

OILFIELD RESEARCH LABORATORIES

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

November 17, 1981

Inexco Oil Company
Rural Route 2, Box 3
Moran, Kansas 66755

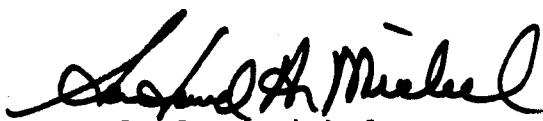
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Campbell Lease, Well No. E-17, located in Allen County, Kansas and submitted to our laboratory on November 2, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES



Sanford A. Michel

SAM/mkf

3 c to Moran, Ks.
2 c to Oklahoma City, Ok.

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Inexco Oil Company Lease Campbell Well No. E-17
 Location 880' EWL & 880' SNL SW $\frac{1}{4}$
 Section 18 Twp. 26S Rge. 21E County Allen State Kansas

Elevation, Feet

Name of Sand..... BARTLESVILLE

Top of Core 720.0

Bottom of Core 818.0

Top of Sand 720.0

Bottom of Sand 818.0

Total Feet of Permeable Sand 17.9

Total Feet of Floodable Sand 9.7

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
1 - 5	3.3	3.3
35 - 50	2.2	5.5
161 - 250	6.7	12.2
290 - 340	2.0	14.2
430 & Above	3.7	17.9

Average Permeability Millidarcys 254.1

Average Percent Porosity 20.5

Average Percent Oil Saturation 33.4

Average Percent Water Saturation..... 44.1

Average Oil Content, Bbls./A. Ft. 520.

Total Oil Content, Bbls./Acre..... 9,300.

Average Percent Oil Recovery by Laboratory Flooding Tests..... 7.1

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. 114.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre 1,104.

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

The core was sampled and the samples sealed in plastic bags by a representative of the client. Fresh water mud was used as a drilling fluid.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, <u>Feet</u>	<u>Description</u>
720.0 - 721.0	Brown sandstone with shale nodules.
721.0 - 725.5	Dark brown sandstone.
725.5 - 727.7	Dark brown slightly carbonaceous sandstone.
727.7 - 731.7	Grayish brown shaly sandstone with shale partings.
810.0 - 812.0	Dark brown sandstone with shale nodules.
812.0 - 813.1	Gray shale.
813.1 - 815.3	Brown sandstone.
815.3 - 816.0	Gray and brown laminated shale and sandstone.
816.0 - 818.0	Brown sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 6,340 barrels of oil per acre was obtained from 9.7 feet of sand. The weighted average percent oil saturation was reduced from 40.2 to 33.1, or represents an average recovery of 7.1 percent. The weighted average effective permeability of the samples is 11.45 millidarcys, while the average initial fluid production pressure is 19.5 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 18 samples tested, 10 produced water and oil, and 6 produced water only. This indicates that approximately 56 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 2650 barrels of oil per acre. This is an average recovery of 273 barrels per acre foot from 9.7 feet of floodable sand analyzed in this core.

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

Original formation volume factor, estimated	1.05
Reservoir water saturation, percent, estimated	30.0
Average porosity, percent	21.0
Oil saturation after flooding, percent	33.1
Performance factor, percent, estimated	50.0
Net floodable sand, feet	9.7

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Inexco Oil Company Lease Campbell Well No. E-17

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	720.3	19.9	34	49	83	525	47.	1.0	1.0	525	47.00
2	721.5	20.5	34	37	71	541	199.	1.0	2.0	541	199.00
3	722.4	20.8	29	47	76	468	296.	1.0	3.0	468	296.00
4	723.3	19.5	40	33	73	605	221.	1.0	4.0	605	221.00
5	724.5	21.1	45	48	93	737	161.	1.0	5.0	737	161.00
6	725.4	21.0	41	45	86	668	247.	0.5	5.5	334	123.50
7	726.6	20.4	47	34	81	744	231.	1.2	6.7	893	277.20
8	727.5	20.6	49	33	82	783	335.	1.0	7.7	783	335.00
9	728.6	15.8	43	32	75	527	3.6	1.3	9.0	685	4.68
10	729.4	16.8	20	61	81	261	1.2	1.0	10.0	261	1.20
11	730.7	11.8	37	60	97	339	2.4	1.0	11.0	339	2.40
12	810.3	22.7	41	41	82	722	216.	1.0	12.0	722	216.00
13	811.4	21.9	41	37	78	697	247.	1.0	13.0	697	247.00
14	813.5	21.8	18	44	62	304	849.	1.0	14.0	304	849.00
15	814.6	18.5	19	45	64	273	38.	1.2	15.2	328	45.60
16	815.9	22.6	22	38	60	386	430.	0.7	15.9	270	301.00
17	816.6	23.4	20	45	65	363	611.	1.0	16.9	363	611.00
18	817.7	31.9	18	68	86	445	611.	1.0	17.9	445	611.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Inexco Oil Company		Lease		Campbell		Well No.		E-17	
Depth Interval, Feet	Feet of Core Analyzed	Average Porosity	Average Percent Oil Saturation	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre	Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	
720.0 - 727.7	7.7	20.4	40.0	40.3	635	4,886	720.0 - 727.7	7.7	215.6	1659.70	
727.7 - 731.0	3.3	14.9	34.2	49.3	389	1,285	727.7 - 731.0	3.3	2.5	8.28	
810.0 - 818.0	6.9	23.1	25.5	45.7	454	3,129	810.0 - 818.0	6.9	417.5	2880.60	
720.0 - 818.0	17.9	20.5	33.4	44.1	520	9,300	720.0 - 818.0	17.9	254.1	4548.58	

