HICKORY CREEK OIL COMPANY

CORE ANALYSIS REPORT

WELL NO. HCO-130

W. Denlin 36

OILFIELD RESEARCH LABORATORIES
536 N. HIGHLAND CHANUTE, KANSAS

# OILFIELD RESEARCH LABORATORIES

536 NORTH HIGHLAND - CHANUTE, KANSAS 66720 - PHONE (316) 431-2650


April 1, 1980

Hickory Creek Oil Company
P.O. Box 379
Parsons, Kansas 67357

Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-130, and submitted to our laboratory on February 26, 1980.

Your business is greatly appreciated.

Very truly yours,

OILFIELD RESEARCH LABORATORIES

Sanford A. Michel

SAM/tem

4 c to Parsons, Kansas
1 c to Chanute, Kansas

## Oilfield Research Laboratories

### GENERAL INFORMATION & SUMMARY

Company Hickory Creek Oil Company Lease – Well No. HCO-130

Location –

Section – Twp – Rge – County – State –

| | |
|---|---|
| Elevation, Feet | – |
| Name of Sand | – |
| Top of Core | 189.0 |
| Bottom of Core | 206.8 |
| Top of Sand | 190.0 |
| Bottom of Sand | 206.8 |
| Total Feet of Permeable Sand | 14.6 |
| Total Feet of Floodable Sand | 9.8 |

Distribution of Permeable Sand:

| Permeability Range Millidarcys | Feet | Cum. Ft. |
|---|---|---|
| 0 – 100 | 7.2 | 7.2 |
| 100 – 200 | 5.4 | 12.6 |
| 200 – 300 | 2.0 | 14.6 |

| | |
|---|---|
| Average Permeability Millidarcys | 108.3 |
| Average Percent Porosity | 23.5 |
| Average Percent Oil Saturation | 48.7 |
| Average Percent Water Saturation | 23.7 |
| Average Oil Content, Bbls./A. Ft. | 888. |
| Total Oil Content, Bbls./Acre | 12,966. |
| Average Percent Oil Recovery by Laboratory Flooding Tests | 5.4 |
| Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. | 97. |
| Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre | 953. |
| Total Calculated Oil Recovery, Bbls./Acre | See "Calculated Recovery" Section. |

The core was sampled and the samples sealed in plastic bags by a representative of the client.

## FORMATION CORED

The detailed log of the formation cored is as follows:

| Depth Interval, Feet | Description |
|---|---|
| 189.0 - 190.0 | Gray sandy shale. |
| 190.0 - 190.8 | Brown slightly shaly sandstone. |
| 190.8 - 195.4 | Dark brwon sandstone. |
| 195.4 - 200.0 | Dark brown slightly carbonaceous sandstone. |
| 200.0 - 206.0 | Brown sandstone. |
| 206.0 - 206.8 | Light brown shaly sandstone. |

## LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests as a total recovery of 953 barrels of oil per acre was obtained from 9.8 feet of sand. The weighted average percent oil saturation was reduced from 51.8 to 46.4, or represents an average recovery of 5.4 percent. The weighted average effective permeability of the samples is 9.85 millidarcys, while the average initial fluid production pressure is 21.7 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 9 samples tested, 6 produced water and oil, and 2 samples produced water only. This indicates that approximately 67 percent of the sand represented by these samples is floodable pay sand.

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## CALCULATED RECOVERY

It would appear from a study of the core data, that efficient primary and waterflood operations in the vicinity of this well should recover approximately 3,600 barrels of oil per acre. This is an average recovery of 367 barrels per acre foot from 9.8 feet of floodable sand analyzed in this core.

These recovery values were calculated using the following data and assumptions:

| | |
|---|---|
| Original formation volume factor, estimated | 1.03 |
| Reservoir water saturation, percent, estimated | 10.0 / 19.0 |
| Average porosity, percent | 23.1 / 22.5 |
| Oil saturation after flooding, percent | 46.4 / 46.2 |
| Performance factor, percent, estimated | 50.0 |
| Net floodable sand, feet | 9.8 / 10.0 |

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RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company Lease - D 36 Well No. HCO-130

