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Western Atlas International
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CORE LABORATORIES

15-187-20602

Amoco Production Company

Jones Gas Unit B #3HI Well

Hugoton Gas Field

Stanton County, Kansas

FINAL REPORT

Performed for:
Amoco Production Company
1670 Broadway
Denver, Colorado 80201

April 3, 1992

Performed by:
Core Laboratories
Dallas Advanced Technology Center
Petrophysical Properties Laboratory
1875 Monetary Lane
Carrollton, Texas 75006

File: DRP-91226

Western Atlas International
A Litton Dresser Company

CORE LABORATORIES

April 3, 1992

Amoco Production Company
1670 Broadway
Denver, Colorado 80201

Attention: Ms. Terrilyn Olson

Subject: Advanced Rock Properties Study
Jones G.U. B #3HI Well
Hugoton Gas Field
Several Formations
Stanton County, Kansas
File Number: DRP-91226

Dear Ms. Olson,

Presented in the following report are the final results of an advanced rock properties study performed on core material obtained from the subject well. Several different analyses were performed as requested by Ms. Terrilyn Olson of Amoco Production Company. Responding to a bid request from Ms. Olson, Mike Hudson of Core Laboratories submitted a proposal to Amoco on September 24, 1991. This proposal was accepted, and an October 1, 1991 letter of authorization to begin work on the study was received at this laboratory. The letter was signed by Donald Barbula of Amoco.

Analyses were conducted as specified in the proposal, with any modifications agreed to by Ms. Olson prior to any changes. Additional information necessary to conduct the study, such as confining pressure, test brine, etc. was furnished by Ms. Olson during telephone conversations. Preliminary data were submitted as they became available. Final results of this study are presented herein.

It has been a pleasure to be of service by performing this study on behalf of Amoco Production Company. Should there be any questions, or if we could be of any further assistance, please do not hesitate to contact us at (214) 466-2673.

Very truly yours,

Jerry D. Warne

Jerry D. Warne
Petrophysics laboratory,
Core Laboratories; Carrollton ATC

Amoco Production Company
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Amoco Production Company
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INTRODUCTION

Full diameter core and drilled core plugs were received at Core Laboratories in Carrollton, Texas on October 4, 1991. Selected plug samples were to be used for advanced rock property testing as specified in communications between Terri Olson of Amoco Production Company and Mike Hudson of Core Laboratories which had taken place during September of 1991. The study, which was originally to have been performed at Core Laboratories in Tulsa, Oklahoma, was transferred to the Carrollton lab following the closure of the Tulsa facility. A letter of authorization to perform the study, dated October 1, 1991, was signed by Mr. Donald Barbula of Amoco Production Company.

Additional information was received from Ms. Olson during the course of the study which was necessary to the performance of the analyses. Included were the net confining pressures to be used during testing, as well as the brine to be used for electrical property tests. Conversations with Ms. Olson led to the cancellation of the permeability and porosity tests at elevated pressures which were part of the study as originally outlined. This occurred when Ms. Olson was informed that these procedures would be included as part of the electrical property tests and would not need to be performed separately.

As requested by Ms. Olson, steady-state and unsteady-state relative permeability data for each sample were combined graphically to present both sets of data on one graph. At Ms. Olson's request, both data sets were calculated using the specific permeability to brine as the base permeability.

All full diameter core which was received on October 4 was returned to Amoco Production Company in Denver, Colorado at the request of Ms. Olson. At this time the plugs samples which were delivered to this location are still at the Carrollton laboratory. Their disposition will be determined by Ms. Olson.

The samples used for this project are listed on the following page, grouped as they were in the September 17, 1991 "Special Core Analysis Plan" submitted by Ms. Olson.

