OIL FIELD RESEARCH LABORATORIES
CHANUTE, KANSAS

January 8, 1952

Franco Central Oil Company
512 Fourth National Bank Building
Wichita 2, Kansas

Gentlemen:

Enclosed herewith is the report of the analysis of the 2¼" Rotary core taken from the Hughes Lease, Well No. W-3, Butler County, Kansas, and submitted to our laboratory on December 23, 1951.

Very truly yours,

OIL FIELD RESEARCH LABORATORIES

Carl L. Pate

CLP:pe
e. e.

# FRANCO CENTRAL OIL COMPANY

## CORE ANALYSIS REPORT

## HUGHES LEASE WELL NO. H-3

## BUTLER COUNTY, KANSAS

OIL FIELD RESEARCH LABORATORIES

CHANUTE, KANSAS

JANUARY 8, 1952

# Oil Field Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company Franco Central Oil Company Lease Hughes Well No. W-3

Location 650' East of West Line & 937' South of North Line, NE SE¼

Section 9 Twp. 26S Rge. 8E County Butler State Kansas

| | |
|---|---|
| Name of Sand | Cattleman |
| Top of Core | 2301.80 |
| Bottom of Core | 2307.80 |
| Top of Sand | 2303.70 |
| Bottom of Sand | 2307.35 |
| Total Feet of Permeable Sand | 1.20 |
| Total Feet of Floodable Sand | 1.15 |

Distribution of Permeable Sand:

| Permeability Range Millidarcys | Feet | Cum. Ft. |
|---|---|---|
| 0 - 10 | 0.95 | 0.95 |
| 10 & above | 0.25 | 1.20 |

| | |
|---|---|
| Average Permeability Millidarcys | 10.79 |
| Average Percent Porosity | 13.51 |
| Average Percent Oil Saturation | 31.66 |
| Average Percent Water Saturation | 58.29 |
| Average Oil Content, Bbls./A. Ft. | 336. |
| Total Oil Content, Bbls./Acre | 688. |
| Average Percent Oil Recovery by Laboratory Flooding Tests | 2.1 |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. | 29. |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre | 15. |
| Total Calculated Oil Recovery, Bbls./Acre | - |
| Packer Setting, Feet | |
| Viscosity, Centipoises @ | |
| A. P. I. Gravity, degrees @ 60 °F | |
| Elevation, Feet | |

# Oil Field Research Laboratories

## GENERAL INFORMATION & SUMMARY

Company Franco Central Oil Company Lease Hughes Well No. W-3

Location 650' East of West Line & 937' South of North Line NE SE¼

Section 9 Twp. 26S Rge. 8E County Butler State Kansas

| | | |
|---|---|---|
| Name of Sand | | Bartlesville |
| Top of Core | | 2430.00 |
| Bottom of Core | | 2540.25 |
| Top of Sand | (According to Geologist) | 2500.00 |
| Bottom of Sand | | 2532.40 |
| Total Feet of Permeable Sand | (Analyzed) | 28.60 |
| Total Feet of Floodable Sand | (Analyzed) | 26.60 |

Distribution of Permeable Sand:

| Permeability Range Millidarcys | Feet | Cum. Ft. |
|---|---|---|
| 0 - 25 | 3.65 | 3.65 |
| 25 - 50 | 7.45 | 11.10 |
| 50 - 75 | 5.90 | 17.00 |
| 75 - 100 | 3.55 | 20.55 |
| 100 & above | 8.05 | 28.60 |

| | |
|---|---|
| Average Permeability Millidarcys | 80.72 |
| Average Percent Porosity | 18.52 |
| Average Percent Oil Saturation | 24.34 |
| Average Percent Water Saturation | 64.49 |
| Average Oil Content, Bbls./A. Ft. | 350. |
| Total Oil Content, Bbls./Acre | 9,665. |
| Average Percent Oil Recovery by Laboratory Flooding Tests | 2.86 |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. | 42. |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre | 1,000. |
| Total Calculated Oil Recovery, Bbls./Acre | 4300. |
| Packer Setting, Feet | |
| Viscosity, Centipoises @ | |
| A. P. I. Gravity, degrees @ 60 °F | |
| Elevation, Feet | |

Salt water was used in making up the circulating fluid used in the coring of the sand in this well.

