

HICKORY CREEK OIL COMPANY

CORE ANALYSIS REPORT

WELL NO. HCO-148

*Neelin #52*

OILFIELD RESEARCH LABORATORIES

536 N. HIGHLAND

CHANUTE, KANSAS



# OILFIELD RESEARCH LABORATORIES

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May 9, 1980

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

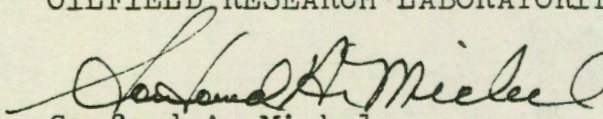
Gentlemen:

Enclosed herewith is the report of the analysis of the rotary core taken from Well No. HCO-148, and submitted to our laboratory on April 3, 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-148

Location -

Section - Twp - Rge - County - State -

Elevation, Feet - - - - -

Name of Sand - - - - -

Top of Core - - - - - 185.0

Bottom of Core - - - - - 205.0

Top of Sand - - - - - 188.2

Bottom of Sand - - - - - 205.0

Total Feet of Permeable Sand - - - - - 16.8

Total Feet of Floodable Sand - - - - - 16.8

Distribution of Permeable Sand:  
Permeability Range  
Millidarcys

Feet

Cum. Ft.

0 - 10 2.3 2.3

10 - 50 4.7 7.0

50 - 100 4.0 11.0

100 - 200 4.0 15.0

200 - 300 1.8 16.8

Average Permeability Millidarcys - - - - - 86.6

Average Percent Porosity - - - - - 18.8

Average Percent Oil Saturation - - - - - 57.2

Average Percent Water Saturation - - - - - 31.2

Average Oil Content, Bbls./A. Ft. - - - - - 836.

Total Oil Content, Bbls./Acre - - - - - 14,051.

Average Percent Oil Recovery by Laboratory Flooding Tests - - - - - 14.4

Average Oil Recovery by Laboratory Flooding Tests, Bbls./A. Ft. - - - - - 214.

Total Oil Recovery by Laboratory Flooding Tests, Bbls./Acre - - - - - 3,600.

Total Calculated Oil Recovery, Bbls./Acre - - - - - See "Calculated Recovery" Section.

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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:

| <u>Depth Interval,<br/>Feet</u> | <u>Description</u>                        |
|---------------------------------|-------------------------------------------|
| 185.0 - 188.2                   | Gray sandy shale.                         |
| 188.2 - 199.7                   | Dark brown slightly calcareous sandstone. |
| 199.7 - 201.0                   | Brown slightly shaly sandstone.           |
| 201.0 - 202.7                   | Brown sandstone.                          |
| 202.7 - 205.0                   | Brown shaly sandstone.                    |

#### LABORATORY FLOODING TESTS

The sand in this core responded to laboratory flooding tests, as a total recovery of 3,600 barrels of oil per acre was obtained from 16.8 feet of sand. The weighted average percent oil saturation was reduced from 57.3 to 42.9, or represents an average recovery of 14.4 percent. The weighted average effective permeability of the samples is 8.30 millidarcys, while the average initial fluid production pressure is 23.8 pounds per square inch (See Table V).

By observing the data given in Table IV, you will note that of the 17 samples tested, 17 produced water and oil. This indicates that approximately 100 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 4,860 barrels of oil per acre. This is an average recovery of 289 barrels per acre foot from 16.8 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 | 15.0 / 26.6 ✓ |
| Average porosity, percent                      | 18.8 / 19.5 ✓ |
| Oil saturation after flooding, percent         | 42.9 / 42.5 ✓ |
| Performance factor, percent, estimated         | ✓ 50.0.       |
| Net floodable sand, feet                       | 16.8 / 14.0 ✓ |

