

HICKORY CREEK OIL COMPANY

CORE ANALYSIS REPORT

WELL NO. HCO-53

W. DEVLIN 14



OILFIELD RESEARCH LABORATORIES

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

November 9, 1979

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-53, and submitted to our laboratory on October 22, 1979.

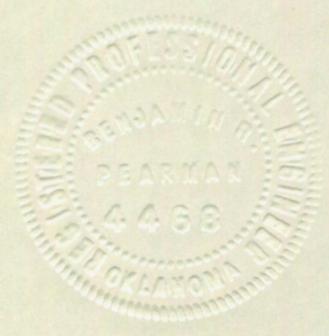
Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
Benjamin R. Pearman

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



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GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease - Well No. HCO-53

Location -

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

Name of Sand	-	
Top of Core	-	177.0
Bottom of Core	-	197.0
Top of Sand	-	177.0
Bottom of Sand	-	197.0
Total Feet of Permeable Sand	-	16.4
Total Feet of Floodable Sand	-	16.2

Distribution of Permeable Sand:
Permeability Range
Millidarcys

	Feet	Cum. Ft.
0 - 50	3.6	3.6
50 - 150	7.1	10.7
150 - 250	3.5	14.2
250 - 350	2.2	16.4

Average Permeability Millidarcys	-	128.5
Average Percent Porosity	-	21.5
Average Percent Oil Saturation	-	58.1
Average Percent Water Saturation	-	16.8
Average Oil Content, Bbls./A. Ft.	-	979.
Total Oil Content, Bbls./Acre	-	18,790.
Average Percent Oil Recovery by Laboratory Flooding Tests	-	21.9
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	-	398.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	-	6,450.

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>
177.0 - 178.2	Brown sandstone.
178.2 - 178.5	Gray laminated sandy shale.
178.5 - 190.1	Brown sandstone.
190.1 - 191.6	Light brown laminated shaly sandstone.
191.6 - 193.4	Gray very shaly sandstone.
193.4 - 195.9	Hard light brown shaly sandstone.
195.9 - 196.4	Gray sandy shale.
196.4 - 197.0	Brown sandstone containing thin carbonaceous partings.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 6,450 barrels of oil per acre was obtained from 16.2 feet of sand. The weighted average percent oil saturation was reduced from 58.8 to 36.9, or represents an average recovery of 21.9 percent. The weighted average effective permeability of the samples is 15.77 millidarcys, while the average initial fluid production pressure is 17.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 20 samples tested, 17 produced water and oil. This indicates that approximately 85 percent of the sand represented by these samples is floodable pay sand.

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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 6,560 barrels of oil per acre. This is an average recovery of 404 barrels per acre foot from 16.2 feet of floodable sand analyzed in this core.

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

Original formation volume factor	✓ 1.03
Reservoir water saturation, percent	10.0 / 11.7
Average porosity, percent	22.9 / 23.3
Oil saturation after flooding, percent	36.9 / 35.8
Performance factor, percent	✓ 45.0
Net floodable pay sand, feet	16.2 / 13.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company

Lease - DLA

Well No. HCO-53

3740.9 437.6

334

2163.3

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	177.8	21.1	58	12	70	949	312.	1.2	1.2	1139	374.40
2	178.9	19.1	81	14	95	1200	210.	0.5	1.7	600	105.00
3	179.5	25.0	62	12	74	1203	222.	1.0	2.7	1203	222.00
4	180.5	23.9	56	16	72	1038	56.	1.0	3.7	1038	56.00
5	181.5	24.5	58	12	70	1102	159.	1.0	4.7	1102	159.00
6	182.5	25.7	62	10	72	1236	107.	1.0	5.7	1236	107.00
7	183.6	24.6	62	8	70	1183	148.	1.0	6.7	1183	148.00
8	184.5	21.0	62	20	82	1010	256.	1.0	7.7	1010	256.00
9	185.5	24.8	67	10	77	1289	194.	1.0	8.7	1289	194.00
10	186.3	26.0	65	6	71	1311	139.	1.0	9.7	1311	139.00
11	187.5	22.9	64	7	71	1137	115.	1.0	10.7	1137	115.00
12	188.5	23.6	66	6	72	1208	84.	1.0	11.7	1208	84.00
13	189.7	21.6	50	19	69	838	84.	1.1	12.8	922	92.40
14	190.5	19.4	44	28	72	662	23.	0.9	13.7	596	20.70
15	191.4	17.3	29	41	70	389	22.	0.6	14.3	233	13.20
16	192.5	11.1	61	30	91	525	Imp.	1.8	16.1	945	0.00
17	193.5	20.7	54	19	73	867	8.5	0.6	16.7	520	5.10
18	194.6	18.4	43	34	77	614	Imp.	1.0	17.7	614	0.00
19	195.6	20.2	52	23	75	815	6.8	0.9	18.6	734	6.12
20	196.5	26.7	62	7	69	1284	17.	0.6	19.2	770	10.20

