

HICKORY CREEK OIL COMPANY

CORE ANALYSIS REPORT

WELL NO. HCO-138

W. Berlin 50

OILFIELD RESEARCH LABORATORIES
536 N. HIGHLAND CHANUTE, KANSAS



OILFIELD RESEARCH LABORATORIES

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April 16, 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-138, and submitted to our laboratory on March 18, 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-138

Location -

Section - Twp - Rge - County - State -

Elevation, Feet - - - - -

Name of Sand - - - - -

Top of Core - - - - - 183.0

Bottom of Core - - - - - 242.0

Top of Sand - - - - - 189.5

Bottom of Sand - - - - - 238.5

Total Feet of Permeable Sand - - - - - 38.2

Total Feet of Floodable Sand - - - - - 18.8

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 10	10.6	10.6
10 - 50	8.3	18.9
50 - 100	5.5	24.4
100 - 200	10.3	34.7
200 - 300	3.5	38.2

Average Permeability Millidarcys - - - - - 74.2

Average Percent Porosity - - - - - 20.8

Average Percent Oil Saturation - - - - - 43.3

Average Percent Water Saturation - - - - - 33.7

Average Oil Content, Bbls./A. Ft. - - - - - 698.

Total Oil Content, Bbls./Acre - - - - - 27,936.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 5.7

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 104.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 1,947.

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

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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>
183.0 - 189.5	Gray sandy shale.
189.5 - 198.8	Brown sandstone.
198.8 - 199.5	Gray sandy shale.
199.5 - 213.2	Brown sandstone.
213.2 - 216.8	Brown slightly shaly sandstone.
216.8 - 221.0	Grayish brown shaly sandstone.
221.0 - 221.2	Gray sandy shale.
221.2 - 222.7	Brown shaly sandstone.
222.7 - 223.6	Gray sandy shale.
223.6 - 225.4	Brown shaly sandstone.
225.4 - 227.3	Gray sandy shale.
227.3 - 228.3	Brown shaly sandstone.
228.3 - 231.4	Gray sandy shale.
231.4 - 232.2	Light brown shaly sandstone.
232.2 - 233.2	Brown sandstone.
233.2 - 237.0	Brown shaly sandstone.
237.0 - 238.5	Brown slightly carbonaceous sandstone.
238.5 - 242.0	Gray sandy shale.

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LABORATORY FLOODING TESTS

The upper portion of the sand in this core responded to laboratory flooding tests, as a total recovery of 1,947 barrels of oil per acre was obtained from 18.8 feet of sand. The weighted average percent oil saturation was reduced from 44.7 to 39.0, or represents an average recovery of 5.7 percent. The weighted average effective permeability of the samples is 12.82 millidarcys, while the average initial fluid production pressure is 15.4 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 26 samples tested, 12 produced water and oil, and 6 samples produced water only. This indicates that approximately 46 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 7,300 barrels of oil per acre. This is an average recovery of 388 barrels per acre foot from 18.8 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	15.0 / 22.5 ✓
Average porosity, percent	23.0 / 23.2 ✓
Oil saturation after flooding, percent	39.0 / 40.8 ✓
Performance factor, percent, estimated	✓ 50.0
Net floodable sand, feet	18.8 / 10.0 ✓

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - D 50 Well No. HCO-138

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	189.8	20.5	47	21	68	748	133.	0.5	0.5	374	66.50
2	190.5	22.7	51	22	73	898	127.	1.5	2.0	1374	190.50
4	192.3	22.8	53	21	74	938	54.	1.5	3.5	1407	81.00
5	193.6	23.2	38	21	59	684	203.	2.0	5.5	1368	406.00
7	195.5	25.5	51	24	75	1009	111.	1.0	6.5	1009	111.00
8	196.6	23.8	42	26	68	776	31.	1.5	8.0	1164	46.50
10	198.4	23.5	55	37	92	1003	145.	1.3	9.3	1304	188.50
11	199.6	21.1	43	40	83	704	203.	1.5	10.8	1056	304.50
13	202.4	24.1	39	48	87	729	188.	2.0	12.8	1458	376.00
15	204.3	23.8	51	30	81	942	145.	2.0	14.8	1884	290.00
17	206.5	23.5	33	35	68	602	145.	2.0	16.8	1204	290.00
19	208.5	21.3	39	47	86	645	62.	2.0	18.8	1290	124.00
21	210.4	21.5	39	38	77	651	92.	2.0	20.8	1302	184.00
23	212.5	18.4	38	41	79	542	19.	2.2	23.0	1192	41.80
25	214.7	18.7	41	38	79	595	18.	1.8	24.8	1071	32.40
27	216.5	19.0	39	36	75	575	13.	1.8	26.6	1035	23.40
30	219.8	16.4	49	35	84	623	4.9	2.0	28.6	1246	9.80
32	221.3	18.7	52	39	91	754	5.8	0.8	29.4	603	4.64
33	222.5	18.0	49	39	88	684	3.3	0.7	30.1	479	2.31
34	224.3	23.7	32	27	59	588	Imp.	1.8	31.9	1058	0.00
35	227.5	13.4	34	50	84	353	7.3	1.0	32.9	353	7.30
36	231.5	16.2	30	48	78	377	7.2	0.8	33.7	302	5.76
37	232.4	17.7	49	33	82	673	23.	1.0	34.7	673	23.00
39	234.5	18.5	56	20	76	804	4.5	1.8	36.5	1447	8.10
40	235.4	20.1	36	34	70	561	7.8	2.0	38.5	1122	15.60
42	237.5	17.5	57	25	82	774	0.63	1.5	40.0	1161	0.95

