

OILFIELD RESEARCH LABORATORIES

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March 27, 1980

Hickory Creek Oil Company
P.O. Box 379
Parsons, Kansas 67357

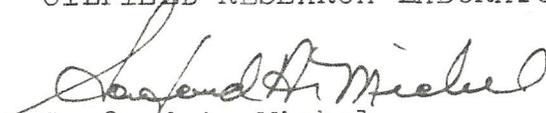
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-135, and submitted to our laboratory on March 5, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

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

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>
178.2 - 184.0	Dark brown slightly carbonaceous sandstone.
184.0 - 191.8	Brown sandstone.
191.8 - 194.2	Grayish brown very shaly sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 1,120 barrels of oil per acre was obtained from 8.8 feet of sand. The weighted average percent oil saturation was reduced from 52.8 to 45.4, or represents an average recovery of 7.4 percent. The weighted average effective permeability of the samples is 13.13 millidarcys, while the average initial fluid production pressure is 25.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 9 samples tested, 6 produced water and oil, and 3 samples produced water only. This indicates that approximately 67 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 3,350 barrels of oil per acre. This is an average recovery of 381 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 / 23.0
Average porosity, percent	23.4 / 22.4
Oil saturation after flooding, percent	✓ 45.4
Performance factor, percent, estimated	✓ 50.0
Net floodable sand, feet	8.8 / 9.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE I-B

Company Hickory Creek Oil Company Lease 5-15 Well No. HCO-135

169.8 206.5 222 966

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	178.6	19.8	49	15	64	753	231.	0.8	0.8	602	184.80
2	179.5	24.5	49	19	68	931	137.	1.5	2.3	1397	205.50
4	181.5	27.0	47	17	64	985	203.	2.0	4.3	1970	406.00
6	183.6	26.1	60	19	79	1215	153.	1.5	5.8	1818	229.50
7	184.6	17.6	65	31	96	888	15.	1.5	7.3	1332	22.50
9	186.5	23.2	40	27	67	720	60.	1.5	8.8	1080	90.00
10	187.5	21.6	47	37	84	788	21.	1.5	10.3	1182	31.50
12	189.5	23.5	39	35	74	711	72.	2.0	12.3	1422	144.00
14	191.5	23.2	33	22	55	594	74.	1.3	13.6	772	96.20

1 X O

1 X O

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company: Hickory Creek Oil Company Lease: 5-15 Well No. HCO-135

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			
1	173.6	20.2	49	768	3	47	46	47	266	13.50	20
2	179.5	24.7	49	939	6	115	43	53	288	10.00	20
4	181.5	24.3	47	995	2	42	45	53	270	40.48	20
6	183.6	25.6	60	1192	11	218	49	38	215	4.26	20
7	184.6	18.0	65	908	15	209	50	41	17	0.22	40
9	186.5	23.0	40	714	0	0	40	50	28	0.37	40
10	187.5	21.5	47	784	7	117	40	57	70	1.35	30
12	189.5	23.3	39	705	0	0	39	58	241	8.66	20
14	191.5	23.1	33	591	0	0	33	60	276	4.50	20