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-53

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
177.0 - 187.0	9.7	181.5	1,760.40
187.0 - 197.0	6.7	51.8	346.72
177.0 - 197.0	16.4	128.5	2,107.12

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
177.0 - 187.0	9.7	23.7	62.3	11.9	1,145.	11,111.
187.0 - 197.0	9.5	19.3	53.8	21.9	808.	7,679.
177.0 - 197.0	19.2	21.5	58.1	16.8	979.	18,790.

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company

Lease

- D L 4

Well No. HCO-53

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		773 Residual Saturation			Volume of Water Recovered cc*	272.73 Effective Permeability Millidarcys**	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water	Bbls./A. Ft.			
1	177.8	21.6	58	972	26	436	32	62	536	178	20.99	10
2	178.9	19.5	81	1225	48	726	33	61	499	217	24.74	10
3	179.5	24.5	62	1178	31	589	31	60	589	279	23.11'	10
4	180.5	24.2	56	1051	24	451	32	60	600	287	33.74	10
5	181.5	25.0	58	1125	22	427	36	56	698	227	61.86	10
6	182.5	25.7	62	1236	26	518	36	53	718	150	17.24	10
7	183.6	24.7	62	1188	32	613	30	57	575	236	12.85	10
8	184.5	21.5	62	1034	25	417	37	54	617	165	18.74	10
9	185.5	24.4	67	1268	29	549	38	54	719	234	4.65	15
10	186.3	25.5	65	1286	24	475	41	50	811	221	4.65	20
11	187.5	22.5	64	1117	19	332	43	43	785	11	0.22	25
12	188.5	23.1	66	1183	21	376	45	45	807	32	0.97	25
13	189.7	21.3	50	826	19	314	31	64	512	289	21.24	10
14	190.5	19.6	44	669	4	61	40	44	608	6	0.15	45
15	191.4	17.0	30	396	0	0	30	55	396	0	Imp.	-
16	192.5	11.3	61	535	0	0	61	30	535	0	Imp.	-
17	193.5	20.9	52	843	0	0	52	36	843	0	Imp.	-
18	194.6	18.7	43	624	4	58	39	57	566	18	0.37	30
19	195.6	20.0	52	907	6	93	46	46	714	8	0.22	40
20	196.5	26.9	62	1294	22	459	40	55	835	225	26.99	10

SOR
= 13
= 35.8

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-53
Depth Interval, Feet	177.0 - 187.0		187.0 - 197.0		177.0 - 197.0	
Feet of Core Analyzed	9.7		6.5		16.2	
Average Percent Porosity	23.8		21.5		22.9	
Average Percent Original Oil Saturation	62.3		53.8		58.8	
Average Percent Oil Recovery	27.7		13.4		21.9	
Average Percent Residual Oil Saturation	34.6		40.4		36.9	
Average Percent Residual Water Saturation	56.6		50.7		54.2	
Average Percent Total Residual Fluid Saturation	91.2		91.1		91.1	
Average Original Oil Content, Bbls./A. Ft.	1,149.		914.		1,054.	
Average Oil Recovery, Bbls./A. Ft.	508.		235.		398.	
Average Residual Oil Content, Bbls./A. Ft.	641.		679.		656.	
Total Original Oil Content, Bbls./Acre	11,145.		5,937.		17,082.	
Total Oil Recovery, Bbls./Acre	4,925.		1,525.		6,450.	
Total Residual Oil Content, Bbls./Acre	6,220		4,412.		10,632.	
Average Effective Permeability, Millidarcys	22.10		6.32		15.77	
Average Initial Fluid Production Pressure, p.s.i.	11.5		26.4		17.7	

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