

OILFIELD RESEARCH LABORATORIES

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

June 25, 1981

Jayhawk Production Company
113 South Kansas
Olathe, Kansas 66061

Attn: Gerald Williams

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Cooper "A" Lease, Well No. 4, located in Franklin County, Kansas and submitted to our laboratory on June 18, 1981.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/kas

5 c to Olathe, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Jayhawk Production Company Lease Cooper "A" Well No. 4
 Location 1000' WEL & 1000' NSL W $\frac{1}{2}$ SE $\frac{1}{4}$
 Section 34 Twp. 18S Rge. 20E County Franklin State Kansas

Elevation, Feet

Name of Sand.....	Third Squirrel
Top of Core	797.0
Bottom of Core	800.0
Top of Sand	797.0
Bottom of Sand	800.0
Total Feet of Permeable Sand	3.0
Total Feet of Floodable Sand	2.0

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
20 - 25	1.0	1.0
105 - 180	2.0	3.0

Average Permeability Millidarcys	102.7
Average Percent Porosity	20.8
Average Percent Oil Saturation	39.3
Average Percent Water Saturation	28.0
Average Oil Content, Bbls./A. Ft.	659.
Total Oil Content, Bbls./Acre	1,977.
Average Percent Oil Recovery by Laboratory Flooding Tests	3.5
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	61.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	122.
Total Calculated Oil Recovery, Bbls./Acre	See "Calculated Recovery"

Section

-2-

The core was sampled by a representative of Oilfield Research Laboratories. Fresh water mud was used as a drilling fluid. 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>
797.0 - 800.0	Black slightly carbonaceous slightly calcareous sandstone.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 122 barrels of oil per acre was obtained from 2.0 feet of sand. The weighted average percent oil saturation was reduced from 50.0 to 46.5, or represents an average recovery of 3.5 percent. The weighted average effective permeability of the samples is 6.16 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 3 samples tested, 2 produced water and oil. This indicates that approximately 67.0 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 460 barrels of oil per acre. This is an average recovery of 231 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, estimated	1.05
Reservoir water saturation, percent, estimated	20.0
Average porosity, percent	22.3
Oil saturation after flooding, percent	46.5
Performance factor, percent, estimated	45.0
Net floodable sand, feet	2.0

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Jayhawk Production Company Lease Cooper "A" 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	797.5	22.7	52	20	72	916	178.	1.0	1.0	916	178.00
2	798.6	21.7	48	23	71	808	109.	1.0	2.0	808	109.00
3	799.4	18.1	18	41	59	253	21.	1.0	3.0	253	21.00

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Lease		Cooper "A"		Well No.	
Jayhawk Production Company						4	
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.				
797.0 - 800.0	3.0	102.7	308.00				
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	
797.0 - 800.0	3.0	20.8	39.3	28.0	659	1,977	

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Jayhawk Production Company Lease Cooper "A" Well No. 4

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	797.5	22.8	52	920	5	88	47	47	832	232	11.80	25
2	798.6	21.8	48	812	2	34	46	45	778	14	0.52	25
3	799.4	18.2	18	254	0	0	18	42	254	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

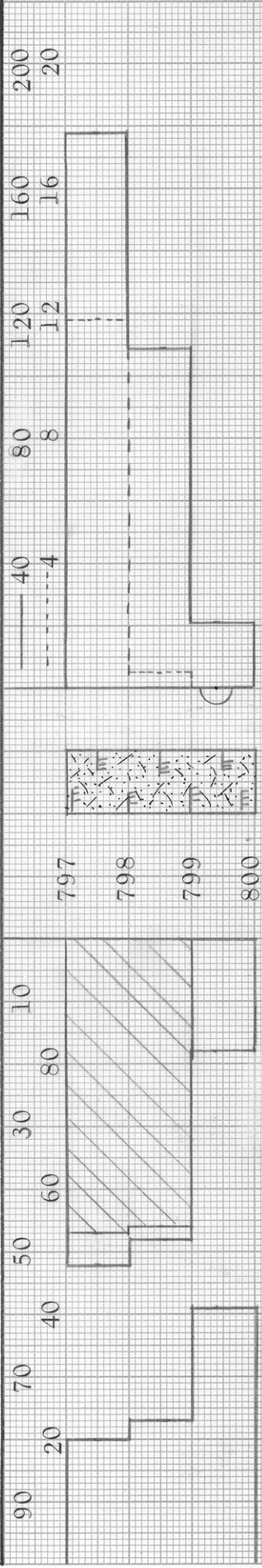
TABLE V

Company	Jayhawk Production Company	Lease	Cooper "A"	Well No.	4
Depth Interval, Feet	797.0 - 800.0				
Feet of Core Analyzed	3.0				
Average Percent Porosity	22.3				
Average Percent Original Oil Saturation	50.0				
Average Percent Oil Recovery	3.5				
Average Percent Residual Oil Saturation	46.5				
Average Percent Residual Water Saturation	46.0				
Average Percent Total Residual Fluid Saturation	92.5				
Average Original Oil Content, Bbls./A. Ft.	866.				
Average Oil Recovery, Bbls./A. Ft.	61.				
Average Residual Oil Content, Bbls./A. Ft.	805.				
Total Original Oil Content, Bbls./Acre	1732.				
Total Oil Recovery, Bbls./Acre	122.				
Total Residual Oil Content, Bbls./Acre	1610.				
Average Effective Permeability, Millidarcys	6.16				
Average Initial Fluid Production Pressure, p.s.i.	25.0				

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

WATER SAT., PERCENT → OIL SAT., PERCENT ←

PERMEABILITY, IN MILLIDARCYS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCYS



KEY:



CARBONACEOUS CALCAREOUS SANDSTONE



FLOODPOT RESIDUAL OIL SATURATION



IMPERMEABLE TO WATER

JAYHAWK PRODUCTION COMPANY

COOPER A LEASE

FRANKLIN COUNTY, KANSAS

WELL NO. 4

DEPTH INTERVAL, FEET	FEET OF CORE ANALYZED	AVERAGE POROSITY		AVG. OIL SATURATION		AVG. WATER SATURATION		AVERAGE PERMEABILITY, MILLIDARCYS		CALCULATED OIL RECOVERY BBLs. / ACRE	
		PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	PERCENT	MILLIDARCYS	MILLIDARCYS	(PRIMARY AND WATERFLOODING)	
797.0 - 800.0	3.0	20.8	39.3	28.0	102.7	460					

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CHANUTE, KANSAS
JUNE, 1981