

OILFIELD RESEARCH LABORATORIES

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October 27, 1962

Schermerhorn Oil Corporation
P.O. Box 287
Tulsa, Oklahoma

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Helwig Lease, Well No. W-4, Labette County, Kansas, and submitted to our laboratory on October 23, 1962.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES


Benjamin R. Pearman

BRP:rf

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GENERAL INFORMATION & SUMMARY

Company Schermerhorn Oil Corp. Lease Helwig Well No. W-4
 Location 660' West of East line & 2640' South of North line, NE
 Section 12 Twp. 33S Rge. 17E County Labette State Kansas

Name of Sand	Bartlesville
Top of Core	614.0
Bottom of Core	634.3
Top of Sand (Analyzed)	614.5
Bottom of Sand (Received)	634.3
Total Feet of Permeable Sand	13.0
Total Feet of Floodable Sand	9.6

Distribution of Permeable Sand: Permeability Range Millidarcys	Feet	Cum. Ft.
0 - 5	6.9	6.9
35 - 75	4.3	11.2
75 & above	1.8	13.0

Average Permeability Millidarcys	31.0
Average Percent Porosity	15.2
Average Percent Oil Saturation	25.2
Average Percent Water Saturation	50.5
Average Oil Content, Bbls./A. Ft.	296.
Total Oil Content, Bbls./Acre	4,442.
Average Percent Oil Recovery by Laboratory Flooding Tests	4.2
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	50.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	480.
Total Calculated Oil Recovery, Bbls./Acre	1,740.
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

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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 non-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

Depth Interval, Feet	Description
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614.0 - 622.0	- Brownish gray shaly sandstone containing a vertical fracture.
622.0 - 623.0	- Light brown, slightly shaly sandstone.
623.0 - 623.5	- Finely laminated shaly sandstone.
623.5 - 624.0	- Brown slightly shaly sandstone.
624.0 - 624.5	- Sandy shale.
624.5 - 625.7	- Brown slightly shaley sandstone
625.7 - 626.7	- Light brown shaly sandstone.
626.7 - 627.5	- Brown slightly shaly sandstone.
627.5 - 628.0	- Shale.
628.0 - 628.5	- Brown slightly shaly sandstone.
628.5 - 629.0	- Brown laminated shaly sandstone.
629.0 - 629.8	- Finely laminated, shaly sandstone.
629.8 - 630.4	- Brown sandstone.
630.4 - 630.8	- Laminated sandstone and shale.
630.8 - 634.3	- Brown sandstone.

Coring was started at a depth of 614.0 feet in shaly sandstone and completed at 634.3 feet in brown sandstone. For the most part, the pay is made up of brown, slightly shaly to brown sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower

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sections is 0.87, 18.7 and 72.4 millidarcys respectively; the overall average being 31.0 (See Table III). By observing the data given on the coregraph, it is noticeable that the sand has an irregular permeability profile. The permeability of the sand varies from impermeable to a maximum of 88. millidarcys.

PERCENT SATURATION & OIL CONTENT

The pay sand in this core shows a fairly good weighted average percent oil saturation, namely, 31.7. The weighted average percent oil saturation of the upper, middle and lower sections is 13.6, 30.2 and 33.6 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 68.1, 43.4 and 37.2 respectively; while that of the pay sand is 40.7, the overall average being 50.5 (See Table III). This gives an overall weighted average total fluid saturation, in the pay section, of 72.4 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, middle and lower sections is 161, 366 and 382 barrels per acre foot respectively; while that of the pay sand is 372, the overall average being 296. The total oil content, as shown by this core, is 4,442 barrels per acre of which 3,573 barrels are in the pay sand section (See Table III).

LABORATORY FLOODING TESTS

The pay sand in this core responded fairly well to laboratory flooding tests, as a total recovery of 480 barrels of oil per acre was obtained from 9.6 feet of sand. The weighted average percent oil saturation was reduced from 31.6 to 27.4, or represents an average recovery of 4.2 percent. The weighted average effective permeability of the samples is 0.981 millidarcys, while the average initial fluid production pressure is 27.2 pounds per square inch (See Table V).

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By observing the data given in Table IV, you will note that of the 16 samples tested, 13 produced water and 11 oil. This indicates that approximately 69 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a fairly uniform effective permeability to water.

CONCLUSION

The results of the laboratory tests indicate that an efficient water-flood in the vicinity of this well should recover approximately 1,740 barrels per acre or 181 barrels per acre foot from the 9.6 feet of floodable pay sand analyzed in this core.

The following data and assumptions were used in calculating these recovery values:

Original formation volume factor	1.04
Present formation volume factor	1.02
Reservoir water saturation, percent	33.0
Primary recovery, estimated, percent	10.0
Present oil saturation, percent	55.6
Average porosity, percent	15.4
Oil saturation after flooding, percent	27.4
Performance factor, percent	55.0
Net floodable pay sand, feet	9.6

This core shows a pay sand section having a good oil saturation, a moderate water saturation and a fairly uniform effective permeability to water.

