

OILFIELD RESEARCH LABORATORIES

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- REGISTERED ENGINEERS -

Chanute, Kansas

April 24, 1961

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Timroth Enterprises
P.O. Box 155
Colorado Springs, Colorado

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Strahm Lease, Well No. 8, Woodson County, Kansas, and submitted to our laboratory on April 18, 1961.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Benjamin R. Pearman

BRP:db

3 c.

This core was taken with a rotary core barrel. The well was drilled in virgin territory. The core was sampled and the samples sealed in plastic bags by the client.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval, Feet</u>	<u>Description</u>
995.0 - 1005.0	- Light brown laminated slightly shaley sandstone.
1005.0 - 1012.6	- Brown laminated slightly shaley sandstone.
1012.6 - 1013.2	- Sandy shale.
1013.2 - 1022.0	- Brown to dark laminated slightly shaley sandstone.
1022.0 - 1023.0	- Shale.

Coring was started at a depth of 995.0 feet in laminated sandstone and completed at 1023.0 feet in shale. This core shows a total of 26.4 feet of sandstone. For the most part, the pay is made up of laminated slightly shaley sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into two sections. The weighted average permeability of the upper and lower sections is 31.14 and 72.20 millidarcys respectively; the overall average being 58.20 (See Table III). 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 2.3 to a maximum of 210 millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 39.5. The weighted average percent oil saturation of the upper and lower sections is 24.1 and 47.4 respectively. The weighted average percent water saturation of the upper and lower sections is 41.4 and 27.3 respectively; the overall average being 32.1 (See Table III).

This gives an overall weighted average total fluid saturation of 71.6 per cent. This low total fluid saturation indicates considerable fluid was lost during coring most of which was probably oil.

The weighted average oil content of the upper and lower sections is 344 and 734 barrels per acre foot respectively; the overall average being 602. The total oil content, as shown by this core, is 15,873 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The sand in this core responded rather well to laboratory flooding tests, as a total recovery of 2,596 barrels of oil per acre was obtained from 19.3 feet of sand. The weighted average percent oil saturation was reduced from 39.1 to 30.4, or represents an average recovery of 8.7 percent. The weighted average effective permeability of the samples is 5.26 millidarcys, while the average initial fluid production pressure is 23.9 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 26 samples tested, 22 produced water and 19 oil. This indicates that approximately 73 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a good and more or less uniform effective permeability to water.

CONCLUSION

Based on the results of the laboratory tests, it appears that 7,450 barrels of oil per acre could be recovered by primary and secondary methods from the area in the vicinity of this well. The primary and secondary reserves are estimated to be 2,980 barrels and 4,470 barrels per acre respectively. These values represent average recoveries of 124 and 203 barrels per acre foot.

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The above recovery values were calculated using the following data and assumptions:

A.P.I. gravity of oil, estimated	25°
Formation volume factor	1.06
Average reservoir water saturation, percent	25.0
Average porosity, percent	20.0
Primary recovery	None
Abandonment oil saturation, percent	33.0
Performance factor, percent	55.0
Net floodable pay sand, feet	22.0

This core indicates a reservoir having a good oil saturation, a low water saturation and a good uniform permeability to water. No difficulty should be encountered in obtaining satisfactory injection rates.

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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	995.5	21.1	15	40	245	59.	1.0	1.0	245	59.00
2	996.5	17.3	27	47	362	17.	1.0	2.0	362	17.00
3	997.5	19.7	26	42	397	19.	1.0	3.0	397	19.00
4	998.5	15.4	25	39	299	30.	1.0	4.0	299	30.00
5	999.5	19.2	20	40	298	39.	1.0	5.0	298	39.00
6	1000.5	21.4	22	37	365	45.	1.0	6.0	365	45.00
7	1001.5	19.1	28	31	415	27.	1.0	7.0	415	27.00
8	1002.5	20.3	28	35	440	42.	1.0	8.0	440	42.00
9	1003.5	13.6	26	62	274	2.3	1.0	9.0	274	2.30
10	1004.5	15.5	44	40	529	60.	1.0	10.0	529	60.00
11	1005.5	17.0	41	34	540	63.	1.0	11.0	540	63.00
12	1006.5	17.0	49	36	646	119.	1.0	12.0	646	119.00
13	1007.5	21.7	25	44	421	44.	1.0	13.0	421	44.00
14	1008.5	23.9	31	39	574	40.	1.0	14.0	574	40.00
15	1009.5	20.1	39	26	608	14.	1.0	15.0	608	14.00
16	1010.5	21.4	50	23	830	47.	1.0	16.0	830	47.00
17	1011.5	22.4	56	14	973	9.0	1.0	17.0	973	9.00
18	1012.5	19.5	48	24	725	145.	0.6	17.6	435	87.00
19	1013.7	21.4	56	22	930	203.	1.0	18.6	930	203.00
20	1015.0	22.0	48	22	818	210.	1.6	20.2	1,310	336.00
21	1016.3	18.0	63	22	879	101.	1.0	21.2	879	101.00
22	1017.4	18.8	52	28	759	17.	1.1	22.3	835	18.70
23	1018.5	18.3	51	26	723	25.	1.1	23.4	795	27.50
24	1019.5	21.0	47	22	765	23.	1.0	24.4	765	23.00
25	1020.5	21.3	56	18	925	44.	1.0	25.4	925	44.00
26	1021.5	20.6	49	26	783	20.	1.0	26.4	783	20.00

