

HICKORY CREEK OIL COMPANY

CORE ANALYSIS REPORT

WELL NO. HCO-86

DEVLIN 26



# OILFIELD RESEARCH LABORATORIES

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

January 11, 1980

Hickory Creek Oil Company  
1128 Main Street  
Parsons, Kansas 67357

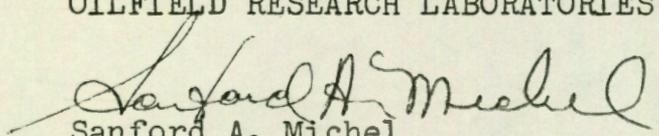
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-86, and submitted to our laboratory on December 13, 1979.

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-86

Location           -          

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

Name of Sand	-	
Top of Core	-	180.0
Bottom of Core	-	220.0
Top of Sand	-	180.0
Bottom of Sand	-	220.0
Total Feet of Permeable Sand	-	39.2
Total Feet of Floodable Sand	-	21.6

**Distribution of Permeable Sand:**  
Permeability Range  
Millidarcys

	Feet	Cum. Ft.
0 - 50	17.5	17.5
50 - 100	9.6	27.1
100 - 200	10.1	37.2
200 - 400	2.0	39.2

Average Permeability Millidarcys	-	80.2
Average Percent Porosity	-	21.2
Average Percent Oil Saturation	-	48.5
Average Percent Water Saturation	-	29.3
Average Oil Content, Bbls./A. Ft.	-	812.
Total Oil Content, Bbls./Acre	-	31,816.
Average Percent Oil Recovery by Laboratory Flooding Tests	-	9.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	-	178.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	-	3,844.
Total Calculated Oil Recovery, Bbls./Acre	-	See "Calculated Recovery" Section.
Packer Setting, Feet	-	
Viscosity, Centipoises @	-	
A. P. I. Gravity, degrees @ 60 °F	-	
Elevation, Feet	-	

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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>
180.0 - 181.0	Brown shaly sandstone.
181.0 - 192.1	Dark brown sandstone.
192.1 - 193.7	Brown slightly shaly sandstone.
193.7 - 196.6	Dark brown sandstone.
196.6 - 197.4	Light brown shaly sandstone.
197.4 - 198.0	Brown sandstone.
198.0 - 198.9	Brown slightly shaly sandstone.
198.9 - 209.7	Dark brown sandstone.
209.7 - 211.3	Light brown shaly sandstone.
211.3 - 213.2	Brown sandstone.
213.2 - 214.0	Brown shaly sandstone.
214.0 - 220.0	Brown sandstone.

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 3,844 barrels of oil per acre was obtained from 21.6 feet of sand. The weighted average percent oil saturation was reduced from 54.0 to 44.2, or represents an average recovery of 9.8 percent. The weighted average effective permeability of the samples is 9.89 milli-

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darcys, while the average initial fluid production pressure is 26.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 40 samples tested, 22 produced water and oil, and 16 samples produced water only. This indicates that approximately 55 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has an erratic permeability profile.

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

#### 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 7,320 barrels of oil per acre. This is an average recovery of 339 barrels per acre foot from 21.6 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 / 16.4
Average porosity, percent	22.5 / 23.2
Oil saturation after flooding, percent	44.2 / 44.5
Performance factor, percent, estimated	✓ 45.0
Net floodable sand, feet	21.6 / 15.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - DEVLIN #26 Well No. HCO-86