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease — Well No. HCO-138

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
189.5 - 211.0	20.8	127.8	2658.50
211.0 - 238.5	17.4	10.1	175.06
189.5 - 238.5	38.2	74.2	2833.56

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 Bbbl./Acre
189.5 - 211.0	20.8	22.9	43.6	32.9	779	16,194
211.0 - 238.5	19.2	18.5	42.9	34.6	612	11,742
189.5 - 238.5	40.0	20.8	43.3	33.7	698	27,936

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Hickory Creek Oil Company Lease - D50 Well No. 166.3 HCO-138

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		1666 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	189.9	20.7	47	755	4	64.5	43	44	691	111	2.30	25
2	190.5	22.5	51	890	5	87.5	46	48	803	230	8.33	15
4	192.3	23.0	53	946	5	89.5	47	46	857	299	6.00	15
5	193.6	23.4	38	690	3	54.0	35	58	636	445	7.30	15
7	195.5	25.4	51	1005	12	236.0	39	37	769	157	2.60	25
8	196.6	24.1	42	785	3	56.5	39	45	729	310	14.74	10
10	198.4	24.0	55	1024	18	335.3	37	53	689	234	39.98	10
11	199.6	21.4	43	714	3	50.5	40	56	664	259	11.22	15
13	202.4	24.6	39	744	3	57.8	36	49	687	212	32.00	10
15	204.3	23.3	51	922	11	199	40	50	723	73	1.20	20
17	206.5	23.2	33	594	0	0	33	62	594	264	14.00	15
19	208.5	21.5	39	651	4	67	35	62	584	482	6.20	15
21	210.4	21.4	39	647	2	33	37	59	614	374	15.74	10
23	212.5	18.2	38	537	0	0	38	52	537	20	0.40	45
25	214.7	18.6	41	592	0	0	41	47	592	19	0.30	40
27	216.5	18.7	39	566	0	0	39	47	566	14	0.20	45
30	219.8	16.9	48	629	0	0	48	40	629	0	Imp.	-
32	221.3	18.5	52	746	0	0	52	40	746	0	Imp.	-
33	222.5	18.0	49	684	0	0	49	40	684	0	Imp.	-
34	224.3	23.6	32	586	0	0	32	55	586	232	3.30	15
35	227.5	13.8	33	353	0	0	33	58	353	28	0.50	25
36	231.5	16.6	29	373	0	0	29	50	373	0	Imp.	-
37	232.4	17.5	49	665	0	0	49	34	665	0	Imp.	-
39	234.5	18.8	56	817	0	0	56	26	817	0	Imp.	-
40	235.4	20.0	36	559	0	0	36	34	559	0	Imp.	-
42	237.5	17.7	57	783	0	0	57	28	783	0	Imp.	-

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-138
Depth Interval, Feet	189.5 - 211.0				
Net of Core Analyzed	18.8				
Average Percent Porosity	23.0				
Average Percent Original Oil Saturation	44.7				
Average Percent Oil Recovery	5.7				
Average Percent Residual Oil Saturation	39.0				
Average Percent Residual Water Saturation	51.9				
Average Percent Total Residual Fluid Saturation	90.9				
Average Original Oil Content, Bbls./A. Ft.	800.				
Average Oil Recovery, Bbls./A. Ft.	104.				
Average Residual Oil Content, Bbls./A. Ft.	696.				
Total Original Oil Content, Bbls./Acre	15,025.				
Total Oil Recovery, Bbls./Acre	1,947.				
Total Residual Oil Content, Bbls./Acre	13,078.				
Average Effective Permeability, Millidarcys	12.82				
Average Initial Fluid Production Pressure, p.s.i.	15.4				

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