

OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND · CHANUTE, KANSAS 66720 · PHONE (316) 431-2650

July 9, 1980

Hickory Creek Oil Company
Box 379
Parsons, Kansas 67357

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-173, and submitted to our laboratory on May 21, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

SAM/tem

4 c to Parsons, Kansas
1 c to Chanute, Kansas

- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

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GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease --- Well No. HCO-173

Location ---

Section --- Twp. --- Rge. --- County --- State ---

Elevation, Feet - - - - -

Name of Sand - - - - -

Top of Core - - - - - 188.5

Bottom of Core - - - - - 208.3

Top of Sand - - - - - 188.5

Bottom of Sand - - - - - 208.3

Total Feet of Permeable Sand - - - - - 19.8

Total Feet of Floodable Sand - - - - - 8.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 100	7.3	7.3
100 - 200	10.0	17.3
200 - 300	2.5	19.8

Average Permeability Millidarcys - - - - - 140.2

Average Percent Porosity - - - - - 23.2

Average Percent Oil Saturation - - - - - 33.9

Average Percent Water Saturation - - - - - 42.8

Average Oil Content, Bbls./A. Ft. - - - - - 599.

Total Oil Content, Bbls./Acre - - - - - 11,865.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 2.9

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 51.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 450.

Total Calculated Oil Recovery, Bbls./Acre - - - - - See "Calculated Recovery" Section.

-2-

The core was sampled and the samples sealed in plastic bags by a representative of the client.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
188.5 - 208.3	Brown slightly calcareous sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 450 barrels of oil per acre was obtained from 8.8 feet of sand. The weighted average percent oil saturation was reduced from 36.4 to 33.5, or represents an average recovery of 2.9 percent. The weighted average effective permeability of the samples is 11.86 millidarcys, while the average initial fluid production pressure is 13.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 14 samples tested, 6 produced water and oil, and 8 samples produced water only. This indicates that approximately 43 percent of the sand represented by these samples is floodable pay sand.

CALCULATED RECOVERY

It would appear from a study of the core data that efficient primary and waterflood operations in the vicinity of this well should recover approximately 2,870 barrels of oil per acre. This is an average recovery of 326 barrels per acre foot from 8.8 feet of floodable sand analyzed in this core.

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LONG 23

-3-

These recovery values were calculated using the following data and assumptions:

Original formation volume factor, estimated

✓ 1.03

Reservoir water saturation, percent, estimated

25.0 / 38.3

Average porosity, percent

21.4 / 23.0

Oil saturation after flooding, percent

33.5 / 34.8

Performance factor, percent, estimated

✓ 50.0

Net floodable sand, feet

8.8 / 7.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease 4 - 23 Well No. HCO-173

2749.4 323.9 590 2128

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			Ft.	Cum. Ft.		
1	188.9	21.9	41	30	697	212.	0.5	0.5	349	106.00
2	189.5	18.0	45	44	628	196.	1.0	1.5	628	196.00
3	190.5	23.6	38	38	696	200.	1.0	2.5	696	200.00
4	191.5	24.3	34	44	641	142.	1.0	3.5	641	142.00
5	192.5	25.8	44	45	881	150.	1.0	4.5	881	150.00
6	193.5	19.8	34	41	522	90.	1.0	5.5	522	90.00
7	194.5	26.0	38	40	767	195.	1.0	6.5	767	195.00
8	195.5	24.6	32	49	611	199.	1.0	7.5	611	199.00
10	197.5	24.1	30	47	561	223.	2.0	9.5	1122	446.00
12	199.5	24.0	32	55	596	189.	2.0	11.5	1192	378.00
14	201.5	19.6	34	45	517	42.	2.0	13.5	1034	84.00
16	203.5	21.6	36	42	603	169.	2.0	15.5	1206	338.00
17	204.5	32.2	22	27	550	52.	2.0	17.5	1100	104.00
19	206.5	18.4	34	43	485	64.	2.3	19.8	1116	147.20

