

OILFIELD RESEARCH LABORATORIES

- REGISTERED ENGINEERS -

700 NORTH MISSION
OKMULGEE, OKLAHOMA
PHONE: 4444

Chanute, Kansas

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

October 24, 1962

Tex-Kan Oils Ltd.
Box 2108
Ft. Worth, Texas

Gentlemen:

Enclosed herewith is the report of the analysis of the Rotary core taken from the Dennis Lease, Well No. N-2, Anderson County, Kansas, and submitted to our laboratory on October 18, 1962.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Benjamin R. Pearman
Benjamin R. Pearman

BRP:rf

3 c. - Ft. Worth, Texas
2 c. - Iola, Kansas

Oilfield Research Laboratories

GENERAL INFORMATION & SUMMARY

Company Tex-Kan Oil Co., Ltd. Lease Dennis Well No. N-2

Location 194' East of West line & 480' South of North line, NW SW

Section 18 Twp. 21S Rge. 21E County Anderson State Kansas

Name of Sand	Squirrel
Top of Core	634.0
Bottom of Core	669.5
Top of Sand	634.0
Bottom of Sand	667.0
Total Feet of Permeable Sand	21.3
Total Feet of Floodable Sand	17.5

Distribution of Permeable Sand:
Permeability Range
Millidarcys

Feet

Cum. Ft.

0 - 1	2.6	2.6
1 - 10	3.8	6.4
10 - 20	6.6	13.0
20 - 50	7.8	20.8
50 & above	0.5	21.3

Average Permeability Millidarcys	19.4
Average Percent Porosity	18.4
Average Percent Oil Saturation	41.2
Average Percent Water Saturation	35.6
Average Oil Content, Bbls./A. Ft.	588.
Total Oil Content, Bbls./Acre	14,445.
Average Percent Oil Recovery by Laboratory Flooding Tests	12.0
Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft.	187.
Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre	3,275.
Total Calculated Oil Recovery, Bbls./Acre	
Packer Setting, Feet	
Viscosity, Centipoises @	
A. P. I. Gravity, degrees @ 60 °F	
Elevation, Feet	

The well was flowing while this core was being taken. The core was sampled and the samples sealed in plastic bags by a representative of the client. The well was drilled in non-virgin territory.

FORMATION CORED

The detailed log of the formation cored is as follows:

<u>Depth Interval,</u> <u>Feet</u>	<u>Description</u>
634.0 - 635.6	Brown, laminated, shaly sandstone.
635.6 - 637.4	Sandy shale.
637.4 - 640.2	Brown, laminated, shaly sandstone.
640.2 - 643.3	Alternate layers sandstone and shale.
643.3 - 645.2	Sandy shale.
645.2 - 646.5	Brown shaly sandstone.
646.5 - 647.4	Sandy shale.
647.4 - 650.0	Brown, laminated, shaly sandstone.
650.0 - 651.2	Brown, calcareous sandstone.
651.2 - 653.2	Brown, laminated, shaly sandstone.
653.2 - 654.5	Laminated shale and sandstone.
654.5 - 664.0	Brown shaly sandstone.
664.0 - 666.5	Laminated sandy shale.
666.5 - 667.0	Brown, laminated, shaly sandstone.
667.0 - 669.5	Laminated sandy shale.

Coring was started at a depth of 634.0 feet in laminated shaly sandstone and completed at 669.5 feet in laminated sandy shale. For the most part, the pay is made up of brown shaly sandstone.

PERMEABILITY

For the sake of distribution, the core was divided into three sections. The weighted average permeability of the upper, middle and lower sections is 2.4, 26.0 and 26.6 millidarcys respectively; the overall average being 19.4 (See Table III). By observing the data given on the

-3-

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 67. millidarcys.

PERCENT SATURATION & OIL CONTENT

The sand in this core shows a very good weighted average percent oil saturation, namely, 41.2. The weighted average percent oil saturation of the upper, middle and lower sections is 43.1, 42.0 and 39.2 respectively. The weighted average percent water saturation of the upper, middle and lower sections is 31.4, 31.6 and 40.7 respectively; the overall average being 35.6 (See Table III). This gives an overall weighted average total fluid saturation of 76.8 percent. This low total fluid saturation indicates considerable fluid was lost during coring.

