



OILFIELD RESEARCH LABORATORIES

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15-037-20467

May 20, 1980

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

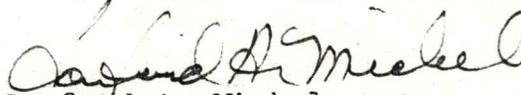
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-155, and submitted to our laboratory on April 14, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

SAM/kas

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

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GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease - Well No. HCO-155

Location -

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

Elevation, Feet - - - - -

Name of Sand - - - - -

Top of Core - - - - - 182.0

Bottom of Core - - - - - 202.3

Top of Sand - - - - - 182.0

Bottom of Sand - - - - - 202.3

Total Feet of Permeable Sand - - - - - 12.5

Total Feet of Floodable Sand - - - - - 12.5

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 100	3.2	3.2
100 - 200	4.2	7.4
200 - 400	3.2	10.6
600 - 700	1.9	12.5

Average Permeability Millidarcys - - - - - 235.2

Average Percent Porosity - - - - - 23.1

Average Percent Oil Saturation - - - - - 40.0

Average Percent Water Saturation - - - - - 40.5

Average Oil Content, Bbls./A. Ft. - - - - - 709.

Total Oil Content, Bbls./Acre - - - - - 8,866.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 5.1

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 88.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 1,097.

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

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>
182.0 - 184.9	Brown slightly calcareous sandstone.
184.9 - 192.7	Gray sandy shale.
192.7 - 196.0	Brown and gray laminated slightly calcareous sandstone and shale.
196.0 - 200.2	Brown slightly calcareous sandstone.
200.2 - 201.4	Brown and gray laminated slightly calcareous sandstone and shale.
201.4 - 202.3	Brown slightly calcareous sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,097 barrels of oil per acre was obtained from 12.5 feet of sand. The weighted average percent oil saturation was reduced from 40.0 to 35.8, or represents an average recovery of 5.1 percent. The weighted average effective permeability of the samples is 16.76 millidarcys, while the average initial fluid production pressure is 13.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 12 samples tested, 12 produced water and oil. This indicates that approximately 100 percent of the sand represented by these samples is floodable pay sand.

SARTIN 13

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 4,270 barrels of oil per acre. This is an average recovery of 341 barrels per acre foot from 12.5 feet of floodable sand analyzed in this core.

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	✓ 37.6
Average porosity, percent	23.2	✓
Oil saturation after flooding, percent	34.9	✓ 32.0
Performance factor, percent (estimated)	50.0	✓
Net floodable sand, feet	12.5	✓ 5.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - Well No. HCO-155

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	182.5	24.4	31	41	72	587	143.	1.0	1.0	587	143.00
2	183.5	24.3	34	33	67	641	172.	1.0	2.0	641	172.00
3	184.5	19.9	42	39	81	648	123.	0.9	2.9	583	110.70
4	193.5	22.3	40	36	76	692	105.	1.3	4.2	900	136.50
5	194.7	16.5	53	40	93	678	60.	1.0	5.2	678	60.00
6	195.6	24.7	45	29	74	862	23.	1.0	6.2	862	23.00
7	196.6	25.3	37	53	90	726	269.	1.0	7.2	726	269.00
8	197.5	20.3	45	37	82	709	340.	1.0	8.2	709	340.00
9	198.5	25.4	38	49	87	749	657.	1.0	9.2	749	657.00
10	199.6	24.4	43	37	80	814	360.	1.2	10.4	977	432.00
11	200.5	24.6	33	48	81	630	9.9	1.2	11.6	756	11.89
12	201.5	25.0	40	45	85	776	650.	0.9	12.5	698	585.00

2328.5

277.1

487

2911.9

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - SARTIN 13 Well No. HCO-155

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	182.5	24.4	31	41	72	587	143.	1.0	1.0	587	143.00
2	183.5	24.3	34	33	67	641	172.	1.0	2.0	641	172.00
3	184.5	19.9	42	39	81	648	123.	0.9	2.9	583	110.70
4	193.5	22.3	40	36	76	692	105.	1.3	4.2	900	136.50
5	194.7	16.5	53	40 ^x	93	678	60.	1.0	5.2	678	60.00
6	195.6	24.7	45	29 ^x	74	862	23.	1.0	6.2	862	23.00
7	196.6	25.3	37	53	90	726	269.	1.0	7.2	726	269.00
8	197.5	20.3	45	37	82	709	340.	1.0	8.2	709	340.00
9	198.5	25.4	38	49	87	749	657.	1.0	9.2	749	657.00
10	199.6	24.4	43	37	80	814	360.	1.2	10.4	977	432.00
11	200.5	24.6	33	48	81	630	9.9	1.2	11.6	756	11.89
12	201.5	25.0	40	45	85	776	650.	0.9	12.5	698	585.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-155

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
182.0 - 184.9	2.9	146.8	425.70
192.7 - 202.3	9.6	261.9	2514.39
182.0 - 202.3	12.5	235.2	2940.09

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
182.0 - 184.9	2.9	23.0	35.5	37.6	624	1,811
192.7 - 202.3	9.6	23.2	41.4	41.4	735	7,055
182.0 - 202.3	12.5	23.1	40.0	40.5	709	8,866

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease - SARTIN 13 Well No. HCO-155

