

OILFIELD RESEARCH LABORATORIES

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

15-037-20477

March 11, 1980

Hickory Creek Oil Company
P.O. Box 379
Parsons, Kansas 67357

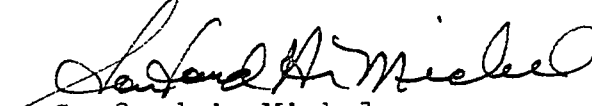
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from well No. HCO-126, and submitted to our laboratory on February 20, 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-126

Location -

Section - Twp - Rge - County - State -

Elevation, Feet - - - - -

Name of Sand - - - - -

Top of Core - - - - - 162.0

Bottom of Core - - - - - 202.6

Top of Sand - - - - - 166.3

Bottom of Sand - - - - - 202.6

Total Feet of Permeable Sand - - - - - 24.1

Total Feet of Floodable Sand - - - - - 17.3

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 10	5.4	5.4
10 - 50	8.2	13.6
50 - 100	5.6	19.2
100 - 150	3.2	22.4
150 - 200	1.7	24.1

Average Permeability Millidarcys - - - - - 62.2

Average Percent Porosity - - - - - 20.2

Average Percent Oil Saturation - - - - - 42.4

Average Percent Water Saturation - - - - - 39.1

Average Oil Content, Bbls./A. Ft. - - - - - 659.

Total Oil Content, Bbls./Acre - - - - - 15,873.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 7.8

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 120.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 2,074.

Total Calculated Oil Recovery, Bbls./Acre - - - - -

See "Calculated
Recovery" Section.

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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>
162.0 - 166.3	Gray sandy shale.
166.3 - 166.9	Grayish brown shaly sandstone.
166.9 - 172.9	Gray sandy shale.
172.9 - 175.8	Light brown shaly sandstone.
175.8 - 177.4	Brown sandstone.
177.4 - 179.0	Gray sandy shale.
179.0 - 179.7	Brown slightly shaly sandstone.
179.7 - 181.3	Brown shaly sandstone.
181.3 - 181.6	Brown sandstone.
181.6 - 182.3	Gray shaly sandstone.
182.3 - 188.6	Brown sandstone.
188.6 - 189.8	Gray sandy shale.
189.8 - 194.7	Dark brown sandstone.
194.7 - 195.0	Gray sandy shale.
195.0 - 196.7	Brown sandstone.
196.7 - 197.7	Grayish brown shaly sandstone.
197.7 - 201.4	Dark brown sandstone.
201.4 - 202.6	Black carbonaceous sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2,074 barrels of oil per acre was obtained from 17.3 feet of sand. The weighted average percent oil saturation was reduced from 44.1 to 36.3, or represents an average recovery of 7.8 percent. The weighted average effective permeability of the samples is 7.87 millidarcys, while the average initial fluid production pressure is 28.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 19 samples tested, 12 produced water and oil, and 4 samples produced water only. This indicates that approximately 63 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 5,780 barrels of oil per acre. This is an average recovery of 334 barrels per acre foot from 17.3 feet of floodable sand analyzed in this core.

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

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SARTIN 22

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Original formation volume factor, estimated

✓ 1.03

Reservoir water saturation, percent, estimated

20.0 / 30.7

Average porosity, percent

20.8 / 19.3

Oil saturation after flooding, percent

✓ 36.3

Performance factor, percent, estimated

✓ 50.0

Net floodable sand, feet

17.3 / 9.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - 5-22 Well No. HCO-126

3503.0 370.3 750 951.94

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	166.6	15.6	50	44	94	605	0.98	0.6	0.6	363	0.59
2	173.6	18.5	36	36	72	517	1.9	1.1	1.7	569	2.09
3	174.5	16.7	39	40	79	505	2.5	1.0	2.7	505	2.50
4	175.7	18.1	41	50	91	576	4.5	0.8	3.5	461	3.60
5	176.5	20.7	50	25	75	803	24.	1.0	4.5	803	4.50
6	177.3	19.7	44	23	67	673	43.	0.6	5.1	404	25.80
7	179.5	11.5	51	47	98	455	18.	0.7	5.8	319	12.60
8	180.5	21.1	50	33	83	819	9.1	1.6	7.4	1310	14.56
9	181.5	18.3	26	50	76	369	0.96	0.3	7.7	111	0.29
10	182.5	16.4	50	30	80	636	18.	1.7	9.4	1081	30.60
(12)	184.7	23.9	41	(35)	76	760	96.	2.0	11.4	1520	192.00
14	186.6	22.1	39	(44)	83	669	90.	1.6	13.0	1070	144.00
16	188.5	20.1	38	(44)	82	593	43.	1.0	14.0	593	43.00
17	190.5	16.4	50	(42)	92	636	27.	1.7	15.7	1081	45.90
19	192.5	24.5	41	(42)	83	779	43.	1.5	17.2	1169	64.50
21	194.5	23.3	45	(45)	90	813	193.	1.7	18.9	1382	328.10
23	196.5	18.2	31	45	76	438	99.	2.0	20.9	856	198.00
26	199.5	23.3	37	(39)	76	669	127.	2.0	22.9	1338	254.00
28	201.5	21.9	46	(36)	82	782	111.	1.2	24.1	938	133.20

