

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

22-31-33W
15-175-20250
SCAL

Special Core Analysis Study
for
AMOCO PRODUCTION COMPANY
~~Phase 2~~ Well
Hugoton Field
Seward County, Kansas

CORE LABORATORIES, INC.

Petroleum Reservoir Engineering

DALLAS, TEXAS

August 29, 1975

Amoco Production Company
Security Life Building
Denver, Colorado 80202

Attention: Mr. Lloyd C. Fured

Subject: Special Core Analysis Study
Prater Gas Unit "A" No. 2 Well
Council Grove Formation
Hugoton Field
Seward County, Kansas
Our File Number: SCAL-75127

Gentlemen:

A representative of Amoco Production Company requested Core Laboratories, Inc. to determine Formation Resistivity Factors and Formation Resistivity Indices for the core samples recovered from the subject well. The core plugs used in this study are lithologically described and identified as to depth interval and sample number on page one.

Core plugs, 1-inch in diameter, were obtained from six full-diameter well core segments recovered from the subject well. Each core plug was extracted of hydrocarbons with toluene, leached of salt with methyl alcohol and dried. An air permeability and a Boyle's Law porosity were determined on each of the clean dry core plugs. Each core plug was evacuated and saturated with simulated Council Grove formation water having a resistivity of 0.059 ohm-meters at 74°F.

The electrical resistivities of the brine and the brine-saturated samples were measured. These measurements were repeated over a period of several days until the results stabilized indicating ionic equilibrium within the core plugs had been attained. The core plugs were then de-saturated by capillary displacement. The electrical resistivity was

Amoco Production Company
Hugoton Field

Page Two

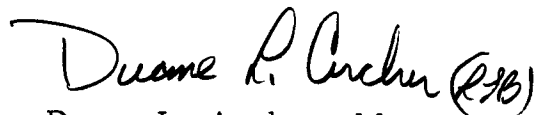
measured at various equilibrium saturation conditions on those core plugs that desaturated. Sample No.'s 6 and 14 did not desaturate. The results of these measurements are presented in tabular form on page two and in graphical form on pages three through seven.

The formation resistivity factor-porosity relationship is shown on page three. Using Archies generalized formula, a cementation exponent "m" of 1.78 and a value for "a" of 1.39 are calculated. The resistivity index-water saturation relationships yield saturation exponents "n" which range from 1.45 to 2.10. Lithological heterogenities present within the core plugs contribute to the variation in saturation exponents. However, it should be noted that Sample No. 1 has an anomaly. The curve drawn through the data would not have a formation resistivity index of 1.0 at 100 per cent brine saturation. This normally indicates the presence of a gas saturation at the formation factor was measured. This has been examined and no gas was present. The cause for this anomaly is unknown at this time.

It was a pleasure working with you on this study. If you have any questions pertaining to these results or if we can be of further assistance, please do not hesitate to contact us.

Very truly yours,

Core Laboratories, Inc



Duane L. Archer, Manager
Special Core Analysis

DLA:JWW:tl

5 cc - Addressee

2 cc - Mr. J. D. Kent

Amoco Production Company
Liberal, Kansas 67901

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File SCAL-75127

Company Amoco Production Company Formation Council Grove
Well Prater Gas Unit "A" No. 2 County Seward
Field Hugoton State Kansas