1786.5 210.2 215 853.8

| 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. | | |
| 1 189 | 190.5 | 21.7 | 48 | 23 | 71 | 808 | 2.0 | 0.8 | 0.8 | 646 | 1.60 |
| 3 191 | 192.5 | 22.6 | 53 | 20 | 73 | 929 | 121. | 2.0 | 2.8 | 1858 | 242.00 |
| 5 193 | 194.5 | 23.5 | 56 | 13 | 69 | 1021 | 156. | 1.4 | 4.2 | 1429 | 218.40 |
| 7 195 | 196.5 | 23.0 | 52 | 16 | 68 | 928 | 50. | 1.6 | 5.8 | 1485 | 80.00 |
| 9 197 | 198.5 | 23.1 | 50 | 23 | 73 | 896 | 83. | 2.0 | 7.8 | 1792 | 166.00 |
| 11 199 | 200.5 | 24.8 | 51 | 27 | 78 | 981 | 116. | 2.0 | 9.8 | 1962 | 232.00 |
| 13 201 | 202.5 | 25.4 | 42 | 23 | 65 | 828 | 221. | 2.0 | 11.8 | 1656 | 442.00 |
| 15 203 | 204.5 | 23.2 | 44 | (35) | 79 | 792 | 96. | 2.0 | 13.8 | 1584 | 192.00 |
| 17 205 | 206.5 | 22.9 | 39 | (35) | 74 | 693 | 8.8 | 0.8 | 14.6 | 554 | 7.04 |

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### SUMMARY OF PERMEABILITY & SATURATION TESTS

### TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-130

| Depth Interval, Feet | Feet of Core Analyzed | Average Permeability, Millidarcys | Permeability Capacity Ft. x Md. |
|---|---|---|---|
| 190.0 - 206.8 | 14.6 | 108.3 | 1,581.04 |

| 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 |
|---|---|---|---|---|---|---|
| 190.0 - 206.8 | 14.6 | 23.5 | 48.7 | 23.7 | 888 | 12,966 |

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### RESULTS OF LABORATORY FLOODING TESTS

### TABLE IV

Company Hickory Creek Oil Company Lease -D 36 Well No. HCO-130

| Sample No. | Depth, Feet | Effective Porosity Percent | Original Oil Saturation | | Oil Recovery | | 402 Residual Saturation | | | Volume of Water Recovered cc* | 80.43 Effective Permeability Millidarcys** | Initial Fluid Production Pressure Lbs./Sq./In. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % | Bbls./A. Ft. | % | Bbls./A. Ft. | % Oil | % Water | Bbls./A. Ft. | | | | |
| 10 / 80-Gm / SHOTS | 1 | 190.5 | 21.5 | 48 | 801 | 4 | 67 | 44 | 48 | 734 | 200 | 11.11 | 20 | 10 / 80-Gm / SHOTS |
| | 3 | 192.5 | 22.5 | 53 | 925 | 6 | 105 | 47 | 50 | 820 | 233 | 12.77 | 20 | |
| | 5 | 194.5 | 23.0 | 56 | 999 | 10 | 178 | 46 | 50 | 821 | 379 | 9.77 | 25 | |
| | 7 | 196.5 | 22.9 | 52 | 924 | 5 | 89 | 47 | 51 | 835 | 333 | 7.50 | 25 | |
| | 9 | 198.5 | 22.8 | 50 | 884 | 4 | 71 | 46 | 52 | 813 | 434 | 8.60 | 20 | |
| | 11 | 200.5 | 25.0 | 51 | 989 | 4 | 78 | 47 | 48 | 911 | 372 | 9.60 | 20 | |
| | 13 | 202.5 | 25.0 | 42 | 815 | 0 | 0 | 42 | 54 | 815 | 401 | 10.02 | 25 | |
| | 15 | 204.5 | 23.3 | 44 | 795 | 0 | 0 | 44 | 51 | 795 | 199 | 11.06 | 20 | |
| | 17 | 206.5 | 23.2 | 39 | 702 | 0 | 0 | 39 | 58 | 702 | 0 | Imp. | - | |

5 OR 11.1 6 46.2

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

ompany Hickory Creek Oil Company Lease - Well No. HCO-130

| | |
|---|---|
| epth Interval, Feet | 190.0 - 206.8 |
| eet of Core Analyzed | 9.8 |
| verage Percent Porosity | 23.1 |
| verage Percent Original Oil Saturation | 51.8 |
| verage Percent Oil Recovery | 5.4 |
| verage Percent Residual Oil Saturation | 46.4 |
| verage Percent Residual Water Saturation | 50.0 |
| verage Percent Total Residual Fluid Saturation | 96.4 |
| verage Original Oil Content, Bbls./A. Ft. | 930. |
| verage Oil Recovery, Bbls./A. Ft. | 97. |
| verage Residual Oil Content, Bbls./A. Ft. | 833. |
| otal Original Oil Content, Bbls./Acre | 9,114. |
| otal Oil Recovery, Bbls./Acre | 953. |
| otal Residual Oil Content, Bbls./Acre | 8,161. |
| verage Effective Permeability, Millidarcys | 9.85 |
| verage Initial Fluid Production Pressure, p.s.i. | 21.7 |

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