1.33 = 30.13
1 - 38.13
= 61.87

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Hickory Creek Oil Company	Lease	Well No.	HCO-173			
	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.			
	188.5 - 195.0	6.5	166.0	1079.00			
	195.0 - 208.3	13.3	127.5	1696.20			
	188.5 - 208.3	19.8	140.2	2775.20			
	Depth Interval, Feet	Feet of Core Analyzed	Average Percent Saturation	Average Percent Water Saturation	Average Oil Content Ebl./A. Ft.	Total Oil Content Bbls./Acre	
	188.5 - 195.0	6.5	22.9	39.0	41.1	690	4,484
	195.0 - 208.3	13.3	23.3	31.4	43.6	555	7,381
	188.5 - 208.3	19.8	23.2	33.9	42.8	599	11,865

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Hickory Creek Oil Company

Lease

LONG - 23

Well No.

HCO-173

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	188.9	21.8	41	693	4	68.5	37	51	330	31.49	10
2	189.5	18.2	45	635	0	0	45	50	339	31.23	10
3	190.5	23.3	38	687	0	0	38	53	164	15.00	10
4	191.5	24.3	34	641	0	0	34	63	264	15.24	10
5	192.5	26.0	44	888	6	121.1	38	52	229	24.37	10
6	193.5	19.7	34	520	0	0	34	61	11	0.15	50
7	194.5	25.8	38	761	5	100	33	61	238	22.79	10
8	195.5	24.7	32	613	0	0	32	62	298	22.50	10
10	197.5	24.3	30	566	0	0	30	63	211	18.90	10
12	199.5	23.9	32	593	0	0	32	65	194	14.24	10
14	201.5	20.0	34	528	2	31.2	32	63	345	14.24	15
16	203.5	21.5	36	600	2	33.2	34	62	198	3.37	15
17	204.5	32.1	22	548	0	0	22	61	318	8.50	10
19	206.5	18.4	34	485	2	29.2	32	65	162	2.70	20

50% = 37.5
= 37.8

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.