Identification and Description of Samples

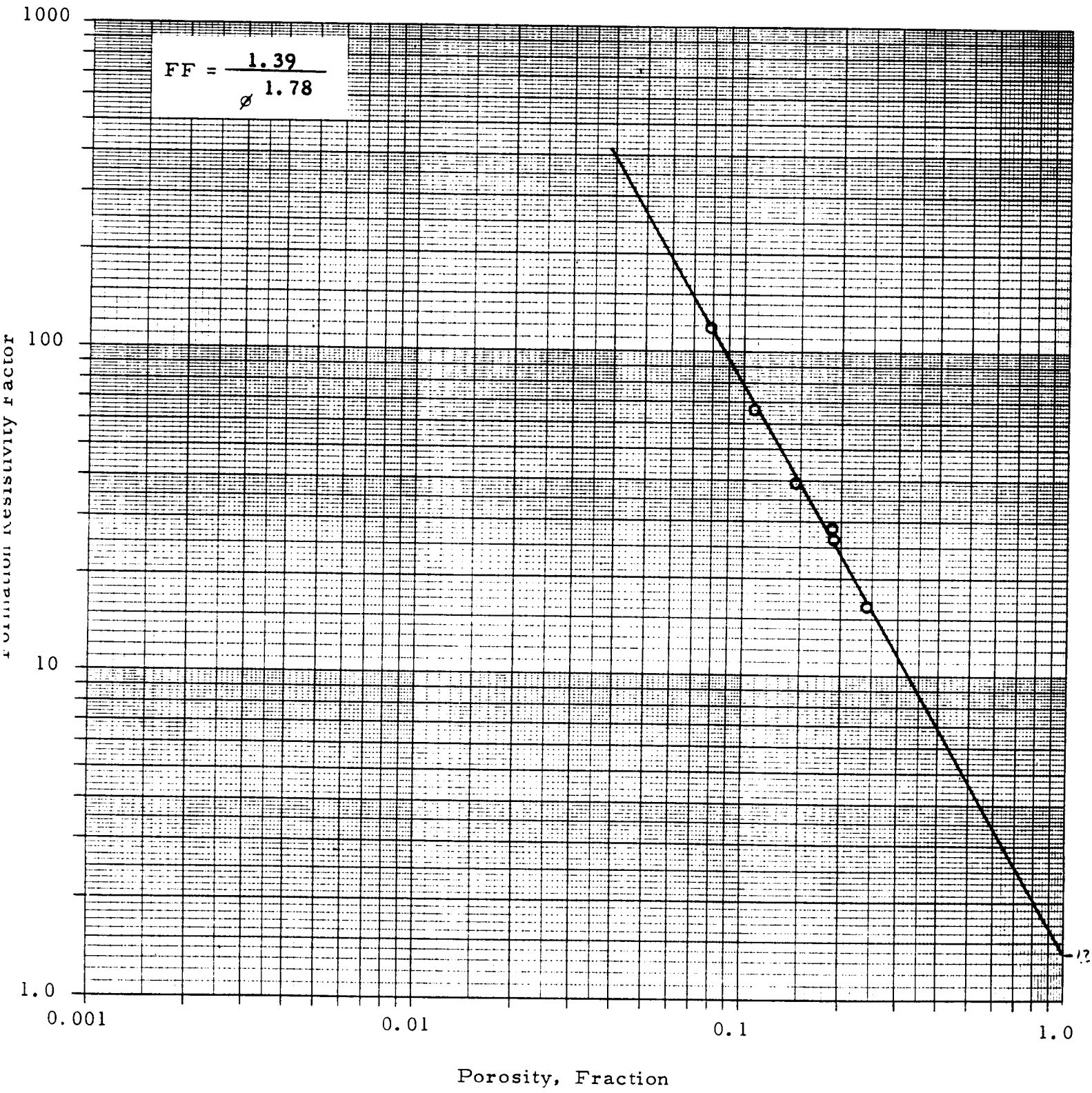
| <u>Sample Number</u> | <u>Depth, Feet</u> | <u>Lithological Description</u> |
|----------------------|--------------------|--|
| 1 | 2931-32 | Ls, buff, v/fn xln, foss |
| 4 | 2953-54 | Ls, gry, v/fn-cse xln, foss, anhy |
| 14 | 2961-62 | slts, red, calc, sl/indurated |
| 2 | 3001-02 | Ls, buff, v/fn xln, foss, few ca crystals, tr anhy |
| 6 | 3019-20 | Dol, red-tan, v/fn xln, sty, sdy |
| 1 | 3063-64 | Dol, buff, v/fn-fn xln, pp vugs, gyp crystals |

Formation Factor and Resistivity Index Data

Resistivity of Saturating Brine, Ohm-Meters: 0.059 @ 74°F.

