

OILFIELD RESEARCH LABORATORIES

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

November 8, 1982

X O Petroleum Oil Company
1860 Lincoln Street, Suite 1050
Denver, Colorado 80295

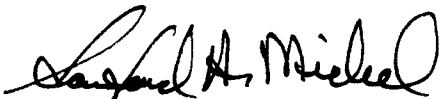
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from the Penka Lease, Well No. B-2, located in Linn County, Kansas and submitted to our laboratory on November 1, 1982.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES



Sanford A. Michel

SAM/rmc

3 c to Denver, Colorado
1 c to Westport Petroleum, Osawatomie, Ks.
1 c to Larry Brown, Hutchinson, Kansas

Oilfield Research Laboratories
GENERAL INFORMATION & SUMMARY

Company X O Petroleum Oil Company Lease Penka Well No. B-2

Location _____

Section 25 Twp. 20S Rge. 21E County Linn State Kansas

Elevation, Feet

Name of Sand

Lower Squirrel

Top of Core

600.0

Bottom of Core

620.2

Top of Sand

600.0

Bottom of Sand

615.5

Total Feet of Permeable Sand

7.2

Total Feet of Floodable Sand

6.2

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 5

2.6

2.6

8 - 24

4.6

7.2

Average Permeability Millidarcys

11.9

Average Percent Porosity

17.4

Average Percent Oil Saturation

29.1

Average Percent Water Saturation

57.3

Average Oil Content, Bbls./A. Ft.

401.

Total Oil Content, Bbls./Acre

4,011.

Average Percent Oil Recovery by Laboratory Flooding Tests

4.0

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

60.

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

374.

Total Calculated Oil Recovery, Bbls./Acre

See "Calculated Recovery"
Section

-2-

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

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
600.0 - 601.0	Grayish brown very shaly sandstone.
601.0 - 603.0	Brown sandstone.
603.0 - 603.2	Grayish brown very shaly sandstone.
603.2 - 603.8	Brown slightly shaly sandstone.
603.8 - 604.1	Gray shale.
604.1 - 606.7	Grayish brown very shaly sandstone.
606.7 - 606.9	Brown sandstone.
606.9 - 607.1	Gray shale.
607.1 - 608.2	Brown shaly sandstone.
608.2 - 608.4	Grayish brown very shaly sandstone.
608.4 - 613.0	Gray shale.
613.0 - 615.0	Brown sandstone.
615.0 - 615.5	Brown shaly sandstone.
615.5 - 616.5	Gray shale.
616.5 - 620.2	Gray slightly sandy shale.

LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 374 barrels of oil per acre was obtained from 6.2 feet of sand. The weighted average percent oil saturation was reduced from 32.4 to 28.4, or represents an average recovery of 4.0 percent. The weighted average effective permeability of the samples is 0.54 millidarcys, while the average initial fluid production pressure is 35.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 12 samples tested, 7 produced water and oil. This indicates that approximately 58 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 1,440 barrels of oil per acre. This is an average recovery of 233 barrels per acre foot from 6.2 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	40.0
Average porosity, percent	19.0
Oil saturation after flooding, percent	28.4
Performance factor, percent, estimated	55.0
Net floodable sand, feet	6.2

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE I-B

Company X O Petroleum Oil Company Lease Penka Well No. B-2

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	600.5	15.9	20	67	87	247	0.95	1.0	1.0	247	0.95
2	601.5	20.3	35	44	79	551	19.	1.0	2.0	551	19.00
3	602.6	20.2	31	43	74	486	18.	1.0	3.0	486	18.00
4	603.5	19.6	34	53	87	516	8.0	0.6	3.6	310	4.80
5	604.4	15.7	35	61	96	426	Imp.	1.0	4.6	426	0.00
6	605.4	14.0	14	81	95	152	Imp.	1.0	5.6	152	0.00
7	606.4	13.7	27	64	91	287	Imp.	0.6	6.2	172	0.00
8	607.5	18.3	33	46	79	469	3.5	1.1	7.3	516	3.85
9	608.3	14.3	26	68	94	288	Imp.	0.2	7.5	58	0.00
10	613.5	18.0	30	52	82	419	23.	1.0	8.5	419	23.00
11	614.5	17.8	34	56	90	470	14.	1.0	9.5	470	14.00
12	615.4	18.8	28	69	97	408	4.4	0.5	10.0	204	2.20

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease	Well No.				
X O Petroleum Oil Company	Penka	B-2				
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	Average Percent Oil Saturation	Average Water Saturation	Total Oil Content Bbls./Acre
600.0 - 615.5	7.2	11.9	85.80	29.1	57.3	4,011
600.0 - 615.5	10.0			17.4	401	

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company X O Petroleum Oil Company Lease Penka Well No. B-2

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.
			%	Bbbls./A. Ft.	%	Bbbls./A. Ft.	% Oil	% Water			
1	600.5	16.2	20	251	0	0	20	68	0	Imp.	-
2	601.5	20.2	35	548	9	141	26	63	50	0.82	25
3	602.6	20.1	31	483	4	62	27	66	24	0.33	30
4	603.5	19.5	34	514	4	61	30	63	20	0.30	35
5	604.4	16.2	34	427	0	0	34	62	0	Imp.	-
6	605.4	14.3	14	155	0	0	14	81	0	Imp.	-
7	606.4	14.2	26	286	0	0	26	65	0	Imp.	-
8	607.5	18.5	33	474	4	57	29	64	42	0.75	40
9	608.3	14.6	26	294	0	0	26	69	0	Imp.	-
10	613.5	18.1	30	421	2	28	28	62	34	0.64	35
11	614.5	17.9	34	472	2	28	32	62	22	0.37	40
12	615.4	19.0	28	413	2	29	26	72	8	0.30	45