Amoco Production Company
File: DRP-91226

Test Program Identification:
1 Permeability to air, porosity
2 Unsteady-state gas/water relative permeability
3 Steady-state water/gas relative permeability
4 Formation resistivity factor
5 Formation resistivity index
6 Formation resistivity index with porous disc capillary pressure
7 Mercury injection (0-2000 psia, drainage)

Sample	Depth, ft	Formation	Part	Group	Test Sequence
62	2298.6	Herrington	III	3	1, 4, 7
63	2299.6	Herrington	I		1, 2, 3, 4, 5, 7
67	2303.6	Herrington	III	4	1, 7
77	2313.6	Herrington	I		1, 2, 3, 4, 5, 7
82	2318.6	Upper Krider	III	4	1, 7
88	2324.6	Upper Krider	III	1	1, 4, 6, 7
90	2326.6	Upper Krider	III	3	1, 4, 7
121	2357.6	Lower Krider	I		1, 2, 3, 4, 5, 7
148	2384.6	Winfield	III	3	1, 4, 7
150	2386.6	Winfield	I		1, 2, 3, 4, 5, 7
224	2460.6	Towanda	III	3	1, 4, 7
233	2469.6	Towanda	III	3	1, 4, 7
235	2471.6	Towanda	III	2	1, 4, 5, 7
236	2472.6	Towanda	III	2	1, 4, 5, 7
254	2490.6	Fort Riley	III	1	1, 4, 6, 7
264	2500.6	Fort Filey	III	3	1, 4, 7
284	2520.6	Fort Riley	I		1, 2, 3, 4, 5, 7

Sample Identification

Preliminary data from each of the tests were submitted to Ms. Olson at Amoco Production Company in Denver as they became available.

Amoco Production Company
File: DRP-91226

BASIC PROPERTY DETERMINATION

Sample Preparation

The samples had been extracted of residual fluids and inorganic salts prior to shipment to this laboratory. According to Ms. Olson, this was accomplished using a 50/50 mixture of toluene and methanol in a reflux soxhlet. Drying was accomplished in a humidity controlled environment, using a relative humidity of 45 percent and a temperature of 145 degrees Fahrenheit (°F). Following receipt of the samples, the endfaces of each of were precision surface ground to ensure a parallelism within at least 0.005 centimeters. They were placed into a humidity contolled oven using the parameters listed to ensure proper dryness, then permeability and porosity were determined for each. Confining pressures used were specified by Ms. Olson. At her request, a confining pressure of 2200 psi was used for sample depths to 2389 feet, with 2350 psi used for samples from greater depths.

CMS-300 Permeability and Porosity

The dry weight of each sample was recorded, then length and diameter measurements were made using digital calipers. The recorded value of each size parameter was determined from the average of 10 measurements. Each sample was placed into a matrix cup and the AutoPorosimeter™ used to inject helium from reference cells of known volume and pressure. Grain volume was determined using Boyle's law of gas expansion. Samples were then loaded into the CMS-300 for determination of permeability and porosity at confining pressures of 800 and 2200 or 2350 psi, depending on depth. The 800 psi value is an "ambient" value used for data comparisons. As the rubber sleeve used for sample confinement in the CMS-300 is very stiff, the 800 psi value is the minimum required to ensure conformance of the sleeve with the sample.

Unsteady-state (transient flow) Klinkenberg permeability values were determined by charging each sample with helium from a reference cell of known volume and pressure, then measuring pressure decay as a function of time. An estimated permeability to air value was calculated using the Klinkenberg permeability and the slippage factor, b, which is determined during the CMS-300 operations.

Helium was injected into each sample from reference cells of known volume and initial pressure, and pore volume (V_p) calculated using Boyle's law. The determined values were used to calculate:

Bulk Volume, cc (V_b) = $V_g + V_p$
Porosity, % = $(V_p/V_b) * 100$
Grain Density, g/cc (GD) = DW/V_g

Permeability, porosity, and grain density are reported on the following page. Plots of permeability versus porosity and grain density versus depth are also presented.