## FORMATION CORED

The detailed log of the formation cored is as follows:

| Depth Interval, Feet | Description |
|---|---|
| | **Cattleman Sand** |
| 2301.80 - 2302.35 | Laminated sandy shale. |
| 2302.35 - 2302.60 | Gray sandstone. |
| 2302.60 - 2303.70 | Gray sandy shale. |
| 2303.70 - 2304.20 | Light brown fine grained micaceous shaley sandstone. |
| 2304.20 - 2305.15 | Gray sandy shale. |
| 2305.15 - 2305.65 | Sandy limestone. |
| 2305.65 - 2306.50 | Light brown fine grained micaceous sandstone. |
| 2306.50 - 2307.00 | Gray sandstone. |
| 2307.00 - 2307.15 | Gray shale. |
| 2307.15 - 2307.35 | Light brown fine grained laminated micaceous shaley sandstone. |
| 2307.35 - 2307.60 | Gray sandy shale. |
| 2307.60 - 2420.00 | Drilled. |
| 2420.00 - 2428.00 | Gray shale (Discarded at well). |
| 2428.00 - 2430.00 | Drilled. |
| 2430.00 - 2449.00 | Gray shale (Discarded at well). |
| 2449.00 - 2503.00 | Drilled. |
| | **Bartlesville Sand** |
| 2503.00 - 2507.10 | Brown fine grained micaceous slightly shaley sandstone. |

2507.10 - 2507.50 - Brown fine grained slightly laminated micaceous carbonaceous shaley sandstone.

2507.50 - 2519.10 - Brown fine grained micaceous sandstone.

2519.10 - 2520.10 - Brown fine grained micaceous slightly shaley sandstone.

2520.10 - 2522.50 - Brown fine grained micaceous sandstone.

2522.50 - 2523.00 - Loss.

2523.00 - 2524.50 - Brown fine grained micaceous slightly shaley sandstone.

2524.50 - 2524.80 - Brown fine grained micaceous sandstone.

2524.80 - 2525.45 - Brown fine grained micaceous conglomeratic sandstone.

2525.45 - 2526.75 - Brown fine grained micaceous sandstone.

2526.75 - 2528.95 - Brown fine grained laminated micaceous carbonaceous sandstone.

2528.95 - 2531.50 - Brown fine grained micaceous sandstone.

2531.50 - 2532.40 - Brown fine grained micaceous calcareous sandstone.

2532.40 - 2534.50 - Gray shale.

2534.50 - 2535.40 - Black shale.

2535.40 - 2536.45 - Black calcareous shale.

2536.45 - 2538.00 - Gray shale (Discarded at well).

2538.00 - 2540.25 - Loss.

The coring of the Cattleman sand was started at a depth of 2301.80 feet in laminated sandy shale and completed at 2307.80 feet in gray sandy shale. This core shows a total of 2.05 feet of formation containing oil. For the most part, the pay is made up of fine grained micaceous to shaley sandstone and sandy limestone.

The coring of the Bartlesville formation was started at a depth of 2503.00 feet in fine grained micaceous slightly shaley sandstone and

completed at 2540.25 feet probably in shale. There was a loss extending from 2538.00 to 2540.25 feet. This core shows a total of 28.90 feet of Bartlesville sand. According to Mr. Cornell, the top of the Bartlesville sand was found at a depth of 2500.00 feet. For the most part, the pay is made up of fine grained micaceous to shaley sandstone. There was a half foot loss extending from 2522.50 to 2523.00 feet, which was probably sandstone.

## PERMEABILITY

The overall weighted average permeability of the Cattlemen and Bartlesville sands is 10.79 and 80.72 millidarcys respectively. For the sake of distribution, the Bartlesville sand was divided into three sections. The weighted average permeability of the three sections is 21.04, 67.45 and 152.02 millidarcys respectively (See Table II). By observing the data given on the coregraph, it is noticeable that the Cattlemen sand is comparatively tight and that the Bartlesville sand has a fairly irregular permeability profile.