SOE = 45.5

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

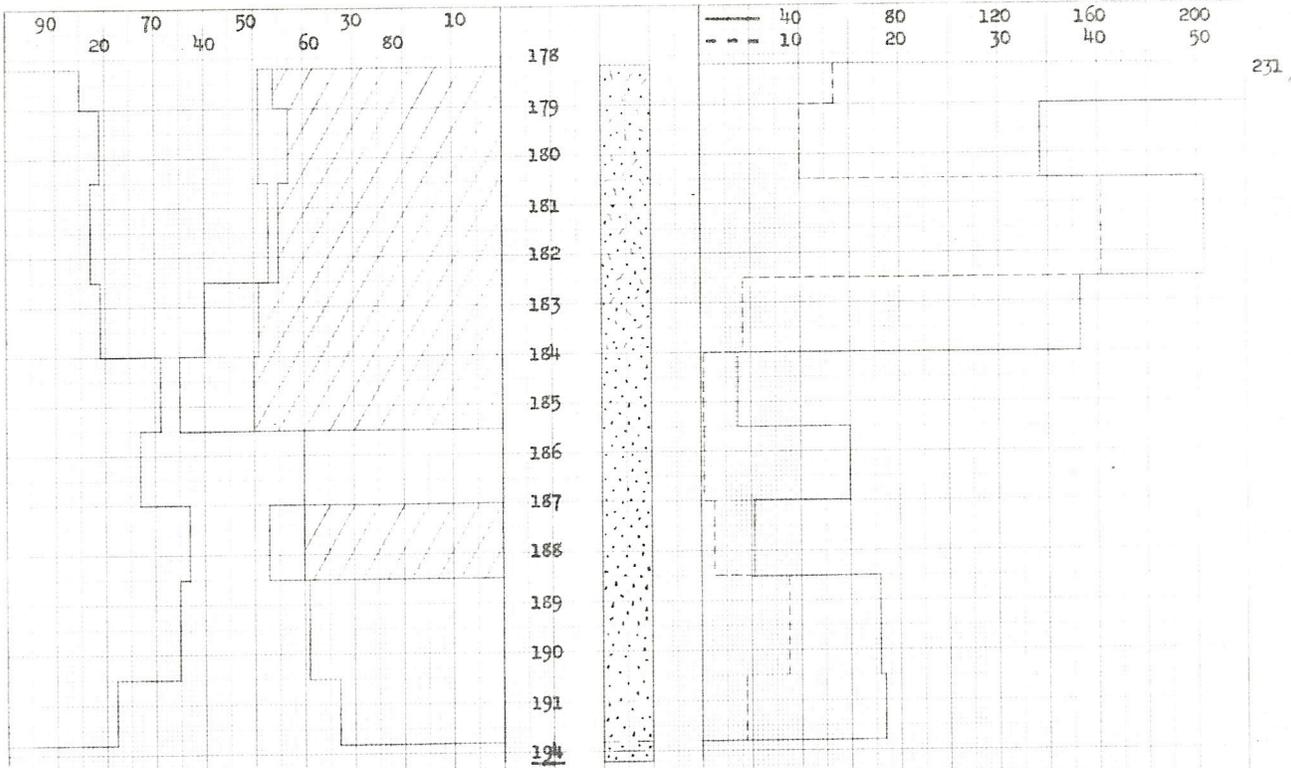
Company	Hickory Creek Oil Company		Lease	—	Well No.	HCO-135
Depth Interval, Feet	178.2 - 184.0	184.0 - 191.8	178.2 - 191.8			
Feet of Core Analyzed	5.8	3.0	8.8			
Average Percent Porosity	25.2	19.8	23.4			
Average Percent Original Oil Saturation	51.2	56.0	52.8			
Average Percent Oil Recovery	5.5	11.0	7.4			
Average Percent Residual Oil Saturation	45.7	45.0	45.4			
Average Percent Residual Water Saturation	50.9	49.0	50.2			
Average Percent Total Residual Fluid Saturation	96.6	94.0	95.6			
Average Original Oil Content, Bbls./A. Ft.	1,002.	846.	949.			
Average Oil Recovery, Bbls./A. Ft.	109.	163.	127.			
Average Residual Oil Content, Bbls./A. Ft.	893.	683.	822.			
Total Original Oil Content, Bbls./Acre	5,811.	2,538.	8,349.			
Total Oil Recovery, Bbls./Acre	631.	489.	1,120.			
Total Residual Oil Content, Bbls./Acre	5,180.	2,049.	7,229.			
Average Effective Permeability, Millidarcys	19.51	0.79	13.13			
Average Initial Fluid Production Pressure, p.s.i.	20.0	35.0	25.0			

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

WATER SAT.,
PERCENT

OIL SAT.,
PERCENT

47 1512
PERMEABILITY, IN MILLIDARCS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS



KEY:

SANDSTONE

CARBONACEOUS SANDSTONE

SHALY SANDSTONE

FLOODPOT RESIDUAL OIL SATURATION

HICKORY CREEK OIL COMPANY

— LEASE —

WELL NO. HCC - 135

— COUNTY, —

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCS	CALCULATED OIL RECOVERY BBL./ACRE
178.2 - 184.0	5.8	25.1	51.2	17.8	176.9	
184.0 - 191.8	7.8	21.9	44.7	30.9	49.3	
178.2 - 191.8	13.6	23.3	47.5	25.3	103.7	3.350 (PRIMARY & WATERFLOODING)

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CHANUTE, KANSAS
MARCH, 1980 HR