



OILFIELD RESEARCH LABORATORIES

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June 8, 1979

Lincoln 77
8485 Kathy Lane
Lincoln, Nebraska 68526

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Edwards Lease, Well No. 4, Coffey County, Kansas, and submitted to our laboratory on May 31, 1979.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Benjamin R. Pearman

SAM:km
4 c to Lincoln, Nebraska
1 c to Topeka, Kansas

- REGISTERED ENGINEERS -

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

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GENERAL INFORMATION & SUMMARY

Company Lincoln 77 Lease Edwards Well No. 4

Location NE SW SW

Section 22 Twp. 22S Rge. 16E County Coffey State Kansas

Name of Sand	Lower Squirrel
Top of Core	1010.0
Bottom of Core	1021.9
Top of Sand	1013.0
Bottom of Sand	1016.0
Total Feet of Permeable Sand	3.0
Total Feet of Floodable Sand	2.0

Distribution of Permeable Sand:
Permeability Range
Millidarcys

	Feet	Cum. Ft.
0 - 100	2.0	2.0
100 - 200	1.0	3.0

Average Permeability Millidarcys	87.0
Average Percent Porosity	18.8
Average Percent Oil Saturation	60.7
Average Percent Water Saturation	23.7
Average Oil Content, Bbls./A. Ft.	890.
Total Oil Content, Bbls./Acre	2,671.
Average Percent Oil Recovery by Laboratory Flooding Tests	18.0
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	286.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	571.
Total Calculated Oil Recovery, Bbls./Acre	580.
(Primary & Waterflooding)	
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
1010.0 - 1012.0	Gray shale.
1012.0 - 1012.6	Hard dark limestone.
1012.6 - 1013.0	Gray and brown laminated shale and sandstone.
1013.0 - 1016.0	Brown sandstone.
1016.0 - 1021.9	Gray shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 571 barrels of oil per acre was obtained from 2.0 feet of sand. The weighted average percent oil saturation was reduced from 62.5 to 44.5, or represents an average recovery of 18.0 percent. The weighted average effective permeability of the samples is 8.41 millidarcys, while the average initial fluid production pressure is 20.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 3 samples tested, 2 produced water and 2 oil. 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 data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 580 barrels of oil per acre. This is an average recovery of 289 barrels per acre foot from 2.0 feet of floodable sand analyzed in this core.

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

Original formation volume factor	1.07
Reservoir water saturation, percent	20.0
Average porosity, percent	20.5
Oil saturation after flooding, percent	44.5
Performance factor, percent	60.0
Net floodable pay sand, feet	2.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Lincoln 77 Lease Edwards Well No. 4

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	1013.7	20.4	65	21	86	1029	181.	1.0	1.0	1029	181.00
2	1014.6	19.9	60	20	80	926	62.	1.0	2.0	926	62.00
3	1015.5	16.2	57	31	88	716	18.	1.0	3.0	716	18.00

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Lincoln 77 Lease Edwards Well No. 4

Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation			Volume of Water Recovered cc ^a	Effective Permeability Millidarcys ^{b,c}	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Ebbls./A. Ft.	%	Ebbls./A. Ft.	% Oil	% Water	Ebbls./A. Ft.			
1	1013.7	20.5	65	1034	21	334	44	54	700	235	12.85	20
2	1014.6	20.4	60	950	15	237	45	48	713	151	3.96	20
3	1015.5	16.3	56	708	0	0	56	40	708	0	Imp.	-

Notes: cc—cubic centimeter.

^a—Volume of water recovered at the time of maximum oil recovery.

^c—Determined by passing water through sample which still contains residual oil.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Lincoln 77	Lease	Edwards	Well No.	4
Depth Interval, Feet	1013.0 - 1016.0				
Feet of Core Analyzed	2.0				
Average Percent Porosity	20.5				
Average Percent Original Oil Saturation	62.5				
Average Percent Oil Recovery	18.0				
Average Percent Residual Oil Saturation	44.5				
Average Percent Residual Water Saturation	51.0				
Average Percent Total Residual Fluid Saturation	96.5				
Average Original Oil Content, Bbls./A. Ft.	993.				
Average Oil Recovery, Bbls./A. Ft.	286.				
Average Residual Oil Content, Bbls./A. Ft.	707.				
Total Original Oil Content, Bbls./Acre	1,984.				
Total Oil Recovery, Bbls./Acre	571.				
Total Residual Oil Content, Bbls./Acre	1,413.				
Average Effective Permeability, Millidarcys	8.41				
Average Initial Fluid Production Pressure, p.s.i.	20.0				

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