HICKORY CREEK OIL COMPANY

CORE ANALYSIS REPORT

WELL NO. HCO-128

OILFIELD RESEARCH LABORATORIES

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

March 17, 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-128, and submitted to our laboratory on February 22, 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

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease – Well No. HCO-128

Location –

Section – Twp. – Rge. – County – State –

Elevation, Feet	–
Name of Sand	–
Top of Core	168.0
Bottom of Core	206.7
Top of Sand	172.3
Bottom of Sand	206.7
Total Feet of Permeable Sand	28.4
Total Feet of Floodable Sand	16.5

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 10	5.3	5.3
10 - 50	9.2	14.5
50 - 100	7.5	22.0
100 - 200	4.4	26.4
300 - 400	2.0	28.4

Average Permeability Millidarcys	78.1
Average Percent Porosity	21.6
Average Percent Oil Saturation	44.6
Average Percent Water Saturation	33.0
Average Oil Content, Bbls./A. Ft.	743.
Total Oil Content, Bbls./Acre	21,113.
Average Percent Oil Recovery by Laboratory Flooding Tests	9.3
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	156.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	2,581.
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:

Depth Interval, Feet	Description
168.0 - 172.3	Gray sandy shale.
172.3 - 177.6	Dark brown sandstone.
177.6 - 179.0	Gray sandy shale.
179.0 - 180.1	Brown shaly sandstone.
180.1 - 181.6	Brown sandstone.
181.6 - 183.3	Grayish brown shaly sandstone.
183.3 - 184.2	Gray sandy shale.
184.2 - 184.8	Brown shaly sandstone.
184.8 - 186.5	Brown sandstone.
186.5 - 187.8	Grayish brown very shaly sandstone.
187.8 - 194.1	Dark brown sandstone.
194.1 - 194.4	Sandstone and shale conglomerate.
194.4 - 194.8	Brown sandstone.
194.8 - 196.7	Grayish brown sandstone and shale conglomerate.
196.7 - 197.4	Gray sandy shale.
197.4 - 203.8	Dark brown sandstone.
203.8 - 206.7	Dark brown slightly conglomeratic sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 2,581 barrels of oil per acre was obtained from 16.5 feet of sand. The weighted average percent oil saturation was reduced from 47.8 to 38.5, or represents an average recovery of 9.3 percent. The weighted average effective permeability of the samples is 3.13 millidarcys, while the average initial fluid production pressure is 29.6 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 19 samples tested, 11 produced water and oil, and 3 samples produced water only. This indicates that approximately 58 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 5,020 barrels of oil per acre. This is an average recovery of 304 barrels per acre foot from 16.5 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	20.0/20.9
Average porosity, percent	22.2/21.0
Oil saturation after flooding, percent	38.5/38.1

Performance factor, percent, estimated	45.0
Net floodable sand, feet	16.5 / 13.0

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - D 40 Well No. HCO-128

3586.4 398.7 641 1360.4

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	172.5	21.6	53	25	78	888	35.	0.7	0.7	622	24.50
2	173.5	22.1	52	24	76	892	58.	1.5	2.2	1338	87.00
4	175.5	21.0	51	21	72	831	98.	1.5	3.7	1247	147.00
5	176.5	20.0	50	27	77	776	36.	1.6	5.3	1242	57.60
7	179.5	19.4	44	38	82	662	7.9	1.1	6.4	728	8.69
8	180.5	20.9	49	27	76	795	20.	1.5	7.9	1193	30.00
10	182.5	15.4	39	53	92	466	1.1	1.7	9.6	792	1.87
11	184.5	15.4	47	50	97	562	4.4	0.6	10.2	337	2.64
13	186.4	20.4	51	24	75	807	23.	1.7	11.9	1372	39.10
15	188.5	21.4	54	23	77	897	44.	1.7	13.6	1525	74.80
17	190.5	22.5	47	26	73	820	33.	2.0	15.6	1640	66.00
19	192.5	23.6	41	31	72	751	109.	2.0	17.6	1502	218.00
21	194.5	16.9	38	47	85	498	147.	0.4	18.0	299	88.20
23	196.5	22.3	46	26	72	796	6.0	1.9	19.9	1512	11.40
25	198.5	26.4	48	31	79	983	62.	1.6	21.5	1573	99.20
27	200.5	23.1	35	42	77	627	349.	2.0	23.5	1254	698.00
29	202.5	24.4	39	32	71	738	170.	2.0	25.5	1476	340.00
31	204.5	21.3	38	43	81	628	88.	1.2	26.7	754	105.60
33	206.5	20.6	26	51	77	416	69.	1.7	28.4	707	117.30
							VERTICAL PERMEABILITY				
1	172.5						24.				
2	173.5						43.				
4	175.5						59.				
5	176.5						10.				
7	179.5						8.3				
8	180.5						8.3				
10	182.5						Imp.				