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-126

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
166.3 - 181.6	7.7	8.6	66.53
182.3 - 202.6	16.4	87.4	1433.30
166.3 - 202.6	24.1	62.2	1499.83

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
166.3 - 181.6	7.7	18.3	44.3	37.1	629	4,845
182.3 - 202.6	16.4	21.0	41.6	40.1	672	11,028
166.3 - 202.6	24.1	20.2	42.4	39.1	659	15,873

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease -5-22 Well No. HCO-126

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation			Volume of Water Recovered cc*	95.96 Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	166.6	16.0	49	608	0	0	49	46	608	0	Imp.	-
2	173.6	18.0	36	503	0	0	36	53	503	9	0.30	50
3	174.5	16.9	39	511	0	0	39	50	511	0	Imp.	-
4	175.7	18.4	41	585	6	86	35	53	499	100	2.10	25
5	176.5	21.0	50	815	17	277	33	64	538	263	8.62	25
6	177.3	19.5	44	666	0	0	44	40	666	0	Imp.	-
7	179.5	12.0	51	475	11	102	40	58	373	4	0.15	50
8	180.5	20.9	50	811	14	227	36	60	584	6	0.15	40
9	181.5	18.7	26	377	0	0	26	72	377	51	0.90	35
10	182.5	16.9	50	656	14	184	36	60	472	46	0.90	35
12	184.7	23.8	41	757	4	74	37	60	683	298	8.10	25
14	186.6	21.9	39	663	3	51	36	61	612	301	6.90	25
16	188.5	20.0	38	590	3	47	35	62	543	41	0.75	35
17	190.5	16.7	50	648	10	130	40	56	518	357	9.00	20
19	192.5	24.4	41	776	7	133	34	62	643	210	22.49	20
21	194.5	23.0	45	803	7	125	38	58	678	258	15.00	20
23	196.5	18.5	31	445	0	0	31	65	445	381	7.87	20
26	199.5	23.4	37	672	2	36	35	60	636	198	10.71	20
28	201.5	21.8	46	778	0	0	46	40	778	117	2.02	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 V

Company	Hickory Creek Oil Company		Lease	-	Well No.	HCO-126
Depth Interval, Feet	166.3 - 181.6	182.3 - 202.6			166.3 - 202.6	
Feet of Core Analyzed	4.1	13.2			17.3	
Average Percent Porosity	18.9	21.4			20.8	
Average Percent Original Oil Saturation	48.5	42.8			44.1	
Average Percent Oil Recovery	12.7	6.3			7.8	
Average Percent Residual Oil Saturation	35.8	36.5			36.3	
Average Percent Residual Water Saturation	59.3	59.1			59.1	
Average Percent Total Residual Fluid Saturation	95.1	95.6			95.4	
Average Original Oil Content, Bbls./A. Ft.	710.	701.			703.	
Average Oil Recovery, Bbls./A. Ft.	190.	98.			120.	
Average Residual Oil Content, Bbls./A. Ft.	520.	603.			583.	
Total Original Oil Content, Bbls./Acre	2,913.	9,254.			12,167.	
Total Oil Recovery, Bbls./Acre	780.	1,294.			2,074.	
Total Residual Oil Content, Bbls./Acre	2,133.	7,960.			10,093.	
Average Effective Permeability, Millidarcys	2.60	9.51			7.87	
Average Initial Fluid Production Pressure, p.s.i.	35.0	25.0			28.3	