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

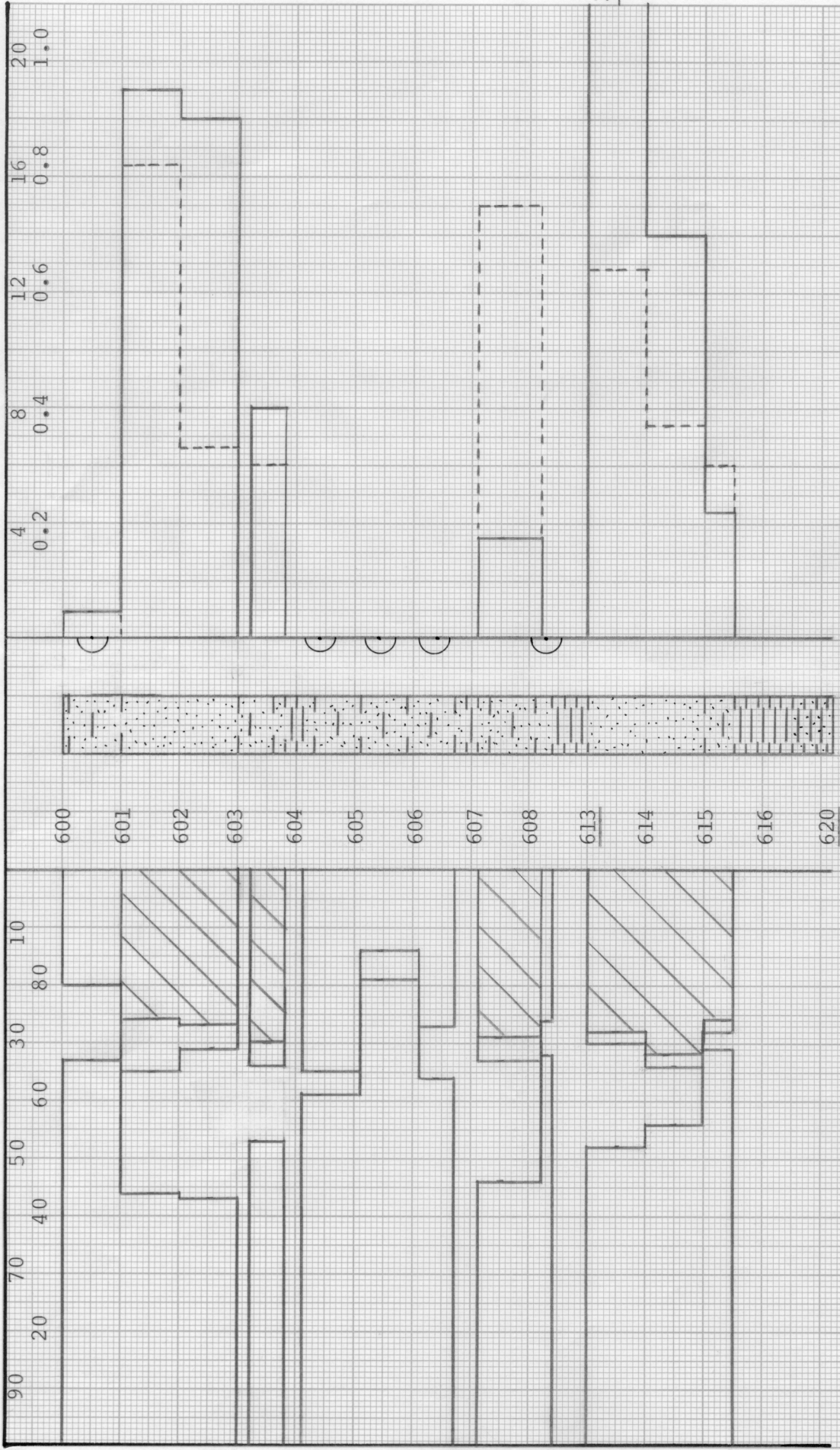
Company	X O Petroleum Oil Company	Lease	Penka	Well No.	B-2
Depth Interval, Feet	600.0 - 615.5				
Feet of Core Analyzed	6.2				
Average Percent Porosity	19.0				
Average Percent Original Oil Saturation	32.4				
Average Percent Oil Recovery	4.0				
Average Percent Residual Oil Saturation	28.4				
Average Percent Residual Water Saturation	64.1				
Average Percent Total Residual Fluid Saturation	92.5				
Average Original Oil Content, Bbls./A. Ft.	477.				
Average Oil Recovery, Bbls./A. Ft.	60.				
Average Residual Oil Content, Bbls./A. Ft.	417.				
Total Original Oil Content, Bbls./Acre	2,962.				
Total Oil Recovery, Bbls./Acre	374.				
Total Residual Oil Content, Bbls./Acre	2,588.				
Average Effective Permeability, Millidarcys	0.54				
Average Initial Fluid Production Pressure, p.s.i.	35.7				

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

WATER SAT.,
PERCENT

OIL SAT.,
PERCENT

PERMEABILITY, IN MILLIDARCS
EFFECTIVE PERMEABILITY TO WATER, IN MILLIDARCS



KEY:

- SANDSTONE
- IMMERMEABLE TO WATER
- FLOODPOT RESIDUAL OIL SATURATION

SHALE.

SANDY SHALE

SHALY SANDSTONE

X O PETROLEUM OIL COMPANY

PENKA LEASE

WELL NO. B-2

LINN COUNTY, KANSAS

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
600.0 - 615.5	10.0	17.4	29.1	57.3	11.9	1440 (PRIMARY AND WATERFLOODING)

OILFIELD RESEARCH LABORATORIES
CHANUTE, KANSAS
NOVEMBER, 1982 PDC