5 ft = 20.9

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease – Well No. HCO-128

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.		
11	184.5						1.6				
13	186.4						2.5				
15	188.5						1.8				
17	190.5						14.				
19	192.5						48.				
21	194.5						101.				
23	196.5						Imp.				
25	198.5						6.1				
27	200.5						273.				
29	202.5						182.				
31	204.5						82.				
33	206.5						47.				

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-128

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
172.3 - 181.6	7.9	44.9	354.79
181.6 - 193.5	9.7	41.5	402.41
194.4 - 206.7	10.8	135.2	1459.70
172.3 - 206.7	28.4	78.1	2216.90

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
172.3 - 181.6	7.9	20.8	49.8	26.7	806	6,370
181.6 - 193.5	9.7	20.5	46.3	32.4	739	7,168
194.4 - 206.7	10.8	23.2	39.3	38.3	701	7,575
172.3 - 206.7	28.4	21.6	44.6	33.0	743	21,113

Oilfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease - D40 Well No. HCO-128

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation (737)			Volume of Water Recovered cc*	Effective Permeability Millidarcys** (89.28)	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	172.5	21.2	53	872	14	230	39	50	642	15	0.30	25
2	173.5	21.8	52	879	16	271	36	50	608	111	2.90	25
4	175.5	20.9	51	827	15	243	36	52	584	38	0.90	30
5	176.5	20.4	50	791	11	174	39	50	617	61	1.50	25
7	179.5	~~19.2~~	44	655	0	0	44	48	655	0	Imp.	-
8	180.5	20.9	49	794	10	162	39	48	632	12	0.30	45
10	182.5	~~15.9~~	38	469	0	0	38	51	469	0	Imp.	-
11	184.5	~~15.4~~	47	562	0	0	47	46	562	0	Imp.	-
13	186.4	~~20.8~~	50	807	0	0	50	40	807	0	Imp.	-
15	188.5	21.6	54	905	14	235	40	44	670	11	0.80	50
17	190.5	22.0	48	819	8	137	40	53	682	34	1.10	35
19	192.5	23.3	42	759	4	72	38	58	687	225	6.00	25
21	194.5	17.0	38	501	2	26	36	52	475	251	5.40	20
23	196.5	22.3	46	796	0	0	46	45	796	0	Imp.	-
25	198.5	26.0	48	968	7	141	41	52	827	57	1.20	25
27	200.5	23.6	34	623	0	0	34	57	623	348	41.58	10
29	202.5	24.1	40	748	2	37	38	54	711	239	11.66	20
31	204.5	21.6	38	637	0	0	31	60	637	255	11.44	20
33	206.5	21.0	25	407	0	0	25	70	407	174	4.20	20

Φ% ÷ 9 = 21.0   NP: 12.9   Sor % ÷ 9 = 38.1

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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Hickory Creek Oil Company Lease - Well No. HCO-128

Depth Interval, Feet	172.3 - 181.6	181.6 - 193.5	194.4 - 206.7	172.3 - 206.7
Feet of Core Analyzed	6.8	3.7	6.0	16.5
Average Percent Porosity	21.0	21.8	23.9	22.2
Average Percent Original Oil Saturation	50.6	50.8	42.7	47.8
Average Percent Oil Recovery	13.1	10.8	4.0	9.3
Average Percent Residual Oil Saturation	37.5	40.0	38.7	38.5
Average Percent Residual Water Saturation	50.0	48.9	54.7	51.4
Average Percent Total Residual Fluid Saturation	87.5	88.9	93.4	89.9
Average Original Oil Content, Bbls./A. Ft.	828.	859.	794.	822.
Average Oil Recovery, Bbls./A. Ft.	214.	182.	76.	156.
Average Residual Oil Content, Bbls./A. Ft.	614.	677.	718.	666.
Total Original Oil Content, Bbls./Acre	5,626.	3,177.	4,763.	13,566.
Total Oil Recovery, Bbls./Acre	1,453.	674.	454.	2,581.
Total Residual Oil Content, Bbls./Acre	4,173.	2,503.	4,309.	10,985.
Average Effective Permeability, Millidarcys	1.29	0.96	6.57	3.13
Average Initial Fluid Production Pressure, p.s.i.	30.	42.5	22.5	29.6

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