The weighted average oil content of the upper, middle and lower sections is 555, 587 and 610 barrels per acre foot respectively; the overall average being 588. The total oil content, as shown by this core, is 14,445 barrels per acre (See Table III).

LABORATORY FLOODING TESTS

The major portion of the sand in this core responded well to laboratory flooding tests, as a total recovery of 3,275 barrels of oil per acre was obtained from 17.5 feet of sand. The weighted average percent oil saturation was reduced from 41.8 to 29.8, or represents an average recovery of 12.0 percent. The weighted average effective permeability of the samples is 2.52 millidarcys, while the average initial fluid production pressure is 27.9 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 28 samples tested, 17 produced water and 19 oil. This indicates that approximately 68 percent of the sand represented by these samples is floodable pay sand. The tests also show that the sand has a wide varia-

-4-

tion in effective permeability to water.

CONCLUSION

Because the area in the vicinity of this well is pressured up, due to water-flooding operations, no attempt was made to calculate recovery values. This core shows a good solid sand section from 648.0 to 664.0 feet having a good oil saturation, a relatively low water saturation and a good effective permeability to water.

Oilfield Research Laboratories

RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Tex-Kan Oil Co., Ltd.

Lease Dennis

Well No. N-2

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	634.2	13.7	30	51	81	319	Imp.	0.6	0.6	192	0.00
2	635.3	16.4	23	29	52	292	0.30	1.0	1.6	292	0.30
3	637.5	14.2	42	54	96	462	0.91	0.5	2.1	231	0.46
4	638.4	16.4	44	29	73	559	1.2	1.0	3.1	559	1.20
5	639.6	20.0	56	18	74	868	8.2	1.3	4.4	1,129	10.66
6	640.3	16.9	52	30	82	681	0.61	0.6	5.0	409	0.37
7	641.4	13.8	38	38	76	406	Imp.	1.0	6.0	406	0.00
8	642.1	15.3	57	25	82	675	1.9	0.8	6.8	540	1.52
9	643.1	16.2	53	27	80	665	1.1	0.7	7.5	465	0.77
10	645.3	19.7	29	35	64	443	0.30	0.5	8.0	222	0.15
11	646.2	20.0	31	35	66	481	42.	0.8	8.8	385	33.50
12	647.6	21.4	59	12	71	979	12.	0.6	9.4	587	7.20
13	648.7	20.0	39	34	73	605	39.	1.0	10.4	605	39.00
14	649.2	19.8	44	28	72	675	18.	1.0	11.4	675	18.00
15	650.1	10.1	40	44	84	313	Imp.	1.2	12.6	376	0.00
16	651.8	19.3	44	27	71	659	21.	1.0	13.6	659	21.00
17	653.0	20.4	34	38	72	538	16.	1.0	14.6	538	16.00
18	654.8	22.3	33	37	70	570	67.	0.5	15.1	285	33.50
19	655.4	21.4	49	45	94	813	46.	1.0	16.1	813	46.00
20	656.8	20.8	34	44	78	548	29.	1.2	17.3	656	34.80
21	657.7	21.5	41	38	79	684	15.	1.0	18.3	684	15.00
22	659.0	21.2	42	40	82	690	12.	1.5	19.8	1,035	18.00
23	660.3	19.7	39	39	78	595	30.	1.0	20.8	595	30.00
24	661.4	19.7	41	40	81	626	25.	1.2	22.0	751	30.00
25	662.4	18.5	36	40	76	516	19.	1.0	23.0	516	19.00
26	663.3	17.8	40	41	81	552	48.	0.6	23.6	331	28.80
27	663.8	18.2	35	38	73	494	15.	0.5	24.1	247	7.50
28	666.7	15.7	43	51	94	523	Imp.	0.5	24.6	262	0.00
								Total	-----	14,445	

Oilfield Research Laboratories

SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company		Tex-Kan Oil Co., Ltd.		Lease	Dennis	Well No.	
						N-2	
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	
634.0 - 645.7	8.0	16.4	43.1	31.4	555	4,445	
645.7 - 652.2	5.6	17.9	42.0	31.6	587	3,287	
652.2 - 667.0	11.0	20.1	39.2	40.7	610	6,713	
634.0 - 667.0	24.6	18.4	41.2	35.6	588	14,445	