Amoco Production Company
File: DRP-91226

Sample	Depth, feet	Confining Pressure psi	Permeability Klinkenberg millidarcys	Permeability To Air millidarcys	Porosity percent	Grain Density gm/cc
62	2298.6	800	0.163	0.238	10.7	2.733
		2200	0.156	0.223	10.6	
63	2299.6	800	7.66	9.11	15.7	2.739
		2200	7.36	8.76	15.5	
		2200*	13.4	15.7	17.7	2.790
67	2303.6	800	14.1	16.7	18.9	2.723
		2200	13.9	16.3	18.7	
77	2313.6	800	5.99	7.49	22.6	2.816
		2200	5.88	7.36	22.5	
		2200*	8.27	10.4	25.0	2.834
82	2318.6	800	2.58	3.33	20.7	2.807
		2200	2.51	3.25	20.6	
88	2324.6	800	1.22	1.65	16.6	2.766
		2200	1.19	1.61	16.5	
90	2326.6	800	0.650	0.807	13.9	2.759
		2200	0.631	0.784	13.7	
121	2357.6	800	7.24	8.88	20.8	2.660
		2200	6.49	8.00	20.4	
148	2384.6	800	0.368	0.506	13.3	2.685
		2200	0.336	0.463	13.1	
150	2386.6	800	1.31	1.77	15.1	2.672
		2200	1.20	1.62	14.8	
		2200**	1.16	1.67	15.8	2.645
224	2460.6	800	0.057	0.106	12.8	2.731
		2350	0.036	0.078	12.7	
233	2469.6	800	0.836	1.02	19.8	2.813
		2350	0.794	0.962	19.7	
235	2471.6	800	2.00	2.49	14.3	2.775
		2350	1.93	2.42	14.2	
236	2472.6	800	11.0	13.4	22.7	2.818
		2350	10.8	13.1	22.6	
254	2490.6	800	1.04	1.38	14.0	2.724
		2350	1.01	1.34	13.9	
264	2500.6	800	0.198	0.273	11.6	2.711
		2350	0.193	0.262	11.5	
284	2520.6	800	5.41	6.50	15.5	2.716
		2350	5.28	6.34	15.2	
		2350*	28.1	31.6	21.0	2.717

* Redetermined due to increase in permeability to liquid during initial flushing.

** Sample broke during relative permeability testing, values redetermined on the piece used for electrical properties testing.