## PERCENT SATURATION & OIL CONTENT

The Cattlemen sand shows a fairly good weighted average percent oil saturation, namely, 31.66. The weighted average percent oil saturation of the three sections of the Bartlesville sand is 26.12, 23.28 and 25.91 respectively; the overall average being 24.34. The weighted average percent water saturation of the three corresponding sections is 67.53, 65.58 and 59.75 respectively; the overall average being 64.49 (See Table IV). This shows that the weighted average percent total fluid saturation of the Cattlemen and Bartlesville sands are 89.95

and 88.8% respectively.

Inasmuch as salt water was used in making up the circulating fluid used in the coring of the sand in this well, no chloride determinations were made as the results would not be representative.

The weighted average oil content of the Cattlemen sand is 336 barrels per acre foot, while the total oil content, as shown by this core, is 688 barrels per acre. The weighted average oil content of the three sections of the Bartlesville sand is 357, 342 and 366 barrels per acre foot respectively; the overall average being 350. The total oil content of the Bartlesville sand, as shown by this core, is 9,665 barrels per acre (See Table IV).

## LABORATORY FLOODING TESTS

Inasmuch as the Bartlesville sand in the core has a comparatively low percent oil saturation, naturally one would expect a low oil recovery by laboratory flooding tests. A total recovery of 1,000 barrels of oil per acre was obtained from the 24.05 feet of Bartlesville sand by laboratory flooding tests. The weighted average percent oil saturation was reduced from 23.54 to 20.66, or represents an average recovery of 2.84 percent. The weighted average effective permeability of the samples is 5.0 millidarcys, while the average initial fluid production pressure is 5.1 pounds per square inch (See Table VI).

By observing the data given in Table V, you will note that of the 4 samples taken in the Cattlemen sand, 2 produced water and 1 oil. The tests also show that the sand is very tight; in fact, 2 of the samples were impermeable to water. Of the 28 samples of the Bartlesville sand,

28 produced water and 24 oil. This indicates that all of the sand represented by these samples is floodable. The tests also show that the Bartlesville sand has a fairly uniform effective permeability.

## CONCLUSION

From a study of the above data, we believe that an efficient water flood within the vicinity of this well will recover approximately 4,300 barrels of oil per acre, or an average of 162 barrels per acre foot from the 26.60 feet of floodable Bartlesville sand analyzed. In calculating this recovery, an allowance was made for oil lost during coring, and it was assumed that the primary production and the true water saturation of the sand are 20 and 35 percent respectively. The Cattlemen sand does not contain sufficient recoverable oil to justify development.

