

OILFIELD RESEARCH LABORATORIES

- REGISTERED ENGINEERS -

700 NORTH MISSION
OKMULGEE, OKLAHOMA
PHONE: 4444

Chanute, Kansas

July 14, 1962

536 N. HIGHLAND
CHANUTE, KANSAS
PHONE: HE 1-2650

Laura Drilling Company
c/o Mr. T.E. Bird
4975 East 26th
Tulsa 14, Oklahoma

Gentlemen:

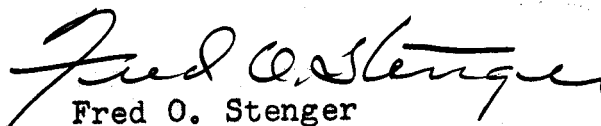
Enclosed herewith is the report of the analysis of the Rotary core taken from the Volney Bass Lease, Well No. 3, Crawford County, Kansas, and submitted to our laboratory on July 9, 1962.

This core was sampled and the samples sealed in plastic bags by a representative of the client.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Fred O. Stenger

FOS:rf

1 c. - Dr. D.A. Busch

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GENERAL INFORMATION & SUMMARY

Company	Laura Drilling Co.	Lease	Volney Bass	Well No.	3
Location	NE NE SW NE				
Section	19	Twp.	28S	Rge.	24E
		County	Crawford		State Kansas
Name of Sand	- - - - -				Tucker
Top of Core	- - - - -				388.0
Bottom of Core	- - - - -				406.0
Top of Sand	- - - - -				393.0
Bottom of Sand	- - - - -				399.6
Good					
Total Feet of Permeable Sand	- - - - -				9.9
Total Feet of Floodable Sand	- - - - -				1.4
Distribution of Permeable Sand:					
Permeability Range Millidarcys	Feet		Cum. Ft.		
0 - 20	1.0		1.0		
20 - 50	4.7		5.7		
50 & above	4.2		9.9		
Average Permeability Millidarcys	- - - - -				80.0
Average Percent Porosity	- - - - -				21.6
Average Percent Oil Saturation	- - - - -				36.0
Average Percent Water Saturation	- - - - -				39.3
Average Oil Content, Bbls./A. Ft.	- - - - -				606.
Total Oil Content, Bbls./Acre	- - - - -				5,994.
Average Percent Oil Recovery by Laboratory Flooding Tests	- - - - -				5.0
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	- - - - -				68.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	- - - - -				95.
Total Calculated Oil Recovery, Bbls./Acre	(Primary & Secondary)				787.
Packer Setting, Feet	- - - - -				
Viscosity, Centipoises @	- - - - -				
A. P. I. Gravity, degrees @ 60 °F	- - - - -				
Elevation, Feet	- - - - -				

Fresh water was used in the coring of the sand in this well. This core was taken from a virgin formation.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u>	<u>Description</u>
<u>Feet</u>	

388.0 - 388.7	- Shale.
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388.7 - 392.2	- Gray shaly sandstone.
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392.2 - 393.0	- Shale.
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393.0 - 395.6	- Light brown sandstone.
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395.6 - 399.6	- Dark brown, slightly laminated, slightly shaly sandstone.
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399.6 - 400.7	- Shale.
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400.7 - 401.4	- Dark carbonaceous sandstone.
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401.4 - 401.9	- Hard, grayish light brown, slightly calcareous sandstone.
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401.9 - 403.3	- Dark carbonaceous sandstone.
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403.3 - 403.4	- Shale.
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403.4 - 406.0	- Dark carbonaceous sandstone.
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Coring was started at a depth of 388.0 feet in shale and completed at 406.0 feet in dark carbonaceous sandstone. This core shows a total of 15.3 feet of sandstone. For the most part, the pay is made up of light and dark brown sandstone, slightly shaly and laminated.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections is 99 and 43 millidarcys respectively; the overall average being 80. (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has a very irregular permeability profile. The permeability of the sand varies from 5. to a maximum of 250. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a good weighted average percent oil

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saturation, namely, 36.0. The weighted average percent oil saturation of the upper and lower sections is 28.3 and 51.2 respectively. The weighted average percent water saturation of the upper and lower sections is 44.6 and 28.9 respectively; the overall average being 39.3 (See Table III). This gives an overall weighted average total fluid saturation of 75.3 percent. This low total fluid saturation indicates considerable fluid was lost during coring which probably was oil.

The weighted average oil content of the upper and lower sections is 485 and 845 barrels per acre foot respectively; the overall average being 606. The total oil content, as shown by this core, is 5,994 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core did not respond very well to laboratory flooding tests, as a total recovery of 95 barrels of oil per acre was obtained from 1.4 feet of sand. The weighted average percent oil saturation was reduced from 32 to 27, or represents an average recovery of 5.0 percent. The weighted average effective permeability of the samples is 0.500 millidarcys, while the average initial fluid production pressure is 30 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 11 samples tested, 7 produced water and 1 oil. This indicates that approximately 9 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a rather extreme range of effective permeability, varying from impermeable to a maximum of 16.10 millidarcys.

