



OILFIELD RESEARCH LABORATORIES

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November 11, 1980

Ramco Energy
Box 176
Thayer, Kansas 66776

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary cores taken from the Balfay Lease, Well No. 1-A, located in Neosho County, Kansas and submitted to our laboratory on August 20, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Sanford A. Michel

SAM/kas

5 c to Thayer, Kansas

- REGISTERED ENGINEERS -

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

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GENERAL INFORMATION & SUMMARY

Company Ramco Energy Lease Balfay Well No. 1-A

Location NW $\frac{1}{4}$ -SE $\frac{1}{4}$ -NE $\frac{1}{4}$

Section 22 Twp. 29S Rge. 21E County Neosho State Kansas

Elevation, Feet	-	-
Name of Sand	Peru	Upper Bartlesville
Top of Core	192.0	413.0
Bottom of Core	204.5	421.3
Top of Sand	192.0	413.0
Bottom of Sand	204.5	421.3
Total Feet of Permeable Sand	12.5	8.3
Total Feet of Floodable Sand	6.7	4.3

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

PERU SAND

0 - 5	4.7	4.7
5 - 10	4.5	9.2
10 - 15	3.3	12.5

UPPER BARTLESVILLE SAND

0 - 5	2.0	2.0
5 - 10	3.4	5.4
10 - 20	2.9	8.3

Average Permeability Millidarcys	7.4	8.5
Average Percent Porosity	15.6	15.6
Average Percent Oil Saturation	38.7	47.3
Average Percent Water Saturation	46.6	41.8
Average Oil Content, Bbls./A. Ft.	467.	575.
Total Oil Content, Bbls./Acre	5,836.	4,771.
Average Percent Oil Recovery by Laboratory Flooding Tests	9.6	6.6
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	124.	73.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	828.	315.
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. 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>
<u>PERU SAND</u>	
192.0 - 192.8	Brown and gray laminated slightly calcareous sandstone and shale.
192.8 - 197.5	Brown calcareous shaly sandstone.
197.5 - 199.3	Brown slightly calcareous sandstone.
199.3 - 202.1	Brown calcareous shaly sandstone.
202.1 - 203.0	Brown slightly calcareous sandstone.
203.0 - 203.9	Brown slightly calcareous shaly sandstone.
203.9 - 204.5	Brown slightly calcareous sandstone.
<u>UPPER BARTLESVILLE SAND</u>	
413.0 - 414.4	Brown shaly sandstone.
414.4 - 415.1	Brown slightly calcareous sandstone.
415.1 - 418.0	Brown slightly calcareous shaly sandstone.
418.0 - 420.2	Brown slightly calcareous sandstone.
420.2 - 421.3	Black slightly calcareous slightly carbonaceous shaly sandstone.

LABORATORY FLOODING TESTS

PERU SAND

The Peru sand in this core responded to laboratory flooding tests, as a total recovery of 828 barrels of oil per acre was obtained from 6.7 feet of sand. The weighted average percent oil saturation was

reduced from 43.9 to 34.3, or represents an average recovery of 9.6 percent. The weighted average effective permeability of the samples is 1.01 millidarcys, while the average initial fluid production pressure is 38.3 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 13 samples tested, 6 produced water and oil, and 4 samples produced water only. This indicates that approximately 46 percent of the sand represented by these samples is floodable pay sand.

LABORATORY FLOODING TESTS

UPPER BARTLESVILLE SAND

The Upper Bartlesville sand in this core responded to laboratory flooding tests, as a total recovery of 315 barrels of oil per acre was obtained from 4.3 feet of sand. The weighted average percent oil saturation was reduced from 51.3 to 44.7, or represents an average recovery of 6.6 percent. The weighted average effective permeability of the samples is 0.82 millidarcys, while the average initial fluid production pressure is 35.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 8 samples tested, 4 produced water and oil. This indicates that approximately 50 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 1220 barrels of oil per acre from the Peru sand, and approximately 560 barrels of oil per acre from the Upper Bartlesville sand. This is an average recovery of 182 barrels per acre foot from 6.7 feet of floodable sand from the Peru sand, and an average