## Oil Field Research Laboratories

**RESULTS OF PERMEABILITY TESTS**

**TABLE I**

Company Franco Central Oil Company Lease Hughes Well No. W-3

| Sample No. | Depth, Feet | Permeability Millidarcys | Feet of Core | | Permeability Capacity Ft. x Md. |
|---|---|---|---|---|---|
| | | | Ft. | Cum. Ft. | |
| 1 | 2302.57 | 15. | 0.25 | 0.25 | 3.75 |
| 2 | 2303.73 | Broken | 0.20 | 0.45 | - |
| 3 | 2304.07 | 9.2 | 0.30 | 0.75 | 2.76 |
| 4 | 2305.20 | Imp. | 0.25 | 1.00 | 0.00 |
| 5 | 2305.70 | Imp. | 0.45 | 1.45 | 0.00 |
| 6 | 2306.20 | 9.9 | 0.65 | 2.10 | 6.44 |
| 7 | 2503.10 | 15. | 0.25 | 2.35 | 3.75 |
| 8 | 2503.40 | 11. | 0.35 | 2.70 | 3.85 |
| 9 | 2503.83 | 17. | 0.45 | 3.15 | 7.65 |
| 10 | 2504.25 | 28. | 0.55 | 3.70 | 15.40 |
| 11 | 2504.96 | 34. | 0.50 | 4.20 | 17.00 |
| 12 | 2505.30 | 36. | 0.45 | 4.65 | 16.20 |
| 13 | 2505.84 | 30. | 0.55 | 5.20 | 16.50 |
| 14 | 2506.33 | 9.9 | 0.55 | 5.75 | 5.45 |
| 15 | 2506.93 | 12. | 0.45 | 6.20 | 5.40 |
| 16 | 2507.30 | 8.7 | 0.40 | 6.60 | 3.48 |
| 17 | 2507.84 | 54. | 0.55 | 7.15 | 29.70 |
| 18 | 2508.32 | 16. | 0.55 | 7.70 | 8.80 |
| 19 | 2508.94 | 150. | 0.55 | 8.25 | 82.50 |
| 20 | 2509.42 | 138. | 0.55 | 8.80 | 75.90 |
| 21 | 2509.95 | 139. | 0.50 | 9.30 | 69.50 |
| 22 | 2510.42 | 106. | 0.50 | 9.80 | 53.00 |
| 23 | 2510.93 | 81. | 0.45 | 10.25 | 36.45 |
| 24 | 2511.36 | 61. | 0.50 | 10.75 | 30.50 |
| 25 | 2511.92 | 79. | 0.45 | 11.20 | 35.55 |
| 26 | 2512.30 | 72. | 0.60 | 11.80 | 43.20 |
| 27 | 2512.94 | 240. | 0.45 | 12.25 | 108.00 |
| 28 | 2513.30 | 85. | 0.55 | 12.80 | 46.75 |
| 29 | 2513.92 | 86. | 0.45 | 13.25 | 38.70 |
| 30 | 2514.38 | 49. | 0.50 | 13.75 | 24.50 |
| 31 | 2514.90 | 36. | 0.45 | 14.20 | 16.20 |
| 32 | 2515.35 | 56. | 0.60 | 14.80 | 33.60 |
| 33 | 2515.92 | 49. | 0.45 | 15.25 | 22.05 |
| 34 | 2516.30 | 54. | 0.45 | 15.10 | 24.30 |
| 35 | 2516.84 | 32. | 0.40 | 16.10 | 12.80 |
| 36 | 2517.17 | 38. | 0.30 | 16.40 | 11.40 |
| 37 | 2517.50 | 45. | 0.45 | 16.85 | 20.25 |
| 38 | 2517.98 | 31. | 0.45 | 17.30 | 13.95 |
| 39 | 2518.30 | 48. | 0.40 | 17.70 | 19.20 |
| 40 | 2518.87 | 45. | 0.50 | 18.20 | 22.50 |

## Oil Field Research Laboratories

**RESULTS OF PERMEABILITY TESTS**

**TABLE I**

Company Franco Central Oil Company Lease Hughes Well No. W-3

| Sample No. | Depth, Feet | Permeability Millidarcys | Feet of Core | | Permeability Capacity Ft. x Md. |
|---|---|---|---|---|---|
| | | | Ft. | Cum. Ft. | |
| 41 | 2519.40 | 50. | 0.50 | 18.70 | 25.00 |
| 42 | 2519.92 | 62. | 0.50 | 19.20 | 31.00 |
| 43 | 2520.42 | 62. | 0.55 | 19.75 | 34.10 |
| 44 | 2520.84 | 51. | 0.45 | 20.20 | 22.95 |
| 45 | 2521.42 | 63. | 0.60 | 20.80 | 37.80 |
| 46 | 2521.93 | 87. | 0.50 | 21.30 | 43.50 |
| 47 | 2522.45 | 55. | 0.30 | 21.60 | 16.50 |
| 48 | 2523.13 | 38. | 0.30 | 21.90 | 11.40 |
| 49 | 2523.48 | 47. | 0.35 | 22.25 | 16.45 |
| 50 | 2523.83 | 33. | 0.35 | 22.60 | 11.55 |
| 51 | 2524.14 | 35. | 0.30 | 22.90 | 10.50 |
| 52 | 2524.45 | 27. | 0.20 | 23.10 | 5.40 |
| 53 | 2524.94 | 23. | 0.35 | 23.45 | 8.05 |
| 54 | 2525.40 | 13. | 0.30 | 23.75 | 3.90 |
| 55 | 2525.90 | 90. | 0.65 | 24.40 | 58.50 |
| 56 | 2526.33 | 176. | 0.50 | 24.90 | 88.00 |
| 57 | 2526.90 | 142. | 0.50 | 25.40 | 71.00 |
| 58 | 2527.24 | 87. | 0.50 | 25.90 | 43.50 |
| 59 | 2527.93 | 143. | 0.50 | 26.40 | 71.50 |
| 60 | 2528.28 | 189. | 0.65 | 27.05 | 122.85 |
| 61 | 2528.80 | 115. | 0.20 | 27.25 | 23.00 |
| 62 | 2529.25 | 142. | 0.65 | 27.90 | 92.30 |
| 63 | 2529.90 | 136. | 0.50 | 28.40 | 68.00 |
| 64 | 2530.35 | 177. | 0.50 | 28.90 | 88.50 |
| 65 | 2530.87 | 220. | 0.45 | 29.35 | 99.00 |
| 66 | 2531.24 | 294. | 0.45 | 29.80 | 132.30 |
| 67 | 2531.88 | 128. | 0.60 | 30.40 | 76.80 |
| 68 | 2532.30 | 71. | 0.30 | 30.70 | 21.30 |

