HICKORY CREEK OIL COMPANY

CORE ANALYSIS REPORT

WELL NO. HCO-82

W. Devlin 24

OILFIELD RESEARCH LABORATORIES
536 N. HIGHLAND CHANUTE, KANSAS

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January 7, 1980

Hickory Creek Oil Company
1128 Main Street
Parsons, Kansas 67357

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-82, and submitted to our laboratory on December 10, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman

Benjamin R. Pearman

SAM/tem
4 c to Parsons, Kansas
1 c to Chanute, Kansas

DEVLIN #24

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease - Well No. HCO-82

Location -

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

Name of Sand	-
Top of Core	188.0
Bottom of Core	201.6
Top of Sand	188.0
Bottom of Sand	199.7
Total Feet of Permeable Sand	11.4
Total Feet of Floodable Sand	8.8

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 50	3.7	3.7
50 - 100	4.7	8.4
100 - 150	2.0	10.4
150 - 200	1.0	11.4

Average Permeability Millidarcys	74.1
Average Percent Porosity	21.0
Average Percent Oil Saturation	52.5
Average Percent Water Saturation	23.0
Average Oil Content, Bbls./A. Ft.	856.
Total Oil Content, Bbls./Acre	9,754.
Average Percent Oil Recovery by Laboratory Flooding Tests	13.6
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	226.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	1,987.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery" Section.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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
188.0 - 195.7	Brown sandstone.
195.7 - 196.8	Light brown and gray laminated sandstone and shale.
196.8 - 197.4	Brown slightly shaly sandstone.
197.4 - 197.7	Gray sandy shale.
197.7 - 199.7	Brown slightly shaly sandstone.
199.7 - 200.9	Gray shale.
200.9 - 201.6	Coal.

LABORATORY FLOODING TESTS

The upper portion of the sand in this core responded well, relative to the lower portion of the sand, to laboratory flooding tests, as a total overall recovery of 1,987 barrels of oil per acre was obtained from 8.8 feet of sand. The weighted average percent oil saturation was reduced from 50.8 to 37.2, or represents an average recovery of 13.6 percent. The weighted average effective permeability of the samples is 9.18 millidarcys, while the average initial fluid production pressure is 23.9 pounds per square inch (See Table V).

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By observing the data given in Table IV, you will note that of the 12 samples tested, 9 produced water and oil, and 1 sample produced water only. This indicates that approximately 75 percent of the sand represented by these samples is floodable sand. The tests also show that the upper portion of the sand has a relatively high and uniform permeability profile.

Please note that the residual oil saturation is presented in the coregraph instead of oil recovery, as in the past.

CALCULATED RECOVERY

It would appear from a study of the data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 3,630 barrels of oil per acre. This is an average recovery of 413 barrels per acre foot from 8.8 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	10.0 / 21.0
Average porosity, percent	21.2 / 21.3
Oil saturation after flooding, percent	37.2 / 30.1
Performance factor, percent, estimated	50.0
Net floodable sand, feet	8.8 / 11.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease D - 29 Well No. HCO-82

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.		
	2327.7	248.2		275			872.				
1	188.5	22.0	44	25	69	751	124.	1.0	1.0	751	124.00
2	189.5	21.5	58	17	75	967	89.	1.0	2.0	967	89.00
3	190.5	20.1	51	23	74	795	106.	1.0	3.0	795	106.00
4	191.5	20.7	58	14	72	931	85.	1.0	4.0	931	85.00
5	192.5	22.2	54	18	72	930	56.	1.0	5.0	930	56.00
6	193.5	22.5	51	23	74	890	66.	1.0	6.0	890	66.00
7	194.5	21.7	52	18	70	875	159.	1.0	7.0	875	159.00
8	195.5	22.1	44	24	68	754	60.	0.7	7.7	528	42.00
9	196.5	18.6	44	33	77	635	26.	1.1	8.8	699	28.60
10	197.2	17.4	54	23	77	729	46.	0.6	9.4	437	27.60
11	198.5	23.7	62	28	90	1140	38.	1.3	10.7	1482	49.40
12	199.5	15.7	55	29	84	670	17.	0.7	11.4	469	11.90