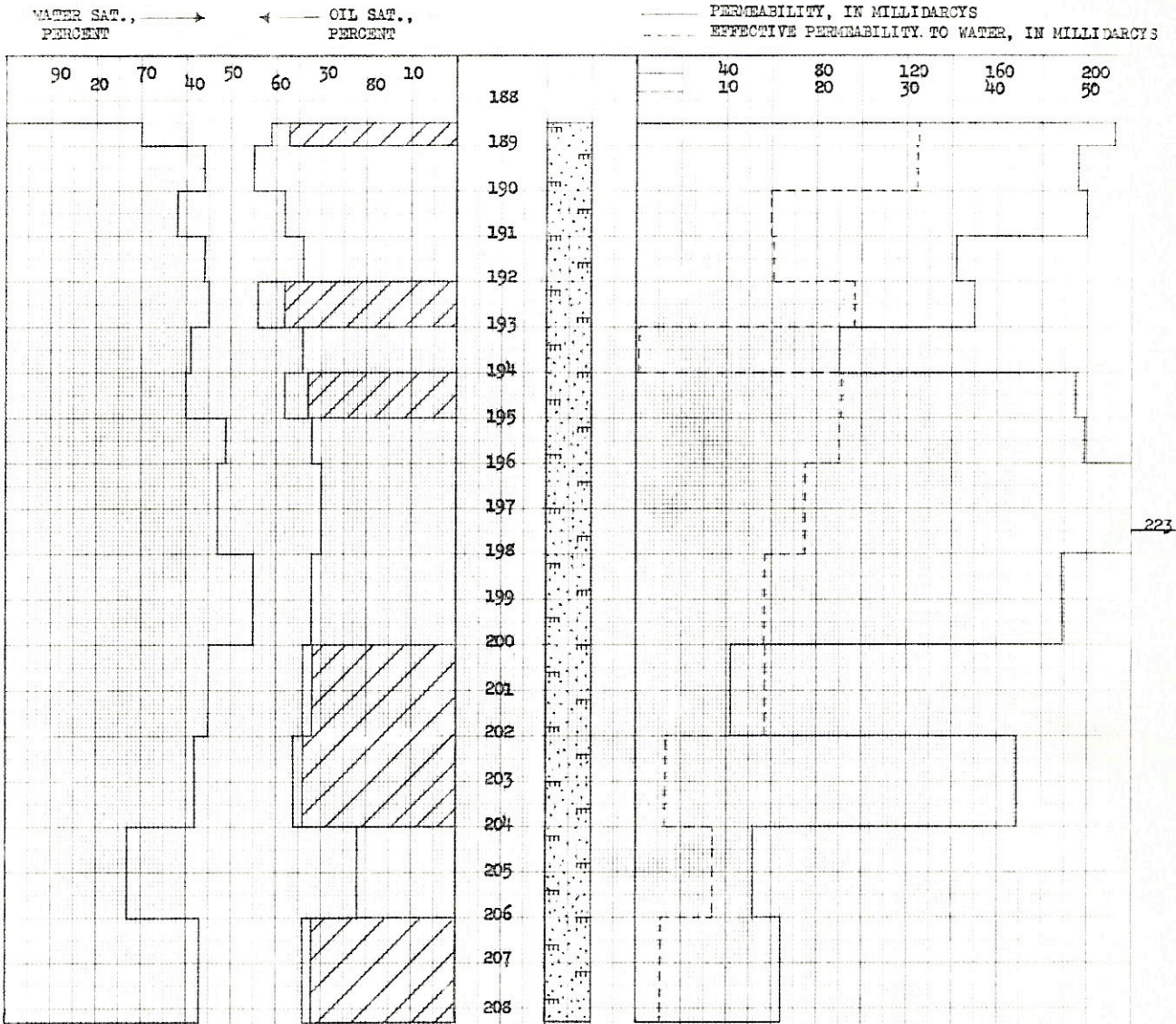
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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Lease	Well No.
Hickory Creek Oil Company	--	HCO-173
Depth Interval, Feet	188.5 - 195.0	195.0 - 208.3
Feet of Core Analyzed	2.5	6.3
Average Percent Porosity	25.1	19.9
Average Percent Original Oil Saturation	41.0	34.6
Average Percent Oil Recovery	5.2	2.0
Average Percent Residual Oil Saturation	35.8	32.6
Average Percent Residual Water Saturation	55.4	63.4
Average Percent Total Residual Fluid Saturation	91.2	96.0
Average Original Oil Content, Bbls./A. Ft.	798.	534.
Average Oil Recovery, Bbls./A. Ft.	102.	31.
Average Residual Oil Content, Bbls./A. Ft.	696.	503.
Total Original Oil Content, Bbls./Acre	1,996.	3,361.
Total Oil Recovery, Bbls./Acre	255.	195.
Total Residual Oil Content, Bbls./Acre	1,741.	3,166.
Average Effective Permeability, Millidarcys	25.16	6.58
Average Initial Fluid Production Pressure, p.s.i.	10.0	16.7
	188.5 - 208.3	188.5 - 208.3
	8.8	21.4
	36.4	33.5
	2.9	61.1
	94.6	609.
	51.	558.
	5,357.	450.
	4,907.	11.86
	13.3	

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



KEY:

CALCAREOUS SANDSTONE

FLOODPOT RESIDUAL OIL SATURATION

HICKORY CREEK OIL COMPANY

LEASE

WELL NO. HCO-173

COUNTY, _____

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY MILLIDARCS	CALCULATED OIL RECOVERY, BHLS./ACRE
188.5 - 195.0	6.5	22.9	39.0	41.1	166.0	
195.0 - 208.3	13.3	23.3	31.4	43.6	127.5	
188.5 - 208.3	19.8	23.2	33.9	42.8	140.2	2,870 (PRIMARY & WATERFLOODING)

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 CHANUTE, KANSAS
 JULY, 1980

VM