## Oil Field Research Laboratories

**SUMMARY OF PERMEABILITY TESTS**

**TABLE II**

Company Franco Central Oil Company Lease Hughes Well No. W-3

| Depth Interval, Feet | Feet of Core Analyzed | Average Permeability, Millidarcys | Permeability Capacity, Ft. x Md. |
|---|---|---|---|
| | CATTLEMEN SAND | | |
| 2302.35 - 2306.50 | 1.20 | 10.79 | 12.95 |
| | BARTLESVILLE SAND | | |
| 2503.00 - 2507.50 | 4.50 | 21.04 | 94.68 |
| 2507.50 - 2525.45 | 17.15 | 67.48 | 1,157.40 |
| 2525.45 - 2532.40 | 6.95 | 152.02 | 1,056.55 |
| 2503.00 - 2532.40 | 28.60 | 80.72 | 2,308.63 |

## Oil Field Research Laboratories

### RESULTS OF SATURATION TESTS

### TABLE III

Company Franco Central Oil Company Lease Hughes Well No. K-3

| Sat. No. | Depth, Feet | Effective Porosity Percent | Percent Saturation | | | Oil Content, Bbls./A. Ft. | Feet of Core | | Total Oil Content Bbls./Acre |
|---|---|---|---|---|---|---|---|---|---|
| | | | Oil | Water | Total | | Ft. | Cum. Ft. | |
| 1A | 2303.90 | 17.9 | 29.2 | 50.8 | 80.0 | 406 | 0.50 | 0.50 | 203 |
| 2A | 2305.45 | 4.7 | 30.6 | 62.5 | 93.1 | 112 | 0.70 | 1.20 | 78 |
| 3A | 2306.45 | 18.3 | 33.3 | 61.2 | 94.5 | 473 | 0.65 | 1.85 | 307 |
| 4A | 2307.25 | 17.6 | 36.4 | 52.9 | 89.3 | 498 | 0.20 | 2.05 | 100 |
| 1 | 2503.60 | 16.5 | 24.3 | 71.6 | 95.9 | 311 | 1.10 | 3.15 | 342 |
| 2 | 2504.65 | 18.2 | 30.6 | 62.3 | 92.9 | 432 | 1.05 | 4.20 | 454 |
| 3 | 2505.65 | 18.9 | 21.6 | 69.8 | 91.4 | 317 | 1.05 | 5.25 | 333 |
| 4 | 2506.65 | 16.9 | 28.3 | 67.2 | 95.5 | 371 | 0.90 | 6.15 | 334 |
| 5 | 2507.64 | 19.1 | 23.1 | 68.0 | 91.1 | 342 | 0.65 | 6.80 | 222 |
| 6 | 2508.64 | 19.4 | 20.6 | 66.2 | 86.8 | 310 | 1.05 | 7.85 | 326 |
| 7 | 2509.70 | 19.7 | 23.9 | 69.3 | 93.2 | 366 | 0.90 | 8.75 | 329 |
| 8 | 2510.65 | 20.9 | 22.0 | 67.3 | 89.3 | 357 | 1.00 | 9.75 | 357 |
| 9 | 2511.65 | 19.4 | 24.0 | 68.4 | 92.4 | 361 | 1.00 | 10.75 | 361 |
| 10 | 2512.65 | 17.3 | 24.3 | 64.7 | 89.0 | 326 | 1.05 | 11.80 | 342 |
| 11 | 2513.65 | 18.2 | 20.0 | 67.6 | 87.6 | 283 | 1.00 | 12.80 | 283 |
| 12 | 2514.65 | 17.8 | 24.5 | 68.2 | 92.7 | 338 | 1.05 | 13.85 | 355 |
| 13 | 2515.70 | 19.6 | 23.2 | 60.9 | 83.9 | 353 | 0.95 | 14.80 | 335 |