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Schermmerhorn Oil Corp. Lease Helwig Well No. W-4

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	615.1	15.5	12	69	81	144	1.3	1.0	1.0	144	1.30
2	616.1	15.8	8	79	87	98	0.26	1.0	2.0	98	0.26
3	619.1	14.6	10	76	86	113	Imp.	1.0	3.0	113	0.00
4	620.1	14.4	7	60	67	78	Imp.	1.0	4.0	78	0.00
5	621.3	15.5	26	60	86	312	1.0	1.4	5.4	436	1.40
6	622.1	16.2	22	49	71	276	3.7	1.0	6.4	276	3.70
7	623.6	16.0	27	40	67	335	3.7	0.5	6.9	168	1.85
8	625.1	14.7	37	38	75	421	35.	1.2	8.1	505	42.00
9	626.1	14.9	28	50	78	324	4.6	1.0	9.1	324	4.60
10	627.1	14.7	27	42	69	308	57.	0.8	9.9	246	45.60
11	628.1	17.1	37	40	77	490	4.7	1.0	10.9	490	4.70
12	630.1	14.4	40	35	75	446	53.	0.6	11.5	268	31.80
13	631.1	13.2	30	34	64	306	88.	0.8	12.3	245	70.40
14	632.1	13.6	32	40	72	337	83.	1.0	13.3	337	83.00
15	633.1	18.6	31	41	72	446	69.	1.0	14.3	446	69.00
16	634.1	13.0	38	33	71	383	61.	0.7	15.0	268	42.70
Total								-----		4,442	

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SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Lease		Well No.	
Schermehron Oil Corp.		Helwig		W-4	
Depth Interval, Feet	Feet of Core Analyzed	Average Permeability, Millidarcys	Permeability Capacity Ft. x Md.		
614.5 - 622.0	3.4	0.87	2.96		
622.0 - 628.5	5.5	18.7	102.45		
629.8 - 634.3	4.1	72.4	296.90		
614.5 - 634.3	13.0	31.0	402.31		

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
614.5 - 622.0	5.4	15.2	13.6	68.1	161	869
622.0 - 628.5	5.5	15.6	30.2	43.4	366	2009
629.8 - 634.3	4.1	14.8	33.6	37.2	382	1564
614.5 - 634.3	15.0	15.2	25.2	50.5	296	4442

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RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Schermmerhorn Oil Corporation			Lease		Helwig		Well No.		W-4		
Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc ^a	Effective Permeability Millidarcys ^{oo}	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbbl./A. Ft.	%	Bbbl./A. Ft.	%	Bbbl./A. Ft.			
1	615.1	15.3	13	154	0	0	13	73	4	0.275	50
2	616.1	15.5	8	96	0	0	8	81	3	0.180	50
3	619.1	14.8	9	103	0	0	9	77	0	Imp.	-
4	620.1	14.1	10	109	0	0	10	68	0	Imp.	-
5	621.3	15.3	24	284	0	0	24	66	0	Imp.	-
6	622.1	16.5	22	281	2	26	20	74	11	0.540	50
7	623.6	16.4	27	344	4	51	23	64	40	0.825	30
8	625.1	14.8	37	424	10	115	27	50	38	0.720	30
9	626.1	14.9	28	324	3	35	25	70	19	0.510	30
10	627.1	15.1	27	316	2	23	25	61	76	1.41	20
11	628.1	17.0	37	488	7	92	30	62	59	1.00	20
12	630.1	14.2	40	440	7	77	33	42	82	1.36	20
13	631.1	13.0	30	302	2	20	28	59	71	1.19	20
14	632.1	13.9	32	345	3	32	29	55	110	1.84	20
15	633.1	18.8	31	451	2	29	29	51	41	0.720	30
16	634.1	13.2	38	389	3	31	35	55	49	0.900	30

Notes: cc—cubic centimeter.

^a—Volume of water recovered at the time of maximum oil recovery.

^{oo}—Determined by passing water through sample which still contains residual oil.

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SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Lease		Well No.
Schermerhorn Oil Corporation	Helwig		W-4
Depth Interval, Feet	622.0 - 628.5	629.8 - 634.3	622.0 - 634.3
Feet of Core Analyzed	5.5	4.1	9.6
Average Percent Porosity	15.7	14.8	15.4
Average Percent Original Oil Saturation	30.2	33.5	31.6
Average Percent Oil Recovery	5.0	3.1	4.2
Average Percent Residual Oil Saturation	25.2	30.4	27.4
Average Percent Residual Water Saturation	63.1	52.9	58.6
Average Percent Total Residual Fluid Saturation	88.3	83.3	86.0
Average Original Oil Content, Bbls./A. Ft.	369.	383.	375.
Average Oil Recovery, Bbls./A. Ft.	61.	35.	50.
Average Residual Oil Content, Bbls./A. Ft.	308.	348.	325.
Total Original Oil Content, Bbls./Acre	2026.	1574.	3600.
Total Oil Recovery, Bbls./Acre	335.	145.	180.
Total Residual Oil Content, Bbls./Acre	1691.	1429.	3120.
Average Effective Permeability, Millidarcys	0.810	1.21	0.981
Average Initial Fluid Production Pressure, p.s.i.	30.0	24.0	27.2

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