● CORE ANALYSIS ● WATER REPRESSURING ENGINEERING ● WATER ANALYSIS ● FLOODING WATER TREATMENT ● SURVEYING

OILFIELD RESEARCH LABORATORIES

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February 6, 1962

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 D.W. Long Lease, Well No. 5, Woodson County, Kansas, and submitted to our laboratory on February 2, 1962.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R Pearman

Benjamin R. Pearman

BRP:rf

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GENERAL INFORMATION & SUMMARY

Company Timroth Enterprises Lease D.W. Long Well No. 5

Location SE

Section 11 Twp. 24S Rge. 16E County Woodson State Kansas

Name of Sand	Squirrel
Top of Core	974.5
Bottom of Core	987.5
Top of Sand	974.5
Bottom of Sand	986.7
Total Feet of Permeable Sand	12.2
Total Feet of Floodable Sand	6.7

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 50	6.5	6.5
50 - 150	2.0	8.5
150 - 300	3.7	12.2

Average Permeability Millidarcys	86.0
Average Percent Porosity	18.8
Average Percent Oil Saturation	41.1
Average Percent Water Saturation	33.6
Average Oil Content, Bbls./A. Ft.	620.
Total Oil Content, Bbls./Acre	7,573.
Average Percent Oil Recovery by Laboratory Flooding Tests	3.8
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	63.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	425.
Total Calculated Oil Recovery, Bbls./Acre (Primary & Secondary)	2,580.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

Fresh water mud was used as the circulating fluid in taking this core. The core was sampled and the samples sealed in plastic bags by a representative of the client. The well was drilled in virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
974.5 - 978.9	Laminated sandstone and shale.
978.9 - 979.5	Brown laminated shaley sandstone.
979.5 - 986.2	Dark brown sandstone.
986.2 - 986.7	Dark carbonaceous sandstone.
986.7 - 987.5	Shale.

Coring was started at a depth of 974.5 feet in laminated sandstone and shale and completed at 987.5 feet in shale. This core shows a total of 12.2 feet of sandstone. For the most part, the pay is made up of dark brown sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into sections. The weighted average permeability of the upper and lower sections is 9.5 and 142.2 millidarcys respectively; the overall average being 86.0 (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 0.49 to a maximum of 267. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a fairly good weighted average percent oil saturation, namely, 41.1. The weighted average percent oil saturation of the upper and lower sections is 34.5 and 47.1 respectively. The weighted average percent water saturation of the upper and lower sections

is 50.8 and 21.6 respectively; the overall average being 33.6 (See Table III). This gives an overall weighted average total fluid saturation of 74.7 percent. This low total fluid saturation indicates considerable fluid was lost during coring most of which probably was oil.

The weighted average oil content of the upper and lower sections is 406 and 770 barrels per acre foot respectively; the overall average being 620. The total oil content, as shown by this core, is 7,573 barrels per acre of which 5,151 barrels are in the pay sand section (See Table III).

LABORATORY FLOODING TESTS

The lower portion of the sand in this core responded to laboratory flooding tests, as a total recovery of 425 barrels of oil per acre was obtained from 6.7 feet of sand. The weighted average percent oil saturation was reduced from 46.0 to 42.2, or represents an average recovery of 3.8 percent. The weighted average effective permeability of the samples is 4.12 millidarcys, while the average initial fluid production pressure is 20.0 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 13 samples tested, 7 produced water and oil. This indicates that approximately 54 percent of the sand represented by these samples is floodable pay sand. The tests also show that the floodable sand has a good, more or less uniform effective permeability to water.