## Oil Field Research Laboratories

**RESULTS OF SATURATION TESTS**

**TABLE III**

Company Franco Central Oil Company Lease Hughes Well No. K-3

| Sat. No. | Depth, Feet | Effective Porosity Percent | Percent Saturation | | | Oil Content, Bbls./A. Ft. | Feet of Core | | Total Oil Content Bbls./Acre |
|---|---|---|---|---|---|---|---|---|---|
| | | | Oil | Water | Total | | Ft. | Cum. Ft. | |
| 14 | 2516.60 | 18.8 | 24.4 | 66.9 | 91.3 | 356 | 1.05 | 15.85 | 374 |
| 15 | 2517.75 | 18.4 | 28.5 | 64.5 | 93.0 | 407 | 1.00 | 16.85 | 407 |
| 16 | 2518.65 | 17.9 | 25.2 | 59.0 | 84.2 | 350 | 0.90 | 17.75 | 315 |
| 17 | 2519.65 | 18.1 | 25.5 | 64.8 | 90.3 | 358 | 1.00 | 18.75 | 358 |
| 18 | 2520.65 | 18.4 | 25.0 | 69.3 | 94.3 | 357 | 1.00 | 19.75 | 357 |
| 19 | 2521.70 | 18.0 | 24.2 | 69.4 | 93.6 | 338 | 1.40 | 21.15 | 473 |
| 20 | 2523.60 | 17.0 | 21.8 | 71.3 | 93.1 | 288 | 1.50 | 22.65 | 432 |
| 21 | 2524.65 | 17.9 | 26.8 | 67.4 | 94.2 | 372 | 0.30 | 22.95 | 112 |
| 22 | 2525.60 | 19.3 | 22.4 | 61.8 | 84.2 | 336 | 0.65 | 23.60 | 218 |
| 23 | 2526.63 | 19.2 | 22.2 | 61.0 | 83.2 | 331 | 1.00 | 24.60 | 331 |
| 24 | 2527.60 | 18.9 | 26.3 | 55.2 | 81.5 | 386 | 1.00 | 25.60 | 386 |
| 25 | 2528.60 | 19.6 | 24.7 | 57.5 | 82.2 | 376 | 0.65 | 26.25 | 244 |
| 26 | 2529.60 | 18.3 | 24.6 | 57.9 | 82.5 | 349 | 1.15 | 27.40 | 401 |
| 27 | 2530.60 | 19.7 | 26.7 | 54.5 | 81.2 | 408 | 1.40 | 28.80 | 571 |
| 28 | 2531.64 | 18.4 | 24.4 | 51.8 | 76.2 | 348 | 0.90 | 29.70 | 313 |
| | | | | | | | Total - - - - - | | 10,353 |

Note: "A" - Sample was taken from core after it was received in the laboratory.

## Oil Field Research Laboratories

**SUMMARY OF SATURATION TESTS**

**TABLE IV**

Company Franco Central Oil Company Lease Hughes Well No. W-3

| Depth Interval, Feet | Feet of Core Analyzed | Average Percent Porosity | Average Percent Oil Saturation | Average Percent Water Saturation | Average Oil Content Bbls./A. Ft. | Total Oil Content Bbls./Acre |
|---|---|---|---|---|---|---|
| | | | CATTLEMEN SAND | | | |
| 2303.70-2307.35 | 2.05 | 13.51 | 31.66 | 58.29 | 336 | 688 |
| | | | BARTLESVILLE SAND | | | |
| 2503.00-2507.10 | 4.10 | 17.66 | 26.12 | 67.83 | 357 | 1,463 |
| 2507.50-2524.80 | 16.80 | 18.20 | 23.28 | 65.58 | 342 | 5,738 |
| 2525.45-2532.40 | 6.75 | 19.85 | 25.91 | 59.75 | 365 | 2,464 |
| 2503.00-2532.40 | 27.65 | 18.52 | 24.34 | 64.49 | 350 | 9,665 |

