



OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS - PHONE HE1-2650

January 26, 1966

Brazos Oil & Gas Company
P.O. Box 22468
Houston, Texas

Attn: Mr. G. P. Huston

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the West Bell Lease, Well No. 3, Douglas County, Kansas, and submitted to our laboratory on January 21, 1966.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
Benjamin R. Pearman

BRP:rf

8 c. - Houston, Texas
1 c. - Chanute, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Brazos Oil & Gas Co. Lease West Bell Well No. 3

Location 640' WEL & 240' NSL, SE

Section 2 Twp. 15S Rge. 20E County Douglas State Kansas

Name of Sand - - - - - Squirrel

Top of Core - - - - - 833.0

Bottom of Core - - - - - 874.5

Top of Sand - - - - - 848.0

Bottom of Sand - - - - - 866.0

Total Feet of Permeable Sand - - - - - 11.5

Total Feet of Floodable Sand - - - - - 2.4

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

Permeability Range Millidarcys	Feet	Cum. Ft.
1 - 5	2.0	2.0
5 - 10	5.1	7.1
10 - 20	3.0	10.1
20 & above	1.4	11.5

Average Permeability Millidarcys - - - - - 11.2

Average Percent Porosity - - - - - 18.0

Average Percent Oil Saturation - - - - - 35.8

Average Percent Water Saturation - - - - - 47.4

Average Oil Content, Bbls./A. Ft. - - - - - 514.

Total Oil Content, Bbls./Acre - - - - - 6,438.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 17.7

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 281.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 675.

Total Calculated Oil Recovery, Bbls./Acre - (Primary & Secondary). - - - - - 710.

Packer Setting, Feet - - - - -

Viscosity, Centipoises @ - - - - -

A. P. I. Gravity, degrees @ 60 °F - - - - -

Elevation, Feet - - - - - 1075.1

Fresh water mud was used as the circulating fluid while taking this core. The core was sampled and the samples sealed in cans by a representative of Oilfield Research Laboratories. The well was drilled in virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
833.0 - 848.0	- Sandy shale.
848.0 - 849.0	- Brown, laminated sandstone and shale.
849.0 - 852.0	- Sandy shale.
852.0 - 858.0	- Brown, laminated sandstone and shale.
858.0 - 860.5	- Sandy shale.
860.5 - 866.0	- Brown, laminated sandstone and shale.
866.0 - 874.5	- Sandy shale.

Coring was started at a depth of 883.0 feet in sandy shale and completed at 874.5 feet also in sandy shale.

PERMEABILITY

The weighted average permeability of the core is 11.2 millidarcys. By observing the data given on the coregraph, it is noticeable that the sand has a rather irregular permeability profile. The permeability of the sand varies from impermeable to a maximum of 33. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil saturation, namely, 35.8. The weighted average percent water saturation

is 47.4 (See Table III). This gives an overall weighted average total fluid saturation of 83.2 percent. This low total fluid saturation indicates considerable fluid was lost during coring which was probably oil.

The weighted average oil content of the core is 514 barrels per acre foot. The total oil content, as shown by this core, is 6,438 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded poorly to laboratory flooding tests, as a total recovery of 615 barrels of oil per acre was obtained from 2.4 feet of sand. The weighted average percent oil saturation was reduced from 55.1 to 37.4, or represents an average recovery of 17.7 percent. The weighted average effective permeability of the samples is 0.875 millidarcys, while the average initial fluid production pressure is 30.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 13 samples tested, 3 produced water and 2 oil. This indicates that approximately 15 percent of the sand represented by these samples is floodable pay sand.

CONCLUSION

The results of the laboratory tests indicate that efficient primary and secondary operations in the vicinity of this well should recover approximately 710 barrels of oil per acre or an average of 294 barrels per acre foot from the 2.4 feet of floodable pay sand analyzed in this

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

Original formation volume factor	1.06
Reservoir water saturation, percent	25.0
Average porosity, percent	21.4
Oil saturation after flooding, percent	37.4
Performance factor, percent	50.0
Net floodable pay sand, feet	2.4

This core indicates a rather shaly reservoir having a good oil saturation, a moderate water saturation and practically no effective permeability to water.