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

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			Ft.	Cum. Ft.		
1	192.4	19.9	30	40	463	3.3	1.0	1.0	463	3.30
2	193.4	16.0	32	57	397	1.4	0.8	1.8	318	1.12
3	194.5	18.7	44	52	638	8.7	1.0	2.8	638	8.70
4	195.2	10.5	35	52	285	3.9	1.0	3.8	285	3.90
5	196.3	15.2	39	50	460	5.8	1.0	4.8	460	5.80
6	197.2	15.5	38	45	457	5.4	0.7	5.5	320	3.78
7	198.4	17.1	59	38	783	13.	1.8	7.3	1409	23.40
8	199.7	12.0	43	53	400	8.3	1.0	8.3	400	8.30
9	200.5	7.9	42	56	257	6.8	0.8	9.1	206	5.44
10	201.3	16.7	36	51	466	3.9	1.0	10.1	466	3.90
11	202.3	18.4	29	46	414	13.	0.9	11.0	373	11.70
12	203.5	15.6	25	59	303	3.9	0.9	11.9	273	3.51
13	204.4	17.9	27	51	375	15.	0.6	12.5	225	9.00
<u>UPPER BARTLESVILLE SAND</u>										
14	413.3	12.4	50	47	481	6.0	1.4	1.4	673	8.40
15	414.7	14.5	28	57	315	13.	0.7	2.1	221	9.10
16	415.6	14.2	46	46	507	6.3	1.0	3.1	507	6.30
17	416.2	17.6	57	33	778	8.7	1.0	4.1	778	8.70
18	417.5	15.9	52	41	641	4.2	0.9	5.0	577	3.78
19	418.6	14.6	47	50	532	18.	1.0	6.0	532	18.00
20	419.5	16.5	39	41	499	13.	1.2	7.2	599	15.60
21	420.5	19.2	54	24	804	0.61	1.1	8.3	884	0.67

Company Ramco Energy

Lease Balfay

Well No. 1-A

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

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.	% PERU SAND	Bbls./A. Ft.	% Oil	% Water				Bbls./A. Ft.
1	192.4	19.8	30	461	0	0	30	58	461	0.30	40	
2	193.4	16.1	32	400	0	0	32	67	400	Imp.	-	
3	194.5	18.6	44	635	6	87	38	60	548	1.50	35	
4	195.2	11.0	34	290	0	0	34	54	290	Imp.	-	
5	196.3	15.1	39	457	7	82	32	63	375	0.67	45	
6	197.2	15.5	38	457	0	0	38	52	457	0.45	50	
7	198.4	17.1	59	782	23	305	36	61	477	1.50	35	
8	199.7	11.8	43	394	5	46	38	56	348	0.75	40	
9	200.5	8.2	41	261	0	0	41	53	261	0.50	45	
10	201.3	16.6	36	464	3	39	33	61	425	0.45	50	
11	202.3	18.3	29	412	2	28	27	59	384	0.75	25	
12	203.4	15.1	26	305	0	0	26	60	305	Imp.	-	
13	204.4	17.8	27	373	0	0	27	67	273	0.90	30	
UPPER BARTLESVILLE SAND												
14	413.3	12.6	50	489	10	98	40	56	391	1.20	35	
15	414.7	14.0	29	315	0	0	29	60	315	Imp.	-	
16	415.6	14.6	45	510	0	0	45	48	510	Imp.	-	
17	416.2	17.5	57	774	4	54	53	42	720	0.33	40	
18	417.5	15.8	52	637	6	74	46	52	563	0.75	30	
19	418.6	14.8	47	540	5	57	42	48	483	0.83	35	
20	419.5	16.9	38	498	0	0	38	43	498	Imp.	-	
21	420.5	18.7	55	798	0	0	55	26	798	Imp.	-	

Well No. 1-A

Lease Balfay

Company Ramco Energy

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	Lease	Belfay	Well No.
	PERU SAND		UPPER BARTLESVILLE SAND
Depth Interval, Feet	192.0 - 204.5	413.0 - 421.3	1-A
Feet of Core Analyzed	6.7	4.3	
Average Percent Porosity	16.3	14.9	
Average Percent Original Oil Saturation	43.9	51.3	
Average Percent Oil Recovery	9.6	6.6	
Average Percent Residual Oil Saturation	34.3	44.7	
Average Percent Residual Water Saturation	60.1	50.1	
Average Percent Total Residual Fluid Saturation	94.4	94.8	
Average Original Oil Content, Bbls./A. Ft.	539.	598.	
Average Oil Recovery, Bbls./A. Ft.	124.	73.	
Average Residual Oil Content, Bbls./A. Ft.	415.	525.	
Total Original Oil Content, Bbls./Acre	3,608.	2,572.	
Total Oil Recovery, Bbls./Acre	828.	315.	
Total Residual Oil Content, Bbls./Acre	2,780.	2,257.	
Average Effective Permeability, Millidarcys	101.	0.82	
Average Initial Fluid Production Pressure, p.s.i.	38.3	35.0	

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