Herbert Weder
Highland, Illinois

Dear Sir:

Enclosed herewith is the report of the analysis of the Cable Tool core taken from the Chris Hastert Lease, Well No. 6, Anderson County, Kansas, and submitted to our laboratory on June 9, 1961.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Benjamin R. Pearman

BRP:rf

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GENERAL INFORMATION & SUMMARY

Company Herbert Weder Lease Chris Hastert Well No. 6

Location _____

Section 13 Twp. 20S Rge. 20E County Anderson State Kansas

Name of Sand - - - - -	Bartlesville
Top of Core - - - - -	785.0
Bottom of Core - - - - -	801.2
Top of Sand - - - - - (Reported)	784.0
Bottom of Sand - - - - -	797.0
Total Feet of Permeable Sand - - - - - (Analyzed)	12.0
Total Feet of Floodable Sand - - - - - (Analyzed)	12.0

Distribution of Permeable Sand:
Permeability Range
Millidarcys

	Feet	Cum. Ft.
0 - 100	1.6	1.6
100 - 300	7.4	9.0
300 - 350	3.0	12.0

Average Permeability Millidarcys - - - - -	230.4
Average Percent Porosity - - - - -	23.4
Average Percent Oil Saturation - - - - -	50.2
Average Percent Water Saturation - - - - -	23.8
Average Oil Content, Bbls./A. Ft. - - - - -	905.
Total Oil Content, Bbls./Acre - - - - -	10,885.
Average Percent Oil Recovery by Laboratory Flooding Tests - - - - -	7.2
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - -	130.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - -	1,557.
Total Calculated Oil Recovery, Bbls./Acre - (Primary and Secondary)	3,630.
Packer Setting, Feet - - - - -	
Viscosity, Centipoises @ - - - - -	
A. P. I. Gravity, degrees @ 60 °F - - - - - (Reported)	23.0
Elevation, Feet - - - - -	

This core was taken with a cable tool core barrel using fresh water as the coring fluid. The well was drilled in virgin territory. The core was sampled and the samples sealed in cans by a representative of Oilfield Research Laboratories.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Description Feet

785.0 - 797.0 - Dark brown sandstone.

797.0 - 797.3 - Coal

797.3 - 801.2 - Shale.

Coring was started at a depth of 785.0 feet in sandstone and completed at 801.2 feet in shale. This core shows a total of 12.0 feet of sandstone. For the most part, the pay is made up of dark 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 180.0 and 274.0 millidarcys respectively; the overall average being 230.4 (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 52 to a maximum of 332 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 50.2. The weighted average percent oil saturation of the upper and lower sections is 46.5 and 53.6 respectively. The weighted average percent water saturation of the upper and lower sections is 26.0 and 22.0 respectively; the overall average being 23.8 (See Table

III). This gives an overall weighted average total fluid saturation of 74.0 percent. This low total fluid saturation indicates considerable fluid was lost during coring which was probably oil.

The weighted average oil content of the upper and lower sections is 845 and 964 barrels per acre foot respectively; the overall average being 905. The total oil content, as shown by this core, is 10,885 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 1,557 barrels of oil per acre was obtained from 12.0 feet of sand. The weighted average percent oil saturation was reduced from 50.3 to 43.1, or represents an average recovery of 7.2 percent. The weighted average effective permeability of the samples is 7.65 millidarcys, while the average initial fluid production pressure is 17.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 12 samples tested, all produced water and oil. This indicates that approximately 100 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 an efficient water-flood in the vicinity of this well should recover approximately 3,200 barrels of oil per acre. This represents an average recovery of 266 barrels of oil per acre foot from the 12 feet of floodable pay sand analyzed in this core. The calculated primary recovery is approximately 430 barrels per acre. The following data and assumptions were used in calculating the above recovery values:

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-4-

Original formation volume factor	1.04
Reservoir water saturation, percent	20.0
Average porosity, percent	23.4
Oil saturation after flooding, percent	43.1
Performance factor, percent	45.0
Net floodable pay sand, feet	12.0