CONCLUSION

Based on results of the above tests it is believed that an efficient water-flood within the vicinity of this well will recover approximately 155 barrels of oil per acre or an average of 111 barrels per acre foot

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for the 1.4 feet of floodable pay sand analyzed. The primary recovery should be approximately 632 barrels per acre or an average of 96 barrels per acre foot for the 6.6 feet of pay sand analyzed.

In calculating these oil recovery values the following facts and assumptions were used:

Original formation volume factor	1.05
Reservoir water saturation, percent	36.
Primary recovery, estimated, percent	5.
Present oil saturation, percent	56.
Average porosity, percent	24.6
Oil saturation after flooding, percent	27.
Performance factor, percent	50.
Net floodable pay sand, feet	1.4

This core shows only a small section of clean sand; for the most part, the sand is either shaly or carbonaceous.

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Sample No.	Depth, Feet	Effective Porosity Percent	Percent Saturation			Oil Content Bbbs. / A Ft.	Perm., Mill.	Feet of Sand		Total Oil Content	Perm. Capacity Ft. X md.
			Oil	Water	Total			Ft.	Cum. Ft.		
1	393.5	17.5	17	51	68	231	131.	1.0	1.0	231	131.00
2	394.5	22.1	16	45	61	274	250.	1.0	2.0	274	250.00
3	395.5	21.5	21	48	69	350	93.	0.6	2.6	210	55.80
4	396.5	24.7	32	43	75	614	35.	1.4	4.0	860	49.00
5	397.5	20.4	21	52	73	332	5.0	1.0	5.0	332	5.00
6	398.5	26.3	42	36	78	858	143.	1.0	6.0	858	143.00
7	399.5	16.9	56	36	92	734	31.	0.6	6.6	440	18.60
8	400.8	20.1	59	27	86	920	23.	0.7	7.3	644	16.10
9	403.5	19.3	30	49	79	449	88.	0.6	7.9	269	52.80
10	404.5	22.5	54	25	79	942	38.	1.0	8.9	942	38.00
11	405.5	21.5	56	22	78	934	34.	1.0	9.9	934	34.00
Total								Total		5,994	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Laura Drilling Co. Lease Volney Bass Well No. 3

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
393.0 - 399.6	6.6	99.	652.40
399.6 - 406.0	3.3	43.	140.90
393.0 - 406.0	9.9	80.	793.30

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 Bbbl./Acre
393.0 - 399.6	6.6	21.8	28.3	44.6	485	3,205
399.6 - 400.6	3.3	21.1	51.2	28.9	845	2,789
393.0 - 400.6	9.9	21.6	36.0	39.3	606	5,994

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company		Laura Drilling Co.		Lease		Volney Bass		Well No.		3	
Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc*	Effective Permeability MilliDarcys**	Initial Field Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
1	393.5	17.6	17	232	0	0	17	65	30	0.700	30
2	394.5	22.2	16	276	0	0	16	78	183	16.10	10
3	395.5	21.4	21	348	0	0	21	75	266	9.06	30
4	396.5	24.6	32	610	5	95	27	62	17	0.500	30
5	397.5	20.3	21	330	0	0	21	60	6	0.460	50
6	398.5	26.2	42	853	0	0	42	43	8	0.306	40
7	399.5	17.0	56	738	0	0	56	36	0	Imp.	-
8	400.8	20.0	59	915	0	0	59	27	0	Imp.	-
9	403.5	19.2	30	446	0	0	30	49	3	0.225	50
10	404.5	22.4	54	938	0	0	54	25	0	Imp.	-
11	405.5	21.4	56	930	0	0	56	22	0	Imp.	-

Notes: cc—cubic centimeters.

*—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 Laura Drilling Co. Lease Volney Bass Well No. 3

Depth Interval, Feet	395.6 - 397.0
Feet of Core Analyzed	1.4
Average Percent Porosity	24.6
Average Percent Original Oil Saturation	32.
Average Percent Oil Recovery	5.
Average Percent Residual Oil Saturation	27.
Average Percent Residual Water Saturation	62.
Average Percent Total Residual Fluid Saturation	89.
Average Original Oil Content, Bbls./A. Ft.	436.
Average Oil Recovery, Bbls./A. Ft.	68.
Average Residual Oil Content, Bbls./A. Ft.	368.
Total Original Oil Content, Bbls./Acre	610.
Total Oil Recovery, Bbls./Acre	95.
Total Residual Oil Content, Bbls./Acre	515.
Average Effective Permeability, Millidarcys	0.500
Average Initial Fluid Production Pressure, p.s.i.	30.

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