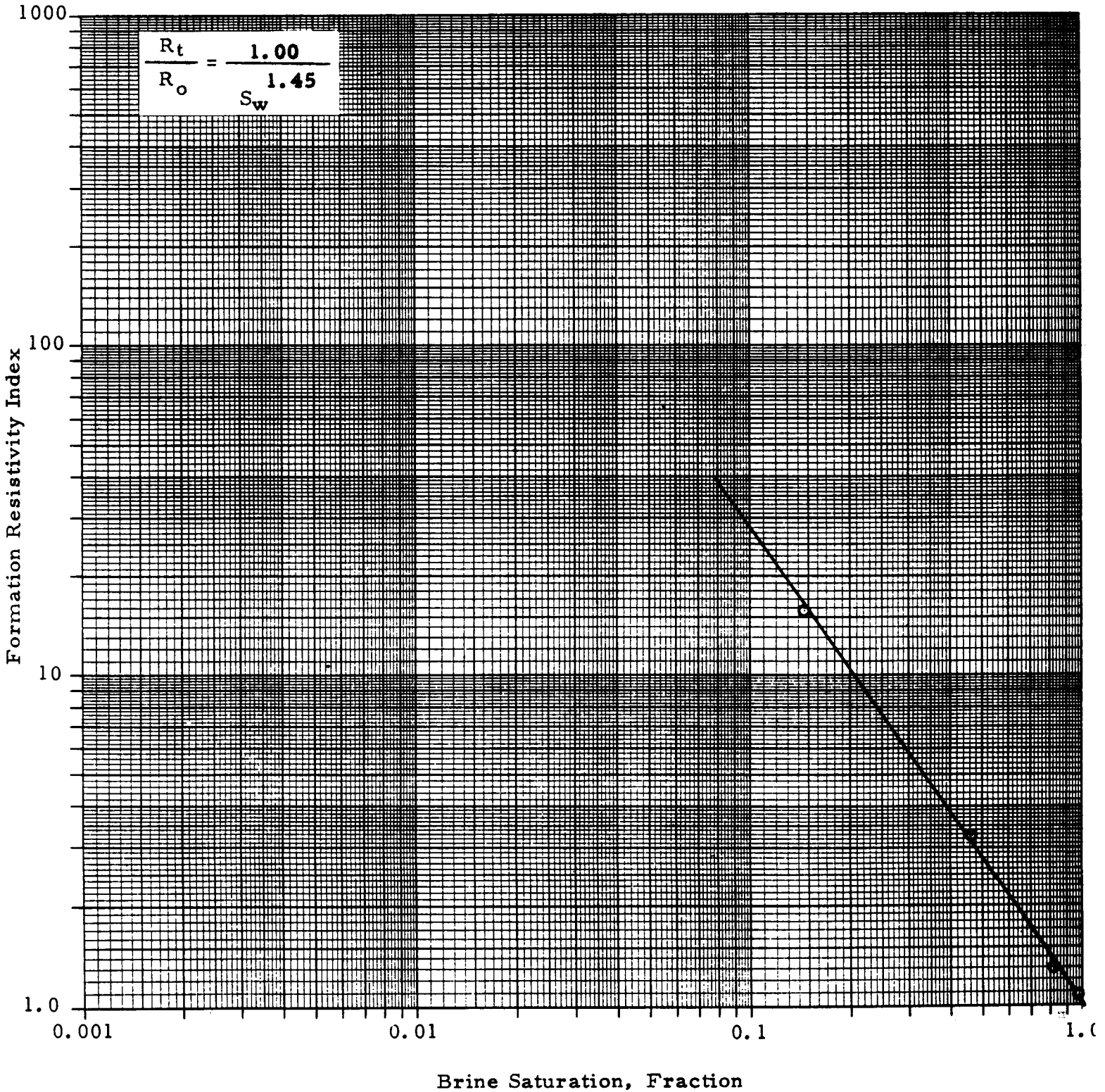
| <u>Sample Number</u> | <u>Porosity, Per Cent</u> | <u>Formation Factor</u> | <u>Brine Saturation, Per Cent Pore Space</u> | <u>Resistivity Index</u> |
|----------------------|---------------------------|-------------------------|--|--------------------------|
| 5 | 19.0 | 26.4 | 100.0 | |
| | | | 98.3 | 1.06 |
| | | | 82.3 | 1.30 |
| | | | 46.5 | 3.28 |
| | | | 14.7 | 15.8 |
| 4 | 10.9 | 66.3 | 100.0 | |
| | | | 98.8 | 1.01 |
| | | | 63.5 | 2.70 |
| 14 | 7.9 | 119 | 100.0 | |
| 2 | 24.1 | 16.1 | 100.0 | |
| | | | 98.5 | 1.01 |
| | | | 36.1 | 4.95 |
| 6 | 14.5 | 39.4 | 100.0 | |
| 1 | 18.9 | 28.3 | 100.0 | |
| | | | 94.7 | 1.27 |
| | | | 71.2 | 2.09 |
| | | | 40.5 | 5.03 |
| | | | 21.1 | 13.6 |
| | | | 15.3 | 27.9 |
| | | | 7.3 | 66.7 |
| 5.3 | 116 | | | |