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Inexco Oil Company Lease Campbell Well No. E-17

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	720.3	20.1	34	530	8	125	26	58	204	12.00	15
2	721.5	20.6	34	543	10	160	24	52	246	9.74	15
3	722.4	20.9	29	470	5	81	24	64	232	18.49	15
4	723.3	19.7	40	611	8	122	32	48	310	21.99	10
5	724.5	21.2	45	740	10	164	35	59	140	14.99	15
6	725.4	21.0	41	668	4	65	37	58	392	9.00	20
7	726.6	20.5	47	747	8	127	39	43	216	14.49	15
8	727.5	20.7	49	787	9	145	40	43	180	4.12	35
9	728.6	16.2	42	528	0	0	42	36	124	2.40	20
10	729.4	16.9	20	262	0	0	20	62	94	0.54	35
11	730.7	12.3	36	344	0	0	36	62	0	Imp.	-
12	810.3	22.8	41	725	3	53	38	45	205	2.10	30
13	811.4	22.1	41	703	4	69	37	49	218	5.70	25
14	813.5	21.9	18	306	0	0	18	68	220	26.39	15
15	814.6	18.4	19	271	0	0	19	47	0	Imp.	-
16	815.9	22.5	22	384	0	0	22	63	354	38.98	15
17	816.6	23.6	20	366	0	0	20	61	230	49.98	10
18	817.7	31.8	18	444	0	0	18	69	400	149.94	10

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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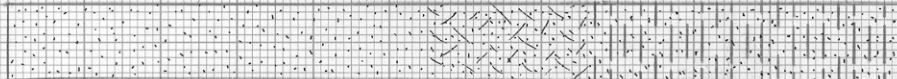
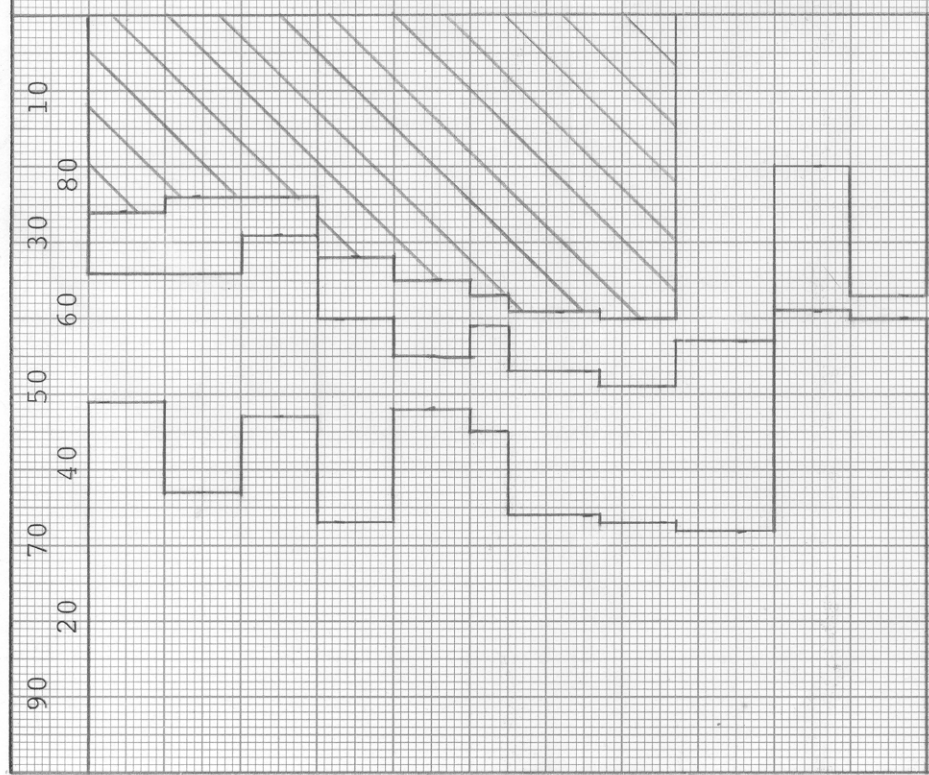
SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