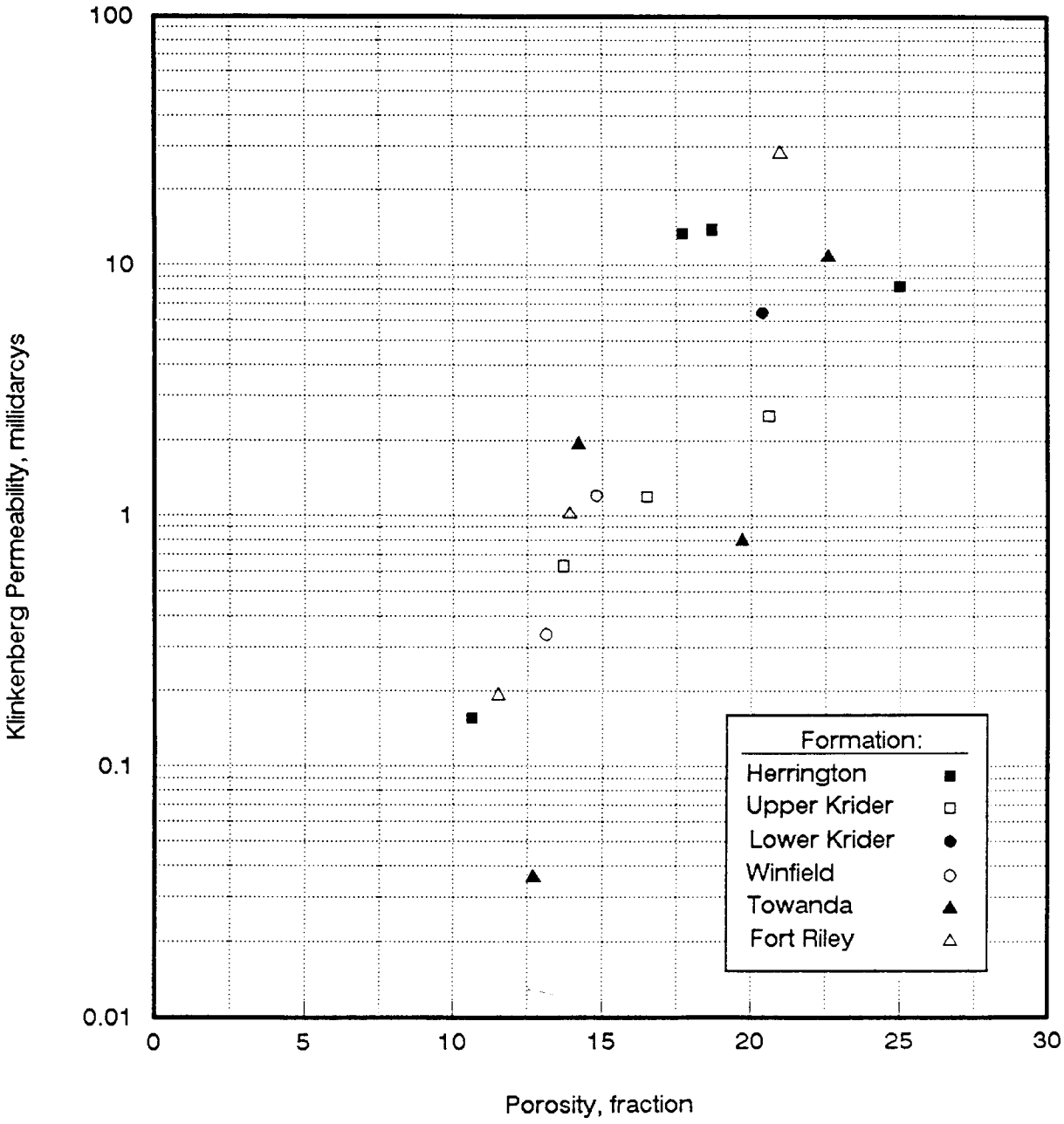
Basic Properties Table

Permeability vs Porosity

Confining Pressure as Noted

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Several (6) Formations
Stanton County, Kansas

Sample ID: Composite
Depth Range, feet: 2298.6 - 2520.6
Sample Condition: Dry
Drying Method: Humidity Contr. Oven
Job File: DRP-91226