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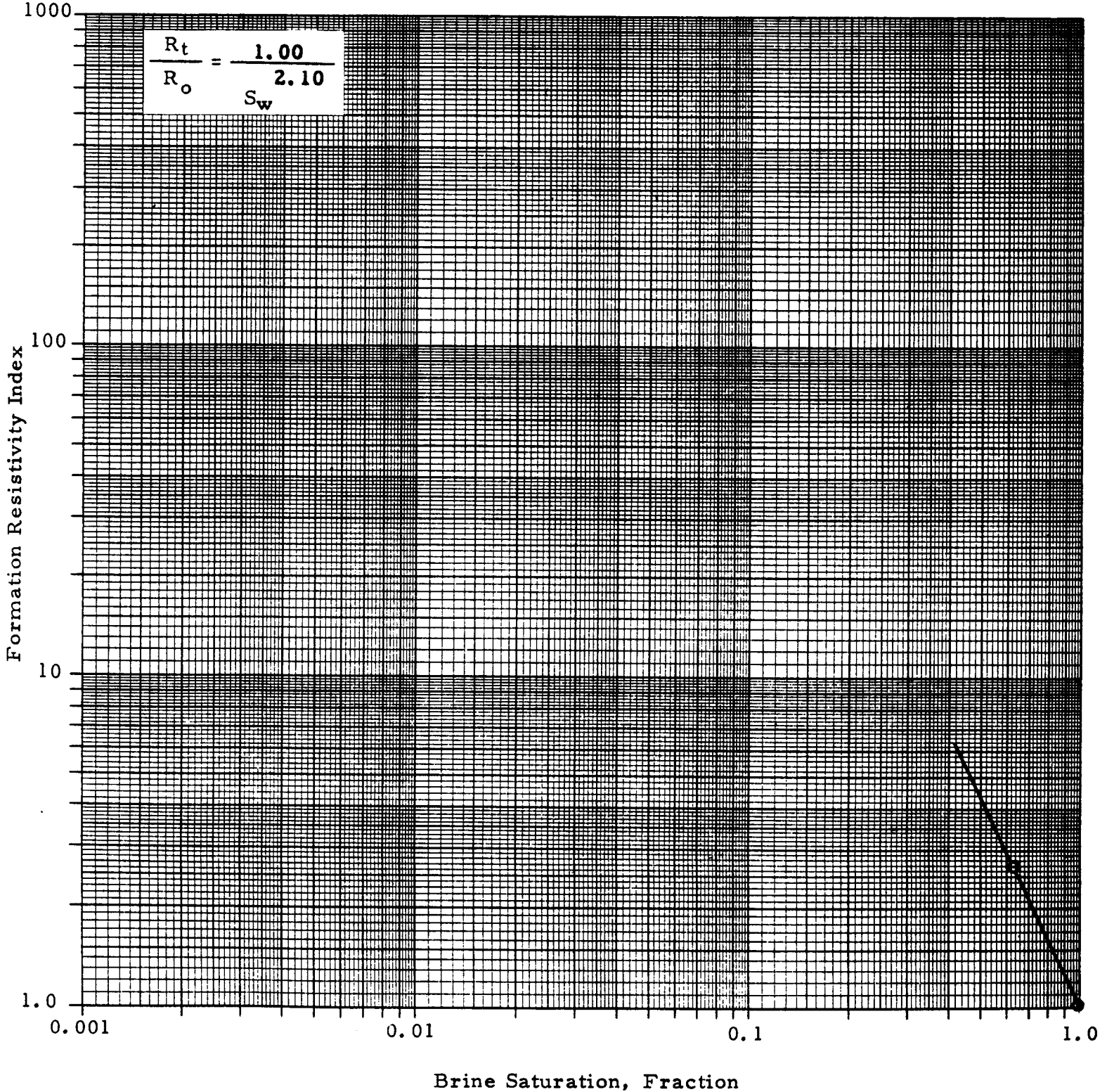
Company Amoco Production Company Formation Council Grove
Well Prater Gas Unit "A" No. 2 County Seward
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Sample Number: 5