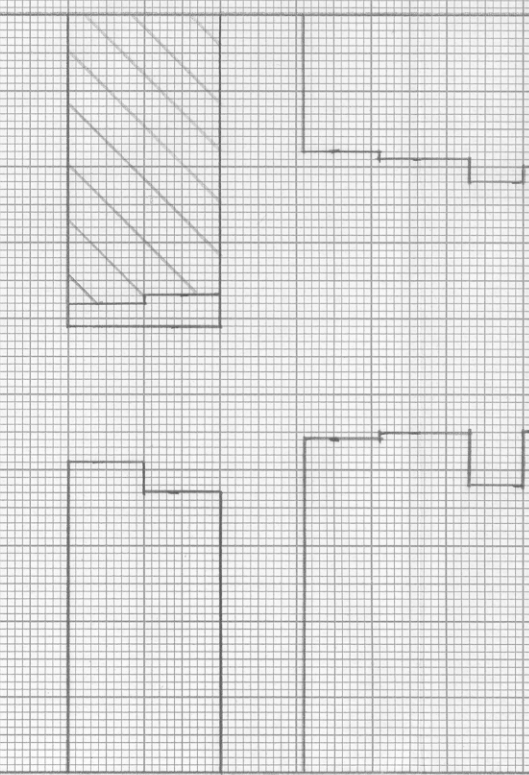
Company	Inexco Oil Company	Lease	Campbell	Well No.	E-17
Depth Interval, Feet	720.0 - 727.7	810.0 - 818.0	720.0 - 818.0		
Feet of Core Analyzed	7.7	2.0	9.7		
Average Percent Porosity	20.6	44.9	21.0		
Average Percent Original Oil Saturation	40.0	41.0	40.2		
Average Percent Oil Recovery	8.0	3.5	7.1		
Average Percent Residual Oil Saturation	32.0	37.5	33.1		
Average Percent Residual Water Saturation	52.6	47.0	51.4		
Average Percent Total Residual Fluid Saturation	84.6	84.5	84.5		
Average Original Oil Content, Bbls./A. Ft.	638.	714.	654.		
Average Oil Recovery, Bbls./A. Ft.	128.	61.	114.		
Average Residual Oil Content, Bbls./A. Ft.	510.	653.	540.		
Total Original Oil Content, Bbls./Acre	4,912.	1,428.	6,340.		
Total Oil Recovery, Bbls./Acre	982.	122.	1,104.		
Total Residual Oil Content, Bbls./Acre	3,930.	1,306.	5,236.		
Average Effective Permeability, Millidarcys	13.41	3.90	11.45		
Average Initial Fluid Production Pressure, p.s.i.	17.5	27.5	19.5		