## Oil Field Research Laboratories

**RESULTS OF LABORATORY FLOODING TESTS**

**TABLE V**

Company Pranco Central Oil Company Lease Hughes Well No. 6-3

| 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. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Percent | Bbls./A. Ft. | Percent | Bbls./A. Ft. | % Oil | % Water | Bbls./A. Ft. | | | |
| 1A | 2502.90 | 17.6 | 28.3 | 387 | 4.1 | 59 | 24.2 | 67.6 | 328 | 1 | 0.093 | 40 |
| 2A | 2503.45 | 8.1 | 30.0 | 119 | 0.0 | 0 | 30.0 | 67.7 | 119 | 0 | Imp. | 50 |
| 3A | 2506.45 | 18.7 | 38.6 | 473 | 0.0 | 0 | 38.6 | 68.7 | 473 | 1 | 0.108 | 30 |
| 4A | 2507.25 | 17.4 | 37.5 | 507 | 0.0 | 0 | 37.5 | 67.7 | 507 | 0 | Imp. | 50 |
| 1 | 2503.30 | 16.3 | 23.1 | 292 | 0.8 | 10 | 22.3 | 64.3 | 282 | 12 | 0.314 | 40 |
| 2 | 2504.65 | 17.9 | 28.8 | 400 | 0.0 | 0 | 28.8 | 64.8 | 400 | 7 | 0.146 | 30 |
| 3 | 2505.65 | 16.8 | 21.8 | 318 | 1.1 | 16 | 20.7 | 70.4 | 302 | 170 | Fractured | 5 |
| 4 | 2506.65 | 16.8 | 29.2 | 381 | 0.0 | 0 | 29.2 | 61.1 | 381 | 48 | 0.550 | 10 |
| 5 | 2507.64 | 19.1 | 21.8 | 323 | 0.0 | 0 | 21.8 | 60.6 | 323 | 79 | 2.82 | 5 |
| 6 | 2508.64 | 19.6 | 21.3 | 324 | 4.1 | 63 | 17.2 | 74.4 | 262 | 184 | 9.85 | 5 |
| 7 | 2509.70 | 19.5 | 28.7 | 344 | 3.1 | 47 | 19.6 | 68.5 | 297 | 139 | 8.21 | 5 |
| 8 | 2510.65 | 20.9 | 20.9 | 339 | 2.8 | 45 | 18.1 | 67.2 | 294 | 203 | 5.37 | 5 |
| 9 | 2511.65 | 19.7 | 22.7 | 347 | 3.0 | 46 | 19.7 | 68.5 | 301 | 199 | 11.10 | 5 |
| 10 | 2512.65 | 17.1 | 25.5 | 339 | 2.3 | 31 | 23.2 | 66.9 | 308 | 45 | 0.658 | 10 |
| 11 | 2513.65 | 17.7 | 21.3 | 293 | 0.0 | 0 | 21.3 | 68.5 | 293 | 102 | 2.57 | 5 |
| 12 | 2514.65 | 18.1 | 24.1 | 338 | 3.5 | 49 | 20.6 | 66.0 | 292 | 166 | 3.08 | 5 |
| 13 | 2515.70 | 19.7 | 22.3 | 344 | 2.1 | 32 | 20.4 | 72.1 | 312 | 214 | 5.41 | 5 |
| 14 | 2516.60 | 18.4 | 25.3 | 333 | 3.3 | 47 | 20.0 | 68.9 | 286 | 151 | 2.91 | 5 |
| 15 | 2517.75 | 18.0 | 28.0 | 391 | 2.6 | 35 | 25.5 | 69.8 | 356 | 202 | 5.81 | 5 |
| 16 | 2518.65 | 17.7 | 23.3 | 328 | 2.2 | 30 | 21.7 | 70.4 | 298 | 165 | 3.40 | 5 |
| 17 | 2519.65 | 17.9 | 25.7 | 330 | 2.7 | 36 | 21.0 | 72.0 | 292 | 149 | 4.68 | 5 |
| 18 | 2520.65 | 18.6 | 24.4 | 352 | 3.2 | 75 | 19.2 | 70.1 | 277 | 214 | 5.28 | 5 |
| 19 | 2521.70 | 17.6 | 23.6 | 322 | 2.3 | 31 | 21.3 | 64.3 | 291 | 103 | 8.00 | 5 |
| 20 | 2523.60 | 17.2 | 20.9 | 279 | 1.4 | 19 | 19.5 | 67.0 | 260 | 51 | 1.44 | 5 |
| 21 | 2524.65 | 17.4 | 27.3 | 369 | 2.3 | 31 | 25.0 | 68.1 | 338 | 52 | 1.08 | 5 |
| 22 | 2525.80 | 19.0 | 21.4 | 330 | 1.9 | 28 | 20.5 | 68.6 | 302 | 127 | 3.23 | 5 |
| 23 | 2526.65 | 19.4 | 21.6 | 328 | 4.1 | 62 | 17.5 | 69.3 | 264 | 139 | 4.24 | 5 |
| 24 | 2527.60 | 19.0 | 24.4 | 360 | 5.4 | 80 | 19.0 | 67.2 | 280 | 170 | 7.61 | 5 |
| 25 | 2528.60 | 19.7 | 25.9 | 366 | 2.0 | 31 | 21.9 | 68.0 | 335 | 134 | 6.10 | 5 |
| 26 | 2529.60 | 18.2 | 25.4 | 359 | 2.3 | 33 | 23.1 | 68.3 | 326 | 210 | 12.61 | 5 |
| 27 | 2530.60 | 19.7 | 26.0 | 395 | 3.7 | 57 | 22.3 | 66.1 | 341 | 338 | 7.56 | 5 |
| 28 | 2531.64 | 18.1 | 23.6 | 333 | 4.6 | 65 | 19.0 | 67.8 | 267 | 174 | 9.89 | 5 |