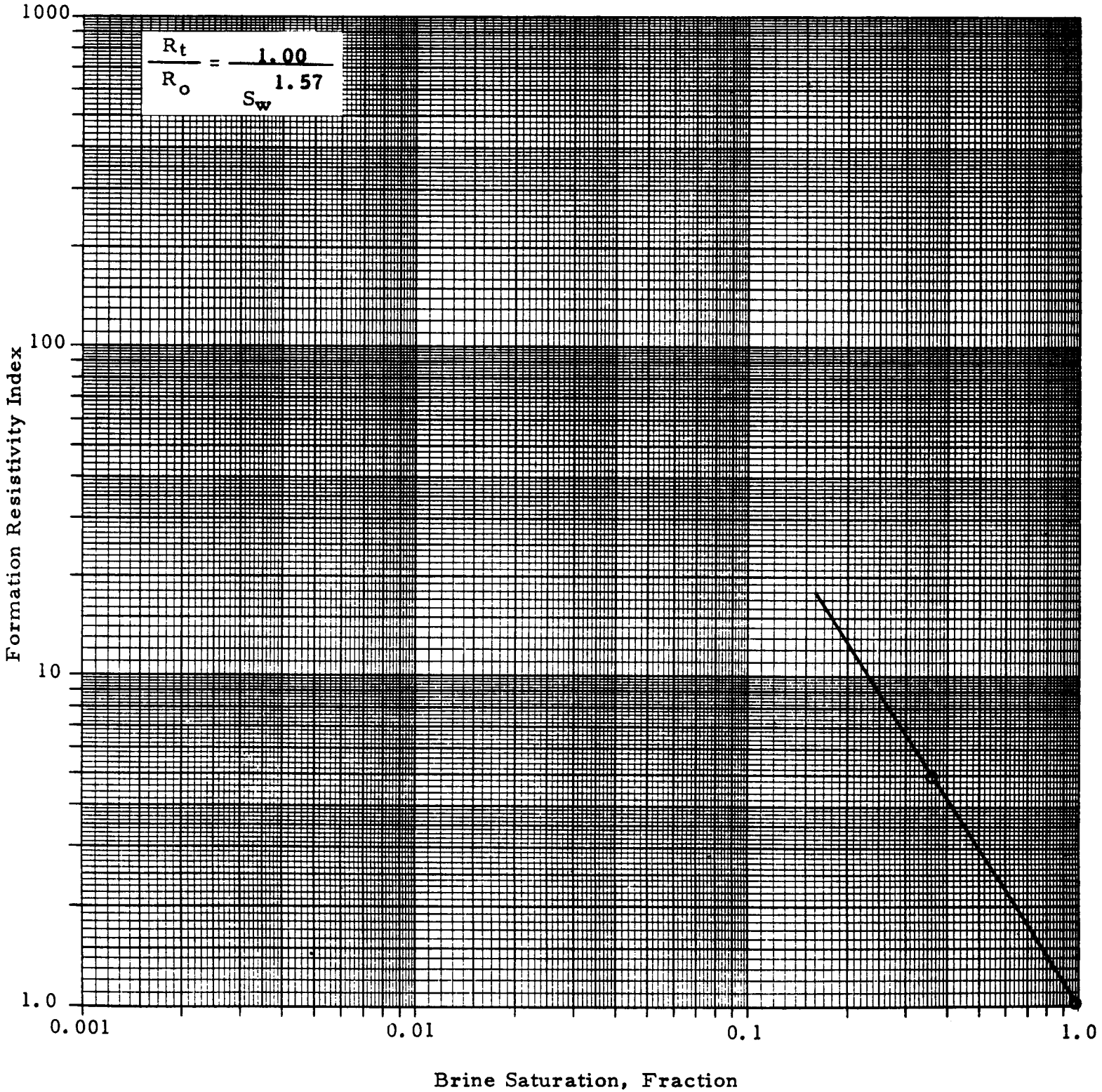
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Sample Number: 4



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Sample Number: 2



Company Amoco Production Company Formation Council Grove
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Sample Number: 1