This core shows a clean sand section having a good oil saturation, a low water saturation and good effective permeability to water. The low gravity of the oil would tend to indicate that the viscosity of the oil would be quite high and that some difficulty might be encountered in carrying out a successful water-flood. For this reason, it is recommended that a small pilot flood be attempted prior to any full scale water-flood development.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Herbert Weder Lease Chris Hastert Well No. 6

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	785.1	23.0	47	22	69	839	52.	0.6	0.6	503	31.20
2	786.1	24.5	46	24	70	874	332.	1.0	1.6	874	332.00
3	787.1	23.9	46	26	72	853	140.	1.0	2.6	853	140.00
4	788.1	22.7	47	30	77	828	276.	1.0	3.6	828	276.00
5	789.1	23.9	44	26	70	815	138.	1.0	4.6	815	138.00
6	790.1	22.4	49	26	75	851	92.	1.0	5.6	851	92.00
7	791.1	25.4	49	26	75	965	317.	1.0	6.6	965	317.00
8	792.1	23.0	48	28	76	856	272.	1.0	7.6	856	272.00
9	793.1	24.1	49	24	73	916	330.	1.0	8.6	916	330.00
10	794.1	23.9	55	18	73	1,020	216.	1.0	9.6	1,020	216.00
11	795.1	22.9	55	19	74	971	269.	1.0	10.6	971	269.00
12	796.1	21.3	62	18	80	1,024	249.	1.4	12.0	1,433	348.60

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease	Well No.
Herbert Weder	Chris Hastert	6

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
785.0 - 790.6	5.6	180.0	1009.20
790.6 - 797.0	6.4	274.0	1752.60
785.0 - 797.0	12.0	230.4	2761.80

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
785.0 - 790.6	5.6	23.4	46.5	26.0	845	4,724
790.6 - 797.0	6.4	23.3	53.6	22.0	964	6,161
785.0 - 797.0	12.0	23.4	50.2	23.8	905	10,885

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company		Herbert Weder		Lease		Chris Hastert		Well No.		6	
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			
1	785.1	23.4	47	853	9	163	38	47	70	4.00	20
2	786.1	24.9	46	888	6	116	40	41	247	13.00	10
3	787.1	23.4	46	835	6	109	40	59	327	16.00	10
4	788.1	23.1	47	842	8	143	39	52	374	13.65	20
5	789.1	23.6	44	805	8	146	36	57	290	13.85	20
6	790.1	22.0	49	835	3	51	46	52	40	0.942	20
7	791.1	25.6	49	973	4	79	45	46	208	12.00	20
8	792.1	23.4	48	871	8	145	40	54	264	11.10	20
9	793.1	23.9	49	908	6	111	43	45	68	3.19	20
10	794.1	23.4	55	998	15	272	40	45	37	1.10	20
11	795.1	22.6	55	964	7	123	48	40	22	0.974	20
12	796.1	21.5	62	1,033	7	117	55	35	74	2.61	10

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	Herbert Weder	Lease	Chris Hastert	Well No.	6
Depth Interval, Feet	785.0 - 790.6 790.6 - 797.0 785.0 - 797.0				
Feet of Core Analyzed	5.6	6.4		12.0	
Average Percent Porosity	23.4	23.3		23.4	
Average Percent Original Oil Saturation	46.4	53.6		50.3	
Average Percent Oil Recovery	6.5	7.8		7.2	
Average Percent Residual Oil Saturation	39.9	45.8		43.1	
Average Percent Residual Water Saturation	51.6	43.6		47.3	
Average Percent Total Residual Fluid Saturation	91.5	89.4		90.4	
Average Original Oil Content, Bbls./A. Ft.	843.	964.		906.	
Average Oil Recovery, Bbls./A. Ft.	118.	140.		130.	
Average Residual Oil Content, Bbls./A. Ft.	725.	824.		776.	
Total Original Oil Content, Bbls./Acre	4,717.	6,160.		10,877.	
Total Oil Recovery, Bbls./Acre	663.	894.		1,557.	
Total Residual Oil Content, Bbls./Acre	4,054.	5,266.		9,320.	
Average Effective Permeability, Millidarcys	10.70	5.01		7.65	
Average Initial Fluid Production Pressure, p.s.i.	16.7	18.3		17.5	

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