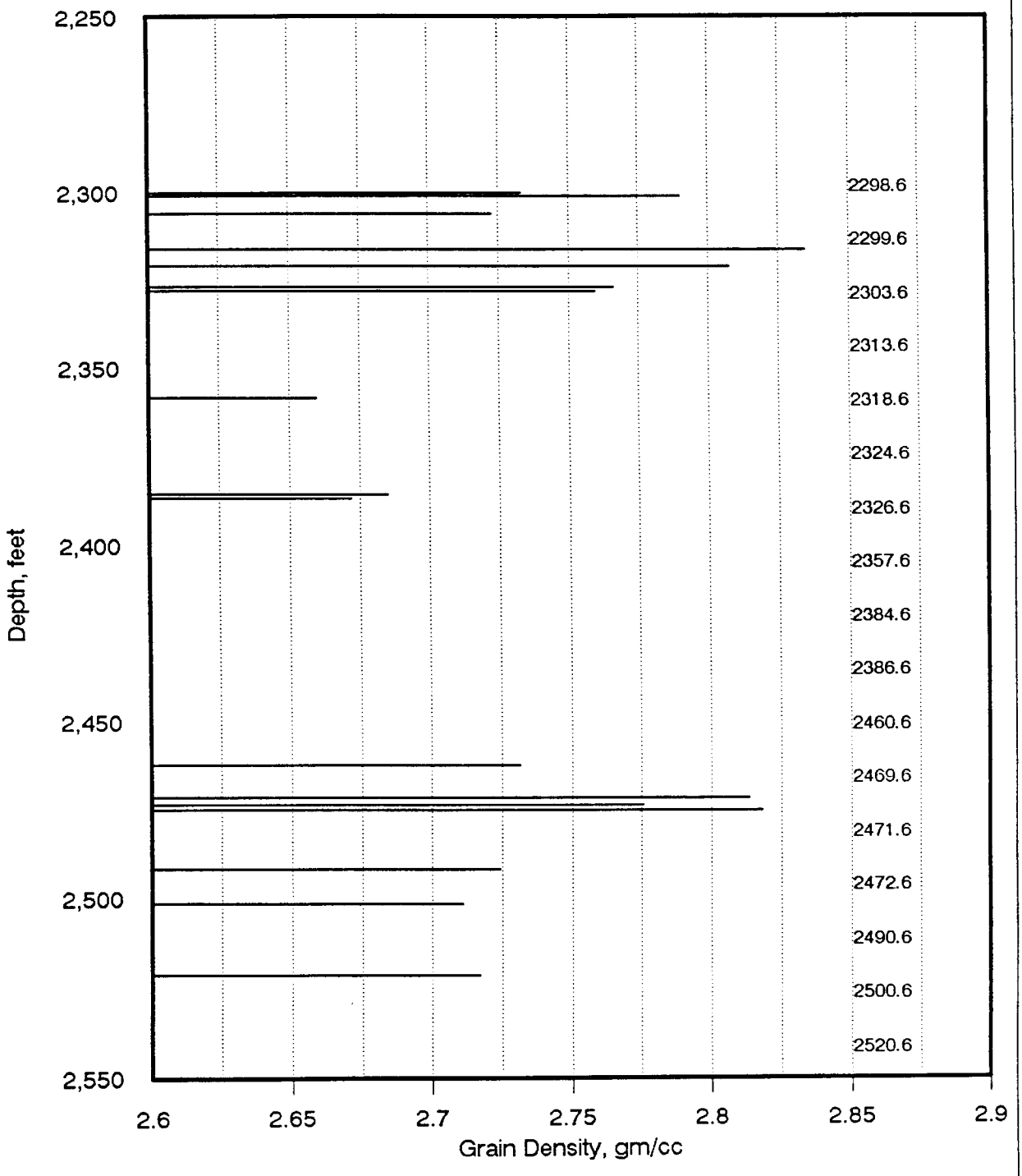


Core Laboratories

Grain Density vs Depth

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Stanton County, Kansas

Sample ID: Composite
Depth Range, feet: 2298.6 - 2520.6
Several (6) Formations
Job File: DRP-91226



Core Laboratories

Amoco Production Company
File: DRP-91226

SECTION 2

RELATIVE PERMEABILITY
Unsteady-State
Steady-State

Amoco Production Company
File: DRP-91226

GAS/WATER RELATIVE PERMEABILITY
Procedures and Results

Sample Selection

Five, 1.5 inch diameter samples were selected by Ms. Olson for testing identified as PART 1. The samples and the sequential analyses they were to undergo are as follows:

Sample	Depth, ft
63	2299.6
77	2313.6
121	2357.6
150	2386.6
284	2520.6

1) Unsteady-state gas/water relative permeability
2) Steady-state water/gas relative permeability (X-ray)
3) Formation resistivity factor
4) Formation resistivity index
5) Mercury injection

This section deals with procedures (1) and (2).

Sample Preparation

Following determination of permeability and porosity (see Section 1) each sample was loaded into a Hassler-style coreholder. The sample was scanned with X-rays and the counts-per-second which passed through the sample recorded for use as an unblocked base scan. The samples were placed into a stainless steel saturation cell and evacuated briefly, then pressure saturated with a brine composed of 73,000 ppm of sodium iodide (NaI) and 77,000 ppm sodium chloride (NaCl). The NaI was used as an X-ray blocker. Each of the saturated samples was then placed back into the Hassler coreholder and and a blocked scan obtained. Partial saturations during steady-state water-displacing-gas testing were determined using the following relationship:

$$S_{tr} = \frac{\log(I) - \log(I_{untr})}{\log(I_{tr}) - \log(I_{untr})}$$

where: S_{tr} = Fractional saturation of traced fluid (Gas sat'n = 1 - S_{tr})
I = Intensity at saturation of interest
I_{untr} = Intensity of the dry sample
I_{tr} = Intensity when saturated with traced fluid

To ensure full saturation before the blocked scan was obtained, each sample was flushed with several pore volumes of the brine against a backpressure. Following the scans it was determined that some of the samples had lost weight, likely due to dissolution of soluble material. The samples were dried and leached of salts with methanol, then permeability and porosity determined again. Leaching was performed with cool methanol and the samples were again dried in the humidity controlled oven. Changes in permeability and porosity values due to dissolution are noted in the Basic Properties Table of Section 1. The above steps were repeated, though the second time 2 grams per liter of calcium sulfate ($CaSO_4$) were added to the brine. This effectively saturated it, ensuring that the dissolution of sulfate minerals would not be repeated.

Unsteady-State Gas-Water Relative Permeability

Each of the samples was loaded into a hydrostatic coreholder and the traced brine flushed through it against backpressure to ensure full saturation. The specific permeability to brine (k_w) was determined at the injection pressure to be used during the gas-water relative permeability test. The k_w value was later used as the base permeability in relative permeability calculations (unsteady-state and steady-state).