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## RESULTS OF SATURATION & PERMEABILITY TESTS

TABLE 1-B

Company Hickory Creek Oil Company

Lease

- D 52

Well No. HCO-148

3340.5

320.6

525

1507.4

| 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          | 188.5       | 20.0                       | 65                 | 19    | 84    | 1009                      | 216.         | 0.8          | 0.8      | 807               | 172.80                   |
| 2          | 189.5       | 16.7                       | 73                 | 25    | 98    | 946                       | 71.          | 1.0          | 1.8      | 946               | 71.00                    |
| 3          | 190.5       | 18.8                       | 63                 | 28    | 91    | 919                       | 147.         | 1.0          | 2.8      | 919               | 147.00                   |
| 4          | 191.5       | 20.6                       | 74                 | 19    | 93    | 1183                      | 199.         | 1.0          | 3.8      | 1183              | 199.00                   |
| 5          | 192.5       | 21.6                       | 66                 | 19    | 85    | 1106                      | 203.         | 1.0          | 4.8      | 1106              | 203.00                   |
| 6          | 193.5       | 21.3                       | 71                 | 20    | 91    | 1173                      | 123.         | 1.0          | 5.8      | 1173              | 123.00                   |
| 7          | 194.5       | 18.4                       | 57                 | 24    | 81    | 814                       | 77.          | 1.0          | 6.8      | 814               | 77.00                    |
| 8          | 195.5       | 21.8                       | 57                 | 26    | 83    | 964                       | 90.          | 1.0          | 7.8      | 964               | 90.00                    |
| 9          | 196.5       | 25.2                       | 37                 | 23    | 60    | 723                       | 166.         | 1.0          | 8.8      | 723               | 166.00                   |
| 10         | 197.5       | 19.7                       | 59                 | 31    | 90    | 902                       | 42.          | 1.0          | 9.8      | 902               | 42.00                    |
| 11         | 198.5       | 17.6                       | 59                 | 33    | 92    | 806                       | 61.          | 1.0          | 10.8     | 806               | 61.00                    |
| 12         | 199.5       | 18.7                       | 49                 | 35    | 84    | 711                       | 27.          | 0.7          | 11.5     | 498               | 18.90                    |
| 13         | 200.5       | 17.0                       | 49                 | 44    | 93    | 646                       | 13.          | 1.3          | 12.8     | 840               | 16.90                    |
| 14         | 201.5       | 15.8                       | 50                 | 44    | 94    | 613                       | 29.          | 1.0          | 13.8     | 613               | 29.00                    |
| 15         | 202.5       | 16.1                       | 45                 | 47    | 92    | 562                       | 25.          | 0.7          | 14.5     | 393               | 17.50                    |
| 16         | 203.5       | 14.0                       | 50                 | 46    | 96    | 543                       | 10.          | 1.3          | 15.8     | 706               | 13.00                    |
| 17         | 204.5       | 17.3                       | 49                 | 42    | 91    | 658                       | 8.4          | 1.0          | 16.8     | 658               | 8.40                     |

GR 189 = CORE 188  
GR 190 = CORE 189

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## SUMMARY OF PERMEABILITY & SATURATION TESTS

TABLE III

Company Hickory Creek Oil Company Lease - Well No. HCO-148

| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Permeability,<br>Millidarcys | Permeability<br>Capacity<br>Ft. x Md. |
|-------------------------|--------------------------|-----------------------------------------|---------------------------------------|
| 188.2 - 197.0           | 8.8                      | 141.9                                   | 1248.80                               |
| 197.0 - 205.0           | 8.0                      | 25.8                                    | 206.70                                |
| 188.2 - 205.0           | 16.8                     | 86.6                                    | 1455.50                               |

| Depth Interval,<br>Feet | Feet of Core<br>Analyzed | Average<br>Percent<br>Porosity | Average<br>Percent Oil<br>Saturation | Average<br>Percent Water<br>Saturation | Average<br>Oil Content<br>Bbl./A. Ft. | Total Oil<br>Content<br>Bbls./Acre |
|-------------------------|--------------------------|--------------------------------|--------------------------------------|----------------------------------------|---------------------------------------|------------------------------------|
| 188.2 - 197.0           | 8.8                      | 20.5                           | 62.5                                 | 22.6                                   | 981                                   | 8,635                              |
| 197.0 - 205.0           | 8.0                      | 16.9                           | 51.4                                 | 40.6                                   | 677                                   | 5,416                              |
| 188.2 - 205.0           | 16.8                     | 18.8                           | 57.2                                 | 31.2                                   | 836                                   | 14,051                             |