Offfield Research Laboratories

RESULTS OF LABORATORY FLOODING TESTS

TABLE IV

Tex-Kan Oil Co., Ltd.			Lease		Dennis		Well No.		N-2		
Sample No.	Depth, Feet	Effective Porosity Percent	Original Oil Saturation		Oil Recovery		Residual Saturation		Volume of Water Recovered cc ^a	Effective Permeability Millidarcys ^{b,c}	Initial Fluid Production Pressure Lbs./Sq./In.
			%	Bbls./A. Ft.	%	Bbls./A. Ft.	% Oil	% Water			
1	634.2	13.5	32	335	0	0	32	51	0	Imp. ^a	-
2	635.3	16.5	22	282	0	0	22	30	0	Imp.	-
3	637.5	14.0	40	434	0	0	40	55	0	Imp.	-
4	638.4	16.1	40	499	0	0	40	33	0	Imp.	-
5	639.6	19.6	56	850	10	152	46	40	0	0.015	40
6	640.3	17.0	50	659	0	0	50	30	0	Imp.	-
7	641.4	13.5	39	408	0	0	39	40	0	0.015	-
8	642.1	15.6	57	689	6	73	51	46	0	0.015	50
9	643.1	16.0	53	657	0	0	53	28	0	Imp.	-
10	645.3	20.0	29	449	4	62	25	67	49	0.900	30
11	646.2	20.0	31	480	4	62	27	69	77	1.70	30
12	647.6	21.0	59	960	31	504	28	64	94	2.00	30
13	648.7	20.5	39	620	9	143	30	67	84	2.20	30
14	649.2	19.9	44	679	15	231	29	69	70	1.60	30
15	650.1	10.0	39	302	0	0	39	45	0	Imp.	-
16	651.8	19.0	44	649	19	280	25	70	37	0.900	30
17	653.0	20.8	34	549	9	145	25	73	165	4.30	20
18	654.8	22.0	33	564	9	154	24	68	146	3.10	20
19	655.4	21.0	49	798	21	342	28	70	167	3.80	20
20	656.8	21.0	34	554	7	114	27	69	165	4.10	20
21	657.7	21.8	41	692	13	220	28	69	167	4.00	20
22	659.0	21.4	42	696	13	216	29	67	103	2.50	30
23	660.3	19.5	39	590	16	242	23	75	182	4.30	20
24	661.4	20.0	41	635	17	264	24	72	201	4.90	20
25	662.4	18.3	36	511	5	71	31	65	69	1.90	30
26	663.3	17.5	40	544	7	95	33	63	94	2.30	30
27	663.8	18.3	35	496	7	99	28	69	50	1.20	30
28	666.7	15.9	42	517	0	0	42	54	0	Imp.	-

Company Tex-Kan Oil Co., Ltd.

Lease Dennis

Well No. N-2

Notes: cc—cubic centimeter.

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

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

Oilfield Research Laboratories

SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

Company	Tex-Kan Oil Co., Ltd.	Lease	Dennis	Well No.	N-2
Depth Interval, Feet	634.0 - 645.7	645.7 - 652.2	652.2 - 667.0	634.0 - 667.0	
Feet of Core Analyzed	2.6	4.4	10.5	17.5	
Average Percent Porosity	18.5	20.0	20.3	20.0	
Average Percent Original Oil Saturation	51.2	42.5	39.1	41.8	
Average Percent Oil Recovery	7.6	14.7	11.9	12.0	
Average Percent Residual Oil Saturation	43.6	27.8	27.2	29.8	
Average Percent Residual Water Saturation	49.0	68.0	69.7	65.5	
Average Percent Total Residual Fluid Saturation	92.6	95.8	96.9	95.3	
Average Original Oil Content, Bbls./A. Ft.	725.	661.	615.	643.	
Average Oil Recovery, Bbls./A. Ft.	110.	228.	189.	187.	
Average Residual Oil Content, Bbls./A. Ft.	615.	433.	426.	456.	
Total Original Oil Content, Bbls./Acre	1,886.	2,908.	6,469.	11,263.	
Total Oil Recovery, Bbls./Acre	287.	1,006.	1,982.	3,275.	
Total Residual Oil Content, Bbls./Acre	1,599.	1,902.	4,487.	7,988.	
Average Effective Permeability, Millidarcys	0.185	1.65	3.46	2.52	
Average Initial Fluid Production Pressure, p.s.i.	40.0	30.0	23.6	27.9	

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