Humidified air was injected into the upstream endface at constant pressure to dynamically displace the brine present. The air was humidified to reduce any dehydration of water during the test. Incremental volumes of water and gas produced downstream were recorded as a function of time. Gas injection was continued until a gas-water relative permeability ratio of at least 30.0 was attained. Though some mobile water often still exists within the sample when the test is terminated under these criteria, the gas/water production ratio is generally increasing so rapidly that it would not be time effective to continue the test. At the request of Ms. Olson, the samples were centrifuged following the unsteady-state tests to displace additional mobile water. The samples were centrifuged individually at rotational speeds calculated to yield displacement pressures 2 to 2-1/2 times the flow pressure used during the unsteady-state displacement. The pseudo-irreducible water saturation of each was calculated using a combination of volumetric and gravimetric data.

Gas-water relative permeability characteristics were calculated from the production data using procedures based on the mathematical methods of Johnson, Bossler and Naumann ("Calculation of Relative Permeability From Displacement Experiments", T.N. 2027, Petroleum Trans., Vol. 216, 1959).

Steady-State Water-Gas Relative Permeability Test

When ready for placement into the x-ray system coreholder, each sample was at a pseudo-irreducible water saturation. Humidified nitrogen was injected through the sample against a backpressure and permeability to the gas in the presence of the immobile water saturation determined. The sample was scanned with x-rays as a verification of the saturation. The humidified nitrogen and sodium iodide traced brine then were injected simultaneously at several water-gas injection ratios, with saturation changes being monitored by x-ray scan. The water-gas injection ratios were increased incrementally to allow the water saturation in the sample to increase. Injection continued at each ratio until equilibrium within the core plug was established. The change in the pressure differential across the sample was monitored continuously, with saturation equilibrium determined as the point when the differential pressure became constant. Finally, brine only was injected and the effective permeability to water in the presence of the residual (trapped) gas saturation determined.

Flow rates and differential pressures were monitored throughout the test process, and were used to calculate permeability values. Saturation values were calculated from x-ray scan data, with scans at each injection ratio compared to the baseline

scans. Steady-state water/gas relative permeability results were calculated from the resulting data. As requested, the data from the steady-state tests were combined with the unsteady-state data for presentation.

Sample 121 split lengthwise when it was removed from the coreholder, making it unsuitable for the electrical property tests which were to have followed. A piece was used for mercury injection analysis. Sample 150 was also broken when it was removed from the coreholder, but had split across the cross section of the sample. The larger piece was trimmed and used to complete the requested test program.

The permeability to gas at the immobile water saturation was higher for each of the five samples than was the specific permeability to brine, though it was still lower in each case than the Klinkenberg permeability. In four of the five samples the trends established by the relative permeability data fit extremely well with the permeability to air value plotted at 100 percent gas saturation. The majority of the data of the fifth sample (77) could easily trend into the permeability to air value also, with only the permeability at the pseudo-irreducible water saturation breaking the trend. The residual gas saturation at the end of the steady-state tests (imbibition) ranged from 30.0 to 41.4 percent of pore space.

File DRP-91226

GAS-WATER RELATIVE PERMEABILITY

Amoco Production Company
Amoco Jones Gas Unit B #3HI
Hugoton Field
Herrington Formation
Stanton County, Kansas

Sample Identification:	63	
Sample Depth:	2299.6	feet
Klinkenberg Permeability:	13.4	md
Porosity:	17.7	percent
Specific Permeability to Water:	5.4	md