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

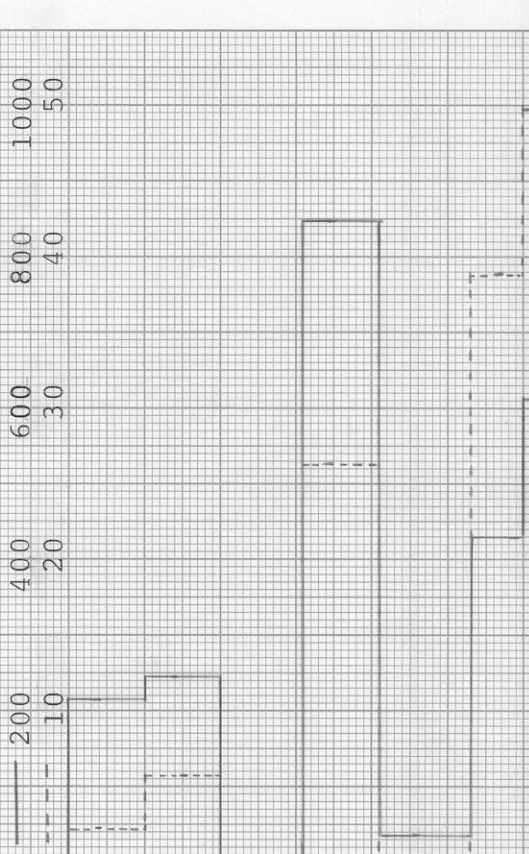
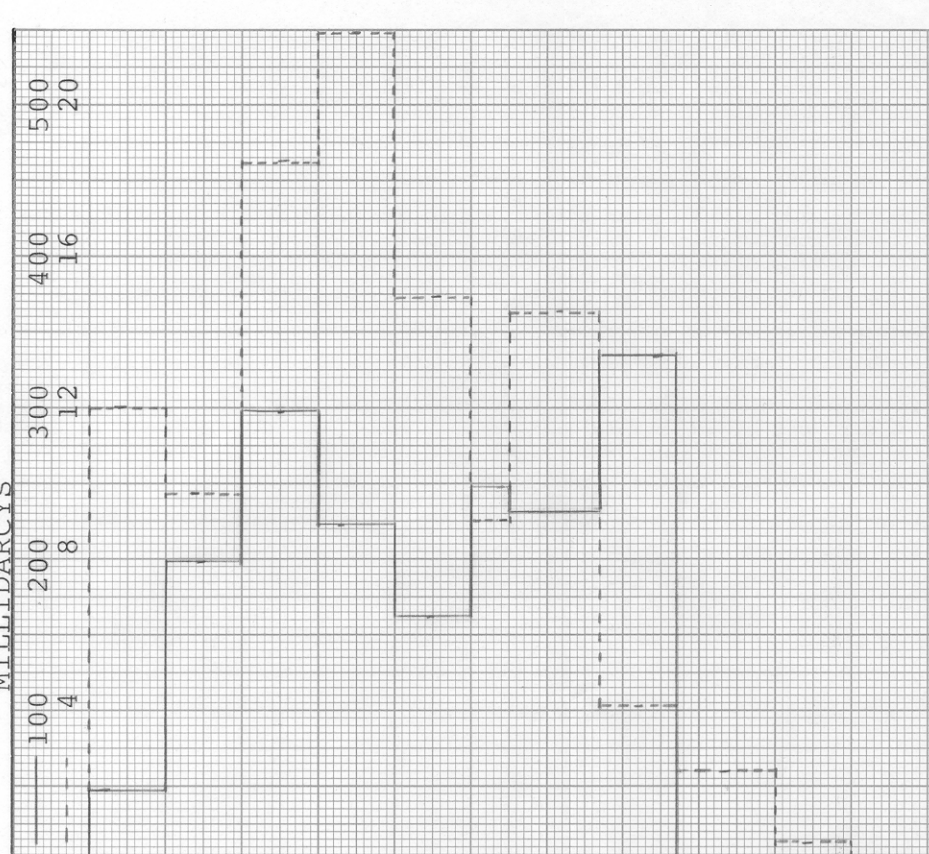
WATER SAT., PERCENT $\longrightarrow$ $\longleftarrow$ OIL SAT., PERCENT



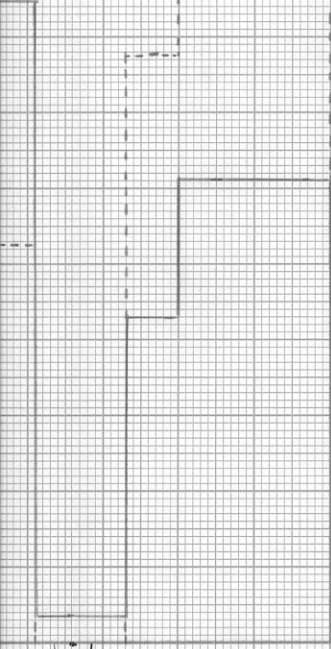
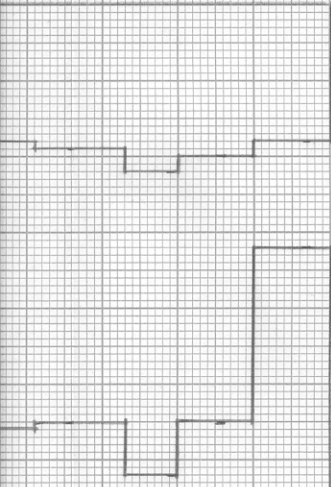
NO CORE
810
811
812
813
814
815
816



PERMEABILITY, IN MILLIDARCYS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS



814
815
816
817
818



149.94

KEY:

SANDSTONE



LAMINATED SANDSTONE AND SHALE



SHALE



SHALY SANDSTONE WITH SHALE PARTINGS



FLOODPOT RESIDUAL OIL SATURATION



CARBONACEOUS SANDSTONE



IMPERMEABLE TO WATER



INEXCO OIL COMPANY

CAMPBELL LEASE

ALLEN COUNTY, KANSAS

WELL NO. E-17

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE PERCENT POROSITY	AVG. OIL SATURATION PERCENT	AVG. WATER SATURATION PERCENT	AVERAGE PERMEABILITY, MILLIDARCYS	CALCULATED OIL RECOVERY BBLs. / ACRE
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720.0 - 727.7	7.7	20.4	40.0	40.3	215.6	
727.7 - 731.0	3.3	14.9	34.2	49.3	2.5	
810.0 - 818.0	6.9	23.1	25.5	45.7	417.5	
720.0 - 818.0	17.9	20.5	33.4	44.1	254.1	2650

(PRIMARY AND
WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
NOVEMBER, 1981

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