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbbs. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	180.5	18.9	50	34	84	733	6.7	1.0	1.0	733	6.70
2	181.5	24.0	47	16	63	875	231.	1.0	2.0	875	231.00
3	182.5	24.1	56	16	72	1047	335.	1.0	3.0	1047	335.00
4	183.5	25.2	54	11	65	1056	118.	1.0	4.0	1056	118.00
5	184.5	25.4	60	10	70	1182	175.	1.0	5.0	1182	175.00
6	185.5	23.5	69	14	83	1258	76.	1.0	6.0	1258	76.00
7	186.5	25.2	62	12	74	1212	169.	1.0	7.0	1212	169.00
8	187.5	22.2	63	9	72	1095	158.	1.0	8.0	1095	158.00
9	188.5	24.7	63	11	74	1207	161.	1.0	9.0	1207	161.00
10	189.5	22.9	60	12	72	1066	89.	1.0	10.0	1066	89.00
11	190.5	23.8	58	13	71	1071	111.	1.0	11.0	1071	111.00
12	191.5	23.6	60	13	73	1099	113.	1.1	12.1	1209	124.30
13	192.5	22.2	56	17	73	965	12.	0.9	13.0	869	10.80
14	193.5	20.3	55	23	78	866	13.	0.7	13.7	606	9.10
15	194.5	22.3	58	27	85	1003	38.	1.3	15.0	1304	49.40
16	195.5	22.7	53	17	70	933	50.	1.0	16.0	933	50.00
17	196.5	14.5	49	47	96	551	91.	0.6	16.6	331	54.60
18	197.5	21.4	47	27	74	780	39.	0.6	17.2	468	23.40
19	198.5	17.2	48	39	87	641	12.	0.9	18.1	577	10.80
20	199.5	22.0	49	22	71	836	29.	1.1	19.2	920	31.90
21	200.5	19.9	43	23	66	664	137.	1.0	20.2	664	137.00
22	201.5	21.9	51	28	79	867	13.	1.0	21.2	867	13.00
23	202.5	19.9	46	30	76	710	83.	1.0	22.2	710	83.00
24	203.5	19.9	44	32	76	679	68.	1.0	23.2	679	68.00
25	204.5	19.8	42	36	78	645	53.	1.0	24.2	645	53.00
26	205.5	19.8	53	26	79	814	58.	1.0	25.2	814	58.00
27	206.5	20.1	39	41	80	608	89.	1.0	26.2	608	89.00
28	207.5	22.0	39	39	78	666	26.	1.0	27.2	666	26.00

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**RESULTS OF SATURATION & PERMEABILITY TESTS**

**TABLE 1-B**

Company Hickory Creek Oil Company Lease - Well No. HCO-86

*8000.*      *845.9*      *1169*      *32103*

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.		
29	208.5	23.1	42	35	77	753	123.	1.0	28.2	753	123.00
30	209.5	14.9	22	67	89	254	14.	0.7	28.9	178	9.80
31	210.5	15.5	25	63	88	301	5.4	1.6	30.5	482	8.64
32	211.5	22.6	46	24	70	807	47.	0.7	31.2	565	32.90
33	212.5	20.0	47	34	81	729	41.	1.2	32.4	875	49.20
34	213.5	17.8	54	33	87	746	7.2	0.8	33.2	597	5.76
35	214.5	19.5	41	37	78	620	25.	1.0	34.2	620	25.00
36	215.5	18.6	45	33	78	649	44.	1.0	35.2	649	44.00
37	216.5	19.1	45	45	90	667	80.	1.0	36.2	667	80.00
38	217.5	22.8	30	42	72	531	141.	1.0	37.2	531	141.00
39	218.5	20.7	32	62	94	514	98.	1.0	38.2	514	98.00
40	219.5	21.9	43	49	92	731	31.	1.0	39.2	731	31.00

*1170*

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### SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-86

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
180.0 - 196.0	16.0	117.1	1,873.30
196.0 - 220.0	23.2	55.9	1,296.00
180.0 - 220.0	39.2	80.2	3,142.30

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
180.0 - 196.0	16.0	23.2	57.8	16.0	1045	16,723
196.0 - 220.0	23.2	19.8	42.1	38.5	651	15,093
180.0 - 220.0	39.2	21.2	48.5	29.3	812	31,816