**Oilfield Research Laboratories**  
**RESULTS OF LABORATORY FLOODING TESTS**

**TABLE IV**

Company Hickory Creek Oil Company Lease - D 52 Well No. HCO-148

| 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          | 188.5 <sup>18.5</sup>  | 20.4                       | 65                      | 1029         | 23           | 364          | 729<br>(42)         | 52      | 665          | 356                           | 143.76                               | 20                                             |
| 2          | 189.5                  | 17.2                       | 73                      | 974          | 26           | 347          | (47)                | 44      | 627          | 291                           | 12.00                                | 20                                             |
| 3          | 190.5                  | 19.0                       | 63                      | 929          | 22           | 324          | (41)                | 52      | 605          | 242                           | 6.40                                 | 25                                             |
| 4          | 191.5                  | 20.6                       | 74                      | 1183         | 28           | 447          | (46)                | 44      | 736          | 347                           | 16.20                                | 20                                             |
| 5          | 192.5                  | 21.7                       | 66                      | 1111         | 18           | 303          | (48)                | 46      | 808          | 212                           | 11.33                                | 20                                             |
| 6          | 193.5                  | 21.4                       | 71                      | 1179         | 20           | 332          | (51)                | 43      | 847          | 348                           | 10.30                                | 20                                             |
| 7          | 194.5                  | 18.7                       | 57                      | 827          | 18           | 261          | (39)                | 49      | 566          | 200                           | 5.60                                 | 25                                             |
| 8          | 195.5                  | 22.0                       | 57                      | 973          | 9            | 154          | (48)                | 46      | 819          | 331                           | 16.20                                | 15                                             |
| 9          | 196.5                  | 24.7                       | 37                      | 709          | 4            | 77           | (33)                | 58      | 632          | 401                           | 10.50                                | 15                                             |
| 10         | 197.5                  | 19.9                       | 59                      | 911          | 21           | 324          | (38)                | 56      | 587          | 425                           | 26.73                                | 15                                             |
| 11         | 198.5                  | 17.6                       | 59                      | 806          | 18           | 246          | (41)                | 44      | 560          | 148                           | 4.50                                 | 25                                             |
| 12         | 199.5 <sup>200.5</sup> | 18.5                       | 49                      | 703          | 8            | 115          | (41)                | 54      | 588          | 280                           | 8.00                                 | 20                                             |
| 13         | 200.5 <sup>201.5</sup> | 16.7                       | 49                      | 635          | 13           | 168          | (36)                | 58      | 467          | 32                            | 0.60                                 | 35                                             |
| 14         | 201.5                  | 15.7                       | 50                      | 609          | 6            | 73           | (44)                | 54      | 536          | 151                           | 3.50                                 | 20                                             |
| 15         | 202.5                  | 15.9                       | 45                      | 555          | 3            | 37           | 42                  | 56      | 518          | 23                            | 0.50                                 | 40                                             |
| 16         | 203.5                  | 14.0                       | 50                      | 543          | 4            | 43           | 46                  | 52      | 500          | 11                            | 0.30                                 | 50                                             |
| 17         | 204.5                  | 17.4                       | 49                      | 661          | 3            | 40           | 46                  | 51      | 621          | 58                            | 1.10                                 | 20                                             |

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.

50R  
114  
40.5

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## SUMMARY OF LABORATORY FLOODING TESTS

TABLE V

|                                                   |                           |               |               |   |          |         |
|---------------------------------------------------|---------------------------|---------------|---------------|---|----------|---------|
| Company                                           | Hickory Creek Oil Company |               | Lease         | - | Well No. | HCO-148 |
| Depth Interval, Feet                              | 188.2 - 197.0             | 197.0 - 205.0 | 188.2 - 205.0 |   |          |         |
| Feet of Core Analyzed                             | 8.8                       | 8.0           | 16.8          |   |          |         |
| Average Percent Porosity                          | 20.6                      | 16.8          | 18.8          |   |          |         |
| Average Percent Original Oil Saturation           | 62.5                      | 51.4          | 57.3          |   |          |         |
| Average Percent Oil Recovery                      | 18.6                      | 9.7           | 14.4          |   |          |         |
| Average Percent Residual Oil Saturation           | 43.9                      | 41.7          | 42.9          |   |          |         |
| Average Percent Residual Water Saturation         | 48.1                      | 53.1          | 50.7          |   |          |         |
| Average Percent Total Residual Fluid Saturation   | 92.0                      | 94.8          | 93.6          |   |          |         |
| Average Original Oil Content, Bbls./A. Ft.        | 989.                      | 675.          | 839.          |   |          |         |
| Average Oil Recovery, Bbls./A. Ft.                | 288.                      | 133.          | 214.          |   |          |         |
| Average Residual Oil Content, Bbls./A. Ft.        | 701.                      | 542.          | 625.          |   |          |         |
| Total Original Oil Content, Bbls./Acre            | 8,708.                    | 5,399.        | 14,107.       |   |          |         |
| Total Oil Recovery, Bbls./Acre                    | 2,536.                    | 1,064.        | 3,600.        |   |          |         |
| Total Residual Oil Content, Bbls./Acre            | 6,172.                    | 4,335.        | 10,507.       |   |          |         |
| Average Effective Permeability, Millidarcys       | 10.97                     | 5.37          | 8.30          |   |          |         |
| Average Initial Fluid Production Pressure, p.s.i. | 20.0                      | 28.1          | 23.8          |   |          |         |

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