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		418 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	182.5	24.7	31	594	2	38	29	50	556	275	18.00	15
2	183.5	24.5	34	646	3	57	31	57	589	384	16.86	10
3	184.5	20.2	42	658	6	94	36	50	564	185	1.35	30
4	193.5	22.2	40	689	5	86	35	60	603	108	2.17	20
5	194.7	17.0	52	686	16	211	36	57	475	251	30.00	10
6	195.6	24.3	45	848	10	189	35	55	659	239	3.09	10
7	196.6	25.6	37	735	3	60	34	56	675	516	24.63	10
8	197.5	20.5	45	716	3	48	42	48	668	262	10.68	15
9	198.5	25.5	38	752	6	119	32	58	633	427	37.50	10
10	199.6	24.4	43	814	2	38	42	55	776	298	16.07	15
11	200.5	24.5	33	627	2	38	31	62	599	353	25.49	10
12	201.5	25.0	40	776	5	97	35	54	679	194	16.50	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

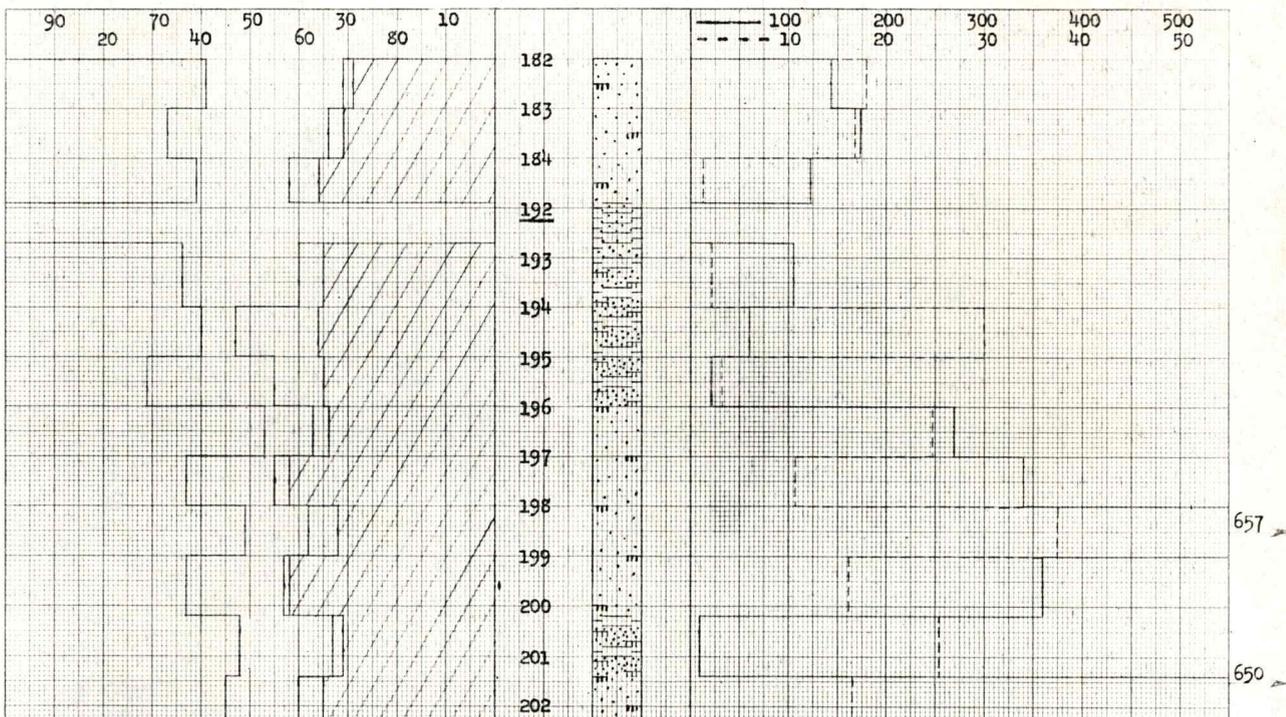
Company	Lease			Well No.
Hickory Creek Oil Company	-			HCO-155
Depth Interval, Feet	182.0 - 184.9	192.7 - 202.3	182.0 - 202.3	
Feet of Core Analyzed	2.9	9.6	12.5	
Average Percent Porosity	23.2	23.2	23.2	
Average Percent Original Oil Saturation	35.5	41.4	40.0	
Average Percent Oil Recovery	3.6	5.6	5.1	
Average Percent Residual Oil Saturation	31.9	35.8	34.9	
Average Percent Residual Water Saturation	52.4	56.4	55.4	
Average Percent Total Residual Fluid Saturation	84.3	92.2	90.3	
Average Original Oil Content, Bbls./A. Ft.	632.	718.	698.	
Average Oil Recovery, Bbls./A. Ft.	62.	96.	88.	
Average Residual Oil Content, Bbls./A. Ft.	570.	622.	610.	
Total Original Oil Content, Bbls./Acre	1,833.	6,891.	8,724.	
Total Oil Recovery, Bbls./Acre	180.	917.	1,097.	
Total Residual Oil Content, Bbls./Acre	1,653.	5,974.	7,627.	
Average Effective Permeability, Millidarcys	12.44	18.07	16.76	
Average Initial Fluid Production Pressure, p.s.i.	18.3	12.2	13.8	

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

WATER SAT.,
PERCENT

OIL SAT.,
PERCENT

47 1512
PERMEABILITY, IN MILLIDARCY
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCY



KEY:



CALCAREOUS SANDSTONE



LAMINATED CALCAREOUS SANDSTONE
AND SHALE



SANDY SHALE



FLOODPOT RESIDUAL OIL SATURATION

HICKORY CREEK OIL COMPANY

-- LEASE

WELL NO. HCO - 155

-- 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
182.0 - 184.9	2.9	23.0	35.5	37.6	146.8	
192.7 - 202.3	9.6	23.2	41.4	41.4	261.9	
182.0 - 202.3	12.5	23.1	40.0	40.5	235.2	4,270 (PRIMARY & WATERFLOODING)

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CHANUTE, KANSAS
MAY, 1980. HR