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

DEVLIN #26

Company Hickory Creek Oil Company

Lease -----

Well No. HCO-86

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	Bbls./A. Ft.			
1	180.5	19.3	50	749	6	90	44	48	659	44	1.00	30
2	181.5	23.6	47	861	7	128	40	54	733	276	22.28	15
3	182.5	23.9	56	1038	14	260	42	54	778	341	34.98	15
4	183.5	25.0	54	1047	12	233	42	47	814	249	15.74	10
5	184.5	25.1	60	1168	13	253	47	48	915	312	32.65	15
6	185.5	23.9	69	1279	27	501	42	47	778	307	21.99	20
7	186.5	25.0	62	1202	26	504	36	56	698	316	44.42	15
8	187.5	22.0	63	1075	0	0	63	28	1075	0	Imp.	-
9	188.5	24.5	63	1197	17	323	46	50	874	247	11.60	30
10	189.5	23.0	60	1071	15	268	45	49	803	70	2.00	30
11	190.5	23.7	58	1066	10	184	48	50	882	232	10.40	30
12	191.5	23.7	60	1103	10	184	50	44	919	65	1.60	35
13	192.5	22.1	56	960	8	137	48	50	823	121	5.40	30
14	193.5	20.5	55	875	10	159	45	51	716	64	2.20	35
15	194.5	22.1	58	994	8	137	50	44	857	43	1.00	30
16	195.5	22.5	53	925	11	192	42	49	733	37	0.80	35
17	196.5	14.5	49	551	0	0	40	40	551	0	Imp.	-
18	197.5	21.4	47	780	4	66	43	44	714	39	1.00	35
19	198.5	17.7	48	659	0	0	48	45	659	9	0.20	45
20	199.5	21.7	49	825	2	34	47	50	791	27	0.40	35
21	200.5	20.1	43	671	0	0	43	51	671	26	0.60	35
22	201.5	21.9	51	866	0	0	51	47	866	41	1.00	35
23	202.5	20.1	46	717	2	31	44	52	686	90	1.80	30
24	203.5	19.6	44	669	0	0	44	52	669	72	1.60	25
25	204.5	19.6	42	639	0	0	42	55	639	90	2.20	30
26	205.5	19.7	53	810	0	0	53	42	810	119	3.60	30
27	206.5	20.5	39	620	0	0	39	57	620	238	6.60	25
28	207.5	21.7	39	657	0	0	39	57	657	158	3.80	20

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.

11.0.5  
12.5  
14.5

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease D ---- 26 Well No. HCO-86

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	Bbls./A. Ft.			
29	208.5	22.9	42	746	0	0	42	55	746	351	11.40	20
30	209.5	15.1	23	269	0	0	23	62	269	19	0.40	45
31	210.5	15.9	25	308	0	0	25	67	308	11	0.30	50
32	211.5	22.6	46	807	4	70	42	45	737	34	0.60	40
33	212.5	20.3	47	740	3	47	44	49	693	48	0.80	30
34	213.5	18.0	55	768	0	0	55	41	768	7	0.20	45
35	214.5	19.2	41	611	0	0	41	56	611	52	0.80	30
36	215.5	19.0	45	663	2	29	43	49	634	53	1.00	30
37	216.5	19.3	45	674	0	0	45	51	674	252	5.00	15
38	217.5	22.4	31	539	0	0	31	67	539	264	15.42	10
39	218.5	21.0	31	505	0	0	31	66	505	211	3.80	10
40	219.5	21.8	43	727	3	51	40	54	676	66	1.11	15

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-86		
Depth Interval, Feet	180.0 - 196.0	196.0 - 220.0	180.0 - 220.0
Feet of Core Analyzed	15.0	6.6	21.6
Average Percent Porosity	23.2	20.9	22.5
Average Percent Original Oil Saturation	57.5	46.1	54.0
Average Percent Oil Recovery	12.9	2.7	9.8
Average Percent Residual Oil Saturation	44.6	43.4	44.2
Average Percent Residual Water Saturation	49.2	49.5	49.3
Average Percent Total Residual Fluid Saturation	93.8	92.9	93.5
Average Original Oil Content, Bbls./A. Ft.	1,039.	746.	950.
Average Oil Recovery, Bbls./A. Ft.	237.	44.	178.
Average Residual Oil Content, Bbls./A. Ft.	802.	702.	772.
Total Original Oil Content, Bbls./Acre	15,585.	4,925.	20,510.
Total Oil Recovery, Bbls./Acre	3,551.	293.	3,844.
Total Residual Oil Content, Bbls./Acre	12,034.	4,632.	16,666.
Average Effective Permeability, Millidarcys	13.82	0.96	9.89
Average Initial Fluid Production Pressure, p.s.i.	25.0	30.7	26.8

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