CONCLUSION

Based on the results of the laboratory tests, it appears that efficient primary and secondary operations in the vicinity of this well should recover approximately 900 and 1,680 barrels of oil per acre respectively. The following data and assumptions were used to calculate the above recovery values:

Original formation volume factor	1.06
Reservoir water saturation, percent	20.0
Primary recovery, estimated, percent	7.0
Average porosity, percent	21.6
Oil saturation after flooding, percent	42.2
Performance factor, percent	55.0
Net floodable pay sand, feet	6.7

The floodable pay sand in this core is rather clean in nature and has a good oil saturation, a low water saturation with good uniform effective permeability to water.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Timroth Enterprises **Lease** D.W. Long **Well No.** 5

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	975.0	13.8	32	62	94	342	2.6	1.0	1.0	342	2.60
2	976.0	13.3	36	62	98	371	0.49	1.0	2.0	371	0.49
3	977.0	17.0	20	56	76	264	1.0	1.0	3.0	264	1.00
4	978.0	17.6	41	31	72	559	12.	1.4	4.4	781	16.80
5	979.0	13.0	45	51	96	454	44.	0.6	5.0	272	26.40
6	980.0	22.2	48	14	62	825	95.	1.0	6.0	825	95.00
7	981.0	23.2	47	14	61	846	252.	1.0	7.0	846	252.00
8	982.0	20.0	49	23	72	760	267.	1.0	8.0	760	267.00
9	983.0	23.6	47	24	71	860	156.	1.0	9.0	860	156.00
10	984.0	21.4	45	25	70	746	104.	1.0	10.0	746	104.00
11	985.0	18.8	43	25	68	626	16.	1.0	11.0	626	16.00
12	986.0	21.2	42	25	67	690	173.	0.7	11.7	483	121.10
13	986.6	16.5	62	26	88	793	3.1	0.5	12.2	397	1.55
								Total	-------	7,573	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Timroth Enterprises Lease D.W. Long Well No. 5

Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.
974.5 - 979.5	5.0	9.5	47.29
979.5 - 986.7	7.2	142.2	1012.65
974.5 - 986.7	12.2	86.0	1059.94

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 Bbls./Acre
974.5 - 979.5	5.0	15.3	34.5	50.8	406	2,030
979.5 - 986.7	7.2	21.2	47.1	21.6	770	5,543
974.5 - 986.7	12.2	18.8	41.1	33.6	620	7,573

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Company Timroth Enterprises Lease D.W. Long Well No. 5

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	Bbls./A. Ft.			
1	975.0	14.0	34	369	0	0	34	61	369	0	Imp.	-
2	976.0	13.4	35	364	0	0	35	62	364	0	Imp.	-
3	977.0	16.7	23	298	0	0	23	55	298	0	Imp.	-
4	978.0	17.7	40	549	0	0	40	33	549	0	Imp.	-
5	979.0	12.8	45	446	0	0	45	50	446	0	Imp.	-
6	980.0	22.0	48	819	4	68	44	52	751	100	3.30	20
7	981.0	22.9	47	835	3	53	44	52	782	231	8.40	20
8	982.0	20.3	49	771	7	110	42	50	661	107	3.40	20
9	983.0	23.4	47	853	5	91	42	50	762	202	7.20	20
10	984.0	21.6	45	754	3	50	42	46	704	157	4.00	10
11	985.0	19.2	43	640	2	30	41	52	610	26	0.600	30
12	986.0	21.1	42	686	2	33	40	54	653	48	1.00	20
13	986.6	16.2	60	754	0	0	60	29	754	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.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company Timroth Enterprises Lease D.W. Long Well No. 5

Depth Interval, Feet	979.5 - 986.2
Feet of Core Analyzed	6.7
Average Percent Porosity	21.6
Average Percent Original Oil Saturation	46.0
Average Percent Oil Recovery	3.8
Average Percent Residual Oil Saturation	42.2
Average Percent Residual Water Saturation	50.6
Average Percent Total Residual Fluid Saturation	92.8
Average Original Oil Content, Bbls./A. Ft.	768.
Average Oil Recovery, Bbls./A. Ft.	63.
Average Residual Oil Content, Bbls./A. Ft.	705.
Total Original Oil Content, Bbls./Acre	5,151.
Total Oil Recovery, Bbls./Acre	425.
Total Residual Oil Content, Bbls./Acre	4,726.
Average Effective Permeability, Millidarcys	4.12
Average Initial Fluid Production Pressure, p.s.i.	20.0

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