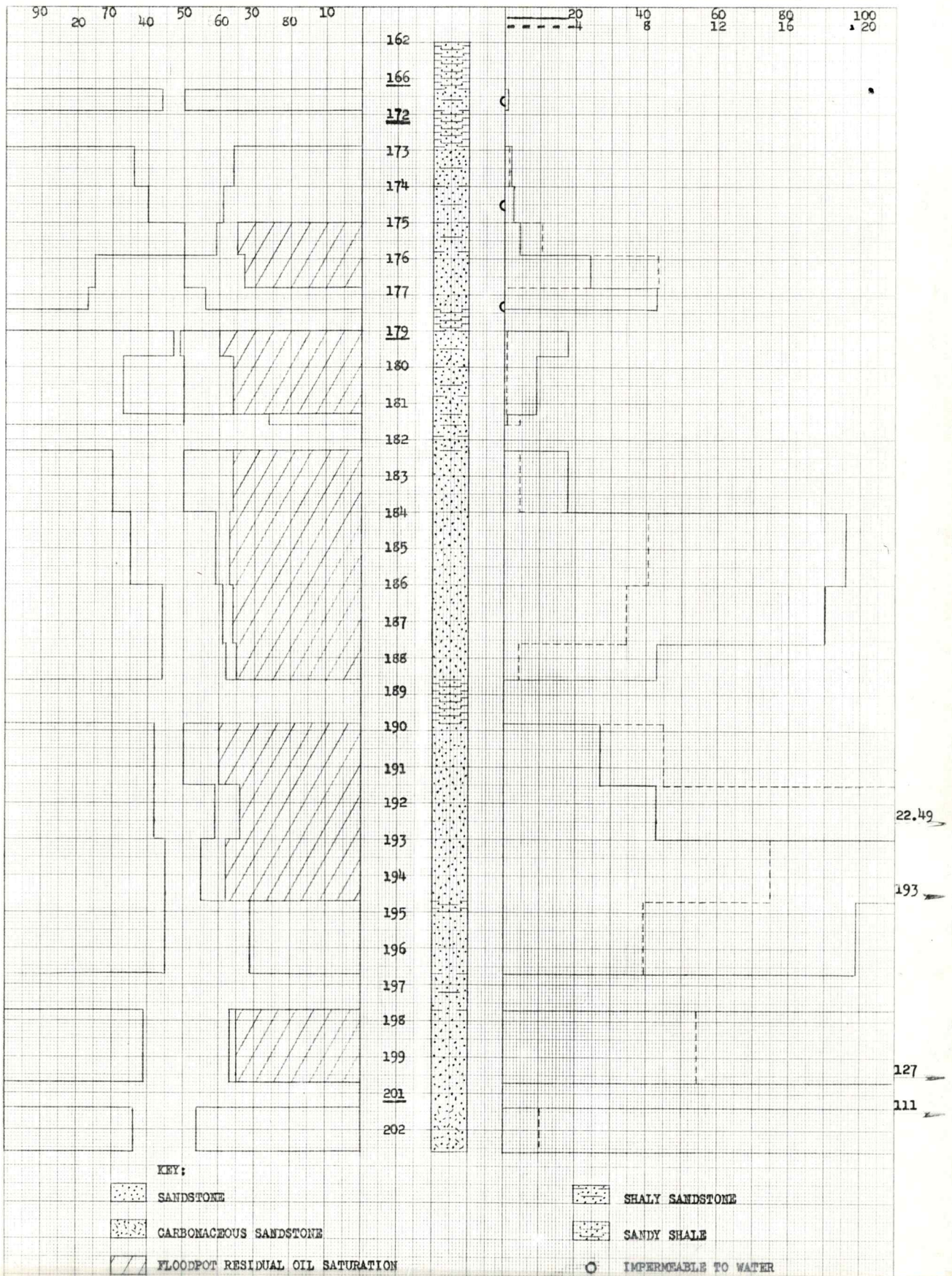
NOTE: Only those samples which recovered oil were used in calculating the above averages.

WATER SAT.,
PERCENT

OIL SAT.,
PERCENT

PERMEABILITY, IN MILLIDARCY

EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCY



HICKORY CREEK OIL COMPANY

-- LEASE

WELL NO. HCO - 126

-- COUNTY, --

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCY	CALCULATED OIL RECOVERY BBL./ACRE
166.3 - 181.6	7.7	18.3	44.3	37.1	8.6	
182.3 - 202.6	16.4	21.0	41.6	40.1	87.4	
166.3 - 202.6	24.1	20.2	42.4	39.1	62.2	5,780 (PRIMARY AND WATERFLOODING)

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CHANUTE, KANSAS
MARCH, 1980. HR