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-82

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
188.0 - 195.0	7.0	97.9	685.00
195.0 - 199.7	4.4	36.3	159.50
188.0 - 199.7	11.4	74.1	844.50

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
188.0 - 195.0	7.0	21.5	52.6	19.7	877	6,139
195.0 - 199.7	4.4	20.1	52.4	28.1	822	3,615
188.0 - 199.7	11.4	21.0	52.5	23.0	856	9,754

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease - DEVLIN 24 Well No. HCO-82

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation			Volume of Water Recovered cc*	81.49 Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	505 % Oil	% Water	Bbls./A. Ft.			
1	188.5	22.1	44	754	10	171	34	60	583	261	16.21	20
2	189.5	21.5	58	967	21	350	37	59	617	220	13.55	15
3	190.5	20.4	51	807	13	206	38	60	601	279	9.80	25
4	191.5	20.6	58	927	21	336	37	61	591	225	7.40	25
5	192.5	22.0	54	922	12	205	42	56	717	148	5.00	25
6	193.5	22.3	51	882	16	277	35	61	605	257	8.20	20
7	194.5	21.7	52	875	17	286	35	63	589	300	19.33	20
8	195.5	21.9	44	748	9	153	35	60	595	42	1.20	30
9	196.5	19.0	44	649	3	44	41	49	605	15	0.40	35
10	197.2	17.4	54	729	0	0	54	37	729	0	Imp.	-
11	198.5	23.4	62	1126	0	0	62	33	1126	18	0.40	45
12	199.5	16.0	55	683	0	0	55	38	683	0	Imp.	-

1.5 OR 9 = 39.1

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.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Hickory Creek Oil Company Lease - Well No. HCO-82

Depth Interval, Feet	188.0 - 195.0	195.0 - 199.7	188.0 - 199.7
Feet of Core Analyzed	7.0	1.8	8.8
Average Percent Porosity	21.5	20.1	21.2
Average Percent Original Oil Saturation	52.6	44.0	50.8
Average Percent Oil Recovery	15.7	5.3	13.6
Average Percent Residual Oil Saturation	36.9	38.7	37.2
Average Percent Residual Water Saturation	60.0	53.3	58.6
Average Percent Total Residual Fluid Saturation	96.9	92.0	95.8
Average Original Oil Content, Bbls./A. Ft.	877.	687.	838.
Average Oil Recovery, Bbls./A. Ft.	262.	86.	226.
Average Residual Oil Content, Bbls./A. Ft.	615.	601.	612.
Total Original Oil Content, Bbls./Acre	6,134.	1,238.	7,372.
Total Oil Recovery, Bbls./Acre	1,831.	156.	1,987.
Total Residual Oil Content, Bbls./Acre	4,303.	1,082.	5,385.
Average Effective Permeability, Millidarcys	11.36	1.28	9.18
Average Initial Fluid Production Pressure, p.s.i.	21.4	32.5	23.9

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

Devlin 24 HCO# 82

Core #1 (188-207.5) cored 20'

188-199.7
Sandstone, fng, brown, micaceous. Carbonaceous fragments 189, (189.9-190), (190.8-190.9) Micaceous parting 193.6. Sand begins to increase in carbonaceous material (fng) 195.2 to 199.2 Micaceous parting 196.3 Carbonaceous parting 199.3.
Entire interval oozes free oil with evidence of gas bubbles on core surface, No water beads on freshly broken surfaces.
199.7-202.1
Coal, Shale laminations from (201.1-202.1).

(202.1-207.5)
Shale, grey. Shale is rich in clay from (202.1-206.3)

End Core Devlin 24
HCO# 82