



OILFIELD RESEARCH LABORATORIES

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

June 27, 1979

15-099-20943

Hickory Creek Oil Company
1128 Main
Parsons, Kansas 67357

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-4, Labette County, Kansas, and submitted to our laboratory on June 18, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
Benjamin R. Pearman

SAM:km

4 c to Parsons, Kansas
1 c to Chanute, Kansas

- REGISTERED ENGINEERS -

CORE ANALYSIS - WATER ANALYSIS - REPRESSURING ENGINEERING - SURVEYING & MAPPING - PROPERTY EVALUATION & OPERATION

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The core was sampled and the samples sealed in plastic bags by an agent of the client. The drilling fluid consisted of fresh water mud. The core was reported to be from a virgin area.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
188.5 - 188.9	Gray sandy shale.
188.9 - 192.0	Brown sandstone.
192.0 - 193.5	Gray and brown laminated sandy shale.
193.5 - 200.5	Brown sandstone.
200.5 - 201.2	Gray and brown laminated sandy shale.
201.2 - 205.2	Brown sandstone.
205.2 - 206.6	Brown and gray laminated shaly sandstone.
206.6 - 208.0	Brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,494 barrels of oil per acre was obtained from 12.1 feet of sand. The weighted average percent oil saturation was reduced from 46.5 to 37.6, or represents an average recovery of 8.9 percent. The weighted average effective permeability of the samples is 2.82 millidarcys, while the average initial fluid production pressure is 25.4 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 17 samples tested, 16 produced water and 12 oil. This

Mc GOWN #3

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icates that approximately 71 percent of the sand represented by
ese samples is floodable pay sand.

CALCULATED RECOVERY

It would appear from a study of the data, that efficient primary
nd waterflood operations in the vicinity of this well should
recover approximately 4,680 barrels of oil per acre. This is an
average recovery of 387 barrels per acre foot from 12.1 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	15.0 / 20.4
Average porosity, percent	22.2 / 21.8
Oil saturation after flooding, percent	37.6 / 38.1
Performance factor, percent	50.0
Net floodable pay sand, feet	12.1 / 9.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - M 3 Well No. HCO-4

Sh 192
193.5

200.5
202.25
Sh

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	187 189.5	23.8	56	14	70	1,034	195.	1.1	1.1	1,137	214.50	
2	188 190.5	22.5	65	14	79	1,135	203.	0.9	2.0	1,022	182.70	
3	189 191.3	22.2	48	21	69	827	52.	1.1	3.1	910	57.20	
4	190 193.7	20.3	48	24	72	756	127.	0.5	3.6	378	63.50	
5	192 194.4	24.3	47	10	57	886	27.	1.0	4.6	886	27.00	
6	193 195.5	21.0	44	21	65	717	24.	1.0	5.6	717	24.00	
7	194 196.5	19.1	45	30	75	667	14.	1.0	6.6	667	14.00	
8	195 197.5	17.8	52	18	70	718	39.	1.0	7.6	718	39.00	
9	196 198.5	23.8	41	24	65	757	84.	1.0	8.6	757	84.00	
10	197 199.5	21.9	39	29	68	663	123.	1.5	10.1	995	184.50	
11	199 201.5	19.3	24	39	63	359	90.	0.8	10.9	287	72.00	
12	200 202.5	23.8	36	30	66	665	80.	1.0	11.9	665	80.00	
13	201 203.5	23.5	36	30	66	656	62.	1.0	12.9	656	62.00	
14	202 204.5	22.3	45	23	68	779	60.	1.2	14.1	935	72.00	
15	203 205.5	23.1	40	31	71	717	40.	0.8	14.9	574	32.00	
16	204 206.5	20.8	29	27	56	468	13.	0.6	15.5	281	7.80	
17	205 207.5	22.3	34	32	66	588	89.	1.4	16.9	823	124.60	
		3378.4			371.8					417	1322	

GR 188

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease — Well No. HCO-4

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
188.9 - 198.0	7.6	81.8	621.90
198.0 - 208.0	9.3	77.3	718.90
188.9 - 208.0	16.9	79.3	1340.80

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
188.9 - 198.0	7.6	21.5	50.6	18.7	847	6,435
198.0 - 208.0	9.3	22.4	36.7	29.3	642	5,973
188.9 - 208.0	16.9	22.0	43.0	24.5	734	12,408

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

100 SKS 10/20 SAND
OCT. 13, 1980

Company Hickory Creek Oil Company Lease -M-3 Well No. HCO-4

GR 189.5
= CORE 189.5

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	189.5 189	23.4	56	1,016	19 ³⁹	345	37	58	671	286	9.58	10	
2	190.5	23.0	65	1,160	25	446	40	54	714	490	7.27	10	
3	191.3 188.8	22.5	48	838	11 ²²	192	37	51	646	136	2.62	15	
4	193.7 191.2	20.8	48	774	8	129	40	56	645	139	3.00	25	
5	194.4	24.0	47	875	15	279	32	62	596	11	0.22	30	
6	195.5	20.6	44	703	0	0	44	49	703	15	0.37	40	
7	196.5	19.2	45	670	4	60	41	55	610	13	0.22	35	
8	197.5	18.2	52	734	7	99	45	51	635	25	0.52	40	
9	198.5 196	23.5	41	748	4	73	37	58	675	131	2.92	25	
10	199.5 197	21.7	39	656	5	85	34	61	572	127	2.55	25	
11	201.5	19.8	25	384	0	0	25	67	384	18	0.37	40	
12	202.5 200	24.1	36	673	3	56	33	64	617	99	2.10	25	
13	203.5	23.0	36	642	0	0	36	62	642	0	Imp.	-	
14	204.5 202	22.3	45	779	5	87	40	55	692	95	1.95	25	
15	205.5	22.8	40	708	2	36	38	53	672	28	0.60	40	
16	206.5	21.2	31	510	0	0	31	64	510	207	3.22	20	
17	207.5 205	22.0	34	580	0	0	34	62	580	194	3.30	20	
							502 59 = 382		624 40.81				

GR
= CORE 189.5

GR 187
= CORE 189.5

GR 188
= CORE 190.5

GR 188
= CORE 191.2

GR 193
= CORE 196

GR 196
= CORE 197

GR 197
= CORE 198

GR 200
= CORE 202

GR 204
= CORE 205

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	Lease			Well No.
Hickory Creek Oil Company	-			HCO-4
Depth Interval, Feet	188.9 - 198.0	198.0 - 208.0	188.9 - 208.0	
Feet of Core Analyzed	6.6	5.5	12.1	
Average Percent Porosity	21.7	22.8	22.2	
Average Percent Original Oil Saturation	51.7	40.3	46.5	
Average Percent Oil Recovery	13.0	4.0	8.9	
Average Percent Residual Oil Saturation	38.7	36.3	37.6	
Average Percent Residual Water Saturation	55.2	58.5	56.7	
Average Percent Total Residual Fluid Saturation	93.9	94.8	94.3	
Average Original Oil Content, Bbls./A. Ft.	872.	711.	798.	
Average Oil Recovery, Bbls./A. Ft.	227.	71.	156.	
Average Residual Oil Content, Bbls./A. Ft.	645.	640.	642.	
Total Original Oil Content, Bbls./Acre	5,749.	3,908.	9,657.	
Total Oil Recovery, Bbls./Acre	1,494.	390.	1,884.	
Total Residual Oil Content, Bbls./Acre	4,255.	3,518.	7,773.	
Average Effective Permeability, Millidarcys	3.40	2.12	2.82	
Average Initial Fluid Production Pressure, p.s.i.	23.6	28.0	25.4	

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