Company Timroth Enterprises Lease Strahm Well No. 8

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company	Lease	Well No.				
Timroth Enterprises	Strahm	8				
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.			
995.0 - 1004.0	9.0	31.14	280.30			
1004.0 - 1022.0	17.4	72.20	1256.20			
995.0 - 1022.0	26.4	58.20	1536.50			
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 Bbl./Acre
995.0 - 1004.0	9.0	18.6	24.1	41.4	344	3,095
1004.0 - 1022.0	17.4	20.2	47.4	27.3	734	12,778
995.0 - 1022.0	26.4	19.6	39.5	32.1	602	15,873

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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.	%	Bbls./A. Ft.	% Oil	% Water			
1	995.5	21.0	15	244	2	33	13	72	208	4.40	10
2	996.5	17.5	28	380	0	0	28	49	0	Imp.	50+
3	997.5	19.5	25	378	0	0	25	48	28	0.700	30
4	998.5	15.7	25	304	3	37	22	75	150	4.30	30
5	999.5	18.9	20	293	2	29	18	72	126	4.50	30
6	1000.5	21.7	22	370	2	34	20	68	260	8.40	20
7	1001.5	19.5	28	423	6	91	22	68	47	1.20	30
8	1002.5	20.3	28	441	6	94	22	68	92	2.70	20
9	1003.5	13.4	25	260	0	0	25	62	0	Imp.	50+
10	1004.5	15.8	44	539	13	159	31	61	359	9.80	20
11	1005.5	17.0	41	541	8	106	33	61	33	1.00	35
12	1006.5	17.6	49	669	21	287	28	69	101	3.00	30
13	1007.5	21.4	25	414	2	33	23	69	249	6.80	20
14	1008.5	23.8	31	572	4	74	27	67	258	16.65	20
15	1009.5	19.7	39	595	4	61	35	62	58	1.40	20
16	1010.5	21.6	50	838	10	168	40	58	227	6.10	20
17	1011.5	22.8	56	990	12	212	44	54	230	13.10	10
18	1012.5	20.0	48	744	7	108	41	54	204	6.00	20
19	1013.7	21.9	56	950	19	322	37	54	117	3.40	20
20	1015.0	22.0	48	819	16	273	32	60	216	6.20	20
21	1016.3	18.6	63	908	19	274	44	46	46	1.20	30
22	1017.4	19.0	52	766	5	74	47	50	1	0.100	50
23	1018.5	18.6	49	706	0	0	49	26	0	Imp.	50+
24	1019.5	20.8	48	774	0	0	48	23	5	0.200	50
25	1020.5	21.0	57	929	0	0	57	20	12	0.300	45
26	1021.5	20.9	49	794	0	0	49	25	0	Imp.	50+

Company Timroth Enterprises Lease Strahm Well No. 8

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	Strahm	Well No.
	995.0 - 1003.0	1004.0 - 1018.0	995.0 - 1018.0
Timroth Enterprises			8
Depth Interval, Feet	6.0	13.3	19.3
Feet of Core Analyzed	19.5	20.4	20.0
Average Percent Porosity	23.0	46.4	39.1
Average Percent Original Oil Saturation	3.5	11.1	8.7
Average Percent Oil Recovery	19.5	35.3	30.4
Average Percent Residual Oil Saturation	70.5	59.0	62.5
Average Percent Residual Water Saturation	90.0	94.3	92.9
Average Percent Total Residual Fluid Saturation	349.	722.	605.
Average Original Oil Content, Bbls./A. Ft.	53.	171.	134.
Average Oil Recovery, Bbls./A. Ft.	296.	551.	471.
Average Residual Oil Content, Bbls./A. Ft.	2,075.	9,617.	11,692.
Total Original Oil Content, Bbls./Acre	318.	2,278.	2,596.
Total Oil Recovery, Bbls./Acre	1,757.	7,339.	9,096.
Total Residual Oil Content, Bbls./Acre	4.25	5.72	5.26
Average Effective Permeability, Millidarcys	23.3	24.2	23.9
Average Initial Fluid Production Pressure, p.s.i.			

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