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.
"A" = Sample was taken from core after it was received in the laboratory.

## Oil Field Research Laboratories

### SUMMARY OF LABORATORY FLOODING TESTS

### TABLE VI

Company Franco Central Oil Company Lease Hughes Well No. #-3

| | 2503.00 2506.20 | 2508.15 2524.80 | 2525.45 2532.40 | 2503.00 2532.40 |
|---|---|---|---|---|
| Depth Interval Feet | | | | |
| Feet of Core Analyzed | 2.15 | 15.15 | 6.75 | 24.05 |
| Average Percent Porosity | 17.49 | 18.46 | 19.01 | 18.53 |
| Average Percent Original Oil Saturation | 22.51 | 23.43 | 24.12 | 23.54 |
| Average Percent Oil Recovery | 0.98 | 2.82 | 3.54 | 2.86 |
| Average Percent Residual Oil Saturation | 21.53 | 20.61 | 20.58 | 20.68 |
| Average Percent Residual Water Saturation | 67.21 | 68.07 | 67.54 | 67.85 |
| Average Percent Total Residual Fluid Saturation | 88.74 | 88.68 | 88.12 | 88.53 |
| Average Original Oil Content, Bbls./A. Ft. | 305. | 335. | 357. | 339. |
| Average Oil Recovery, Bbls./A. Ft. | 13. | 41. | 53. | 42. |
| Average Residual Oil Content, Bbls./A. Ft. | 292. | 294. | 304. | 297. |
| Total Original Oil Content, Bbls./Acre | 656. | 5,074. | 2,408. | 8,138. |
| Total Oil Recovery, Bbls./Acre | 28. | 615. | 357. | 1,000. |
| Total Residual Oil Content, Bbls./Acre | 628. | 4,459. | 2,051. | 7,138. |
| Average Effective Permeability, Millidarcys | 0.314 | 4.39 | 7.75 | 5.00 |
| Average Initial Fluid Production Pressure, p.s.i. | 12.5 | 5.3 | 5.0 | 5.1 |

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