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Brazos Oil & Gas Co. Lease West Bell Well No. 3

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	848.1	23.4	33	35	68	599	12.	1.0	1.0	599	12.00
2	852.2	14.4	18	64	82	201	5.6	0.6	1.6	121	3.36
3	853.1	16.2	19	48	67	238	6.5	1.0	2.6	238	6.50
4	854.3	13.7	19	74	93	202	4.2	1.0	3.6	202	4.20
5	855.2	14.9	33	65	98	381	Imp.	1.0	4.6	381	0.00
6	856.1	18.7	30	45	75	435	12.	1.0	5.6	435	12.00
7	857.1	19.8	71	27	98	1,091	33.	1.4	7.0	1,527	46.20
8	860.9	20.4	37	38	75	585	6.3	1.0	8.0	585	6.30
9	861.7	16.1	30	56	86	374	5.1	0.5	8.5	187	2.55
10	862.5	19.8	34	37	71	521	9.0	1.0	9.5	521	9.00
11	863.3	17.1	30	50	80	397	1.1	1.0	10.5	397	1.10
12	864.4	16.3	36	47	83	455	19.	1.0	11.5	455	19.00
13	865.5	19.6	52	37	89	790	6.3	1.0	12.5	790	6.30
								Total-----		6,438	

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease	Well No.					
Brazos Oil & Gas Co.	West Bell	3					
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.	Average Percent Porosity	Average Percent Water Saturation	Average Oil Content Bbl./A. Ft.	Total Oil Content Bbls./Acre
848.0 - 866.0	11.5	11.2	128.51	18.0	47.4	514	6,438
848.0 - 866.0	12.5			35.8			

Oilfield Research Laboratories

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.
			%	Bbbs./A. Ft.	%	Bbbs./A. Ft.	% Oil	% Water			
1	848.1	23.0	33	587	2	36	31	60	77	1.40	30
2	852.2	14.2	20	220	0	0	20	63	0	Imp.	-
3	853.1	16.5	19	243	0	0	19	50	0	Imp.	-
4	854.3	13.6	18	190	0	0	18	75	0	Imp.	-
5	855.2	15.1	33	386	0	0	33	66	0	Imp.	-
6	856.1	18.4	32	456	0	0	32	46	0	Imp.	-
7	857.1	20.3	71	1118	29	456	42	55	18	0.500	30
8	860.9	20.0	37	574	0	0	37	60	11	0.300	50
9	861.7	16.0	31	384	0	0	31	58	0	Imp.	-
10	862.5	20.0	32	496	0	0	32	38	0	Imp.	-
11	863.3	17.0	30	395	0	0	30	52	0	Imp.	-
12	864.4	16.5	36	461	0	0	36	46	0	Imp.	-
13	865.5	19.3	54	809	0	0	54	38	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.

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Brazos Oil & Gas Co.	Lease	West Bell	Well No.	3
Depth Interval, Feet	848.0 - 866.0				
Feet of Core Analyzed	2.4				
Average Percent Porosity	21.4				
Average Percent Original Oil Saturation	55.1				
Average Percent Oil Recovery	17.7				
Average Percent Residual Oil Saturation	37.4				
Average Percent Residual Water Saturation	57.1				
Average Percent Total Residual Fluid Saturation	94.5				
Average Original Oil Content, Bbls./A. Ft.	896.				
Average Oil Recovery, Bbls./A. Ft.	281.				
Average Residual Oil Content, Bbls./A. Ft.	615.				
Total Original Oil Content, Bbls./Acre	2,152.				
Total Oil Recovery, Bbls./Acre	675.				
Total Residual Oil Content, Bbls./Acre	1,477.				
Average Effective Permeability, Millidarcys	0.875				
Average Initial Fluid Production Pressure, p.s.i.	30.0				

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