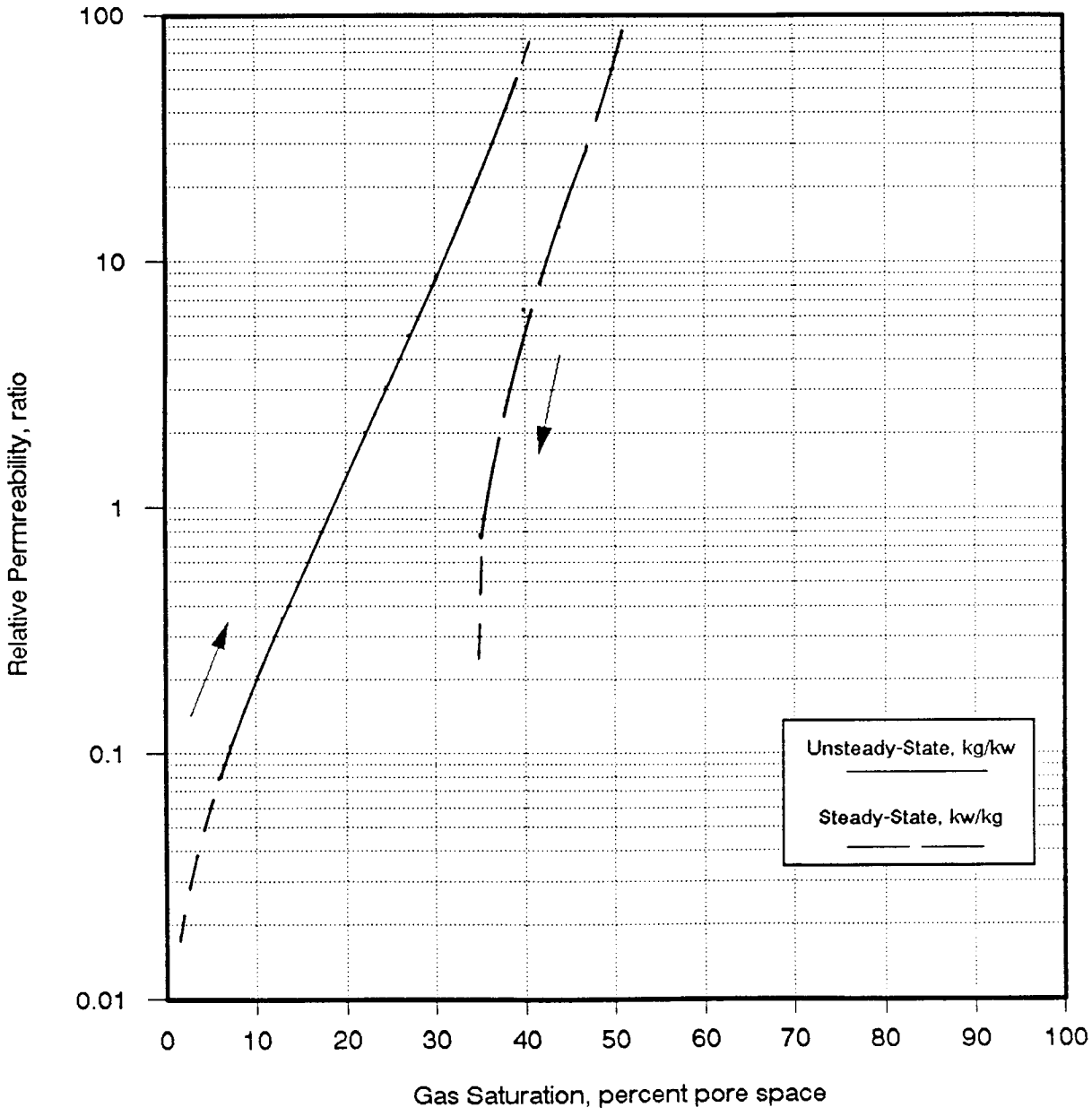
Gas Saturation, percent pore space	Gas-Water Relative Permeability Ratio	Relative Permeability to Gas,* fraction	Relative Permeability to Water,* fraction
Unsteady-State Gas Displacing Water			
0.0	0.000	0.000	1.000
5.8	0.079	0.047	0.600
7.1	0.106	0.057	0.540
9.4	0.174	0.077	0.440
12.9	0.354	0.110	0.312
17.4	0.802	0.170	0.212
22.2	2.01	0.230	0.114
24.5	3.08	0.288	0.094
27.1	5.00	0.341	0.068
30.1	8.75	0.416	0.048
33.8	17.4	0.498	0.029
36.6	30.5	0.563	0.018
38.1	41.9	0.610	0.015
39.2	53.6	0.643	0.012
Steady-State Water Displacing Gas			
65.8	-	1.18	-
52.8	119.	0.771	0.0065
50.0	60.4	0.664	0.011
47.0	29.1	0.524	0.018
43.9	13.9	0.390	0.028
39.9	6.39	0.281	0.044
38.1	2.72	0.155	0.057
35.0	0.779	0.060	0.077
33.1	-	-	0.089

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Herrington Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	63
Sample Depth, feet:	2299.6
Klinkenberg Perm., md:	13.4
Porosity, percent:	17.7
Initial Sw, percent:	100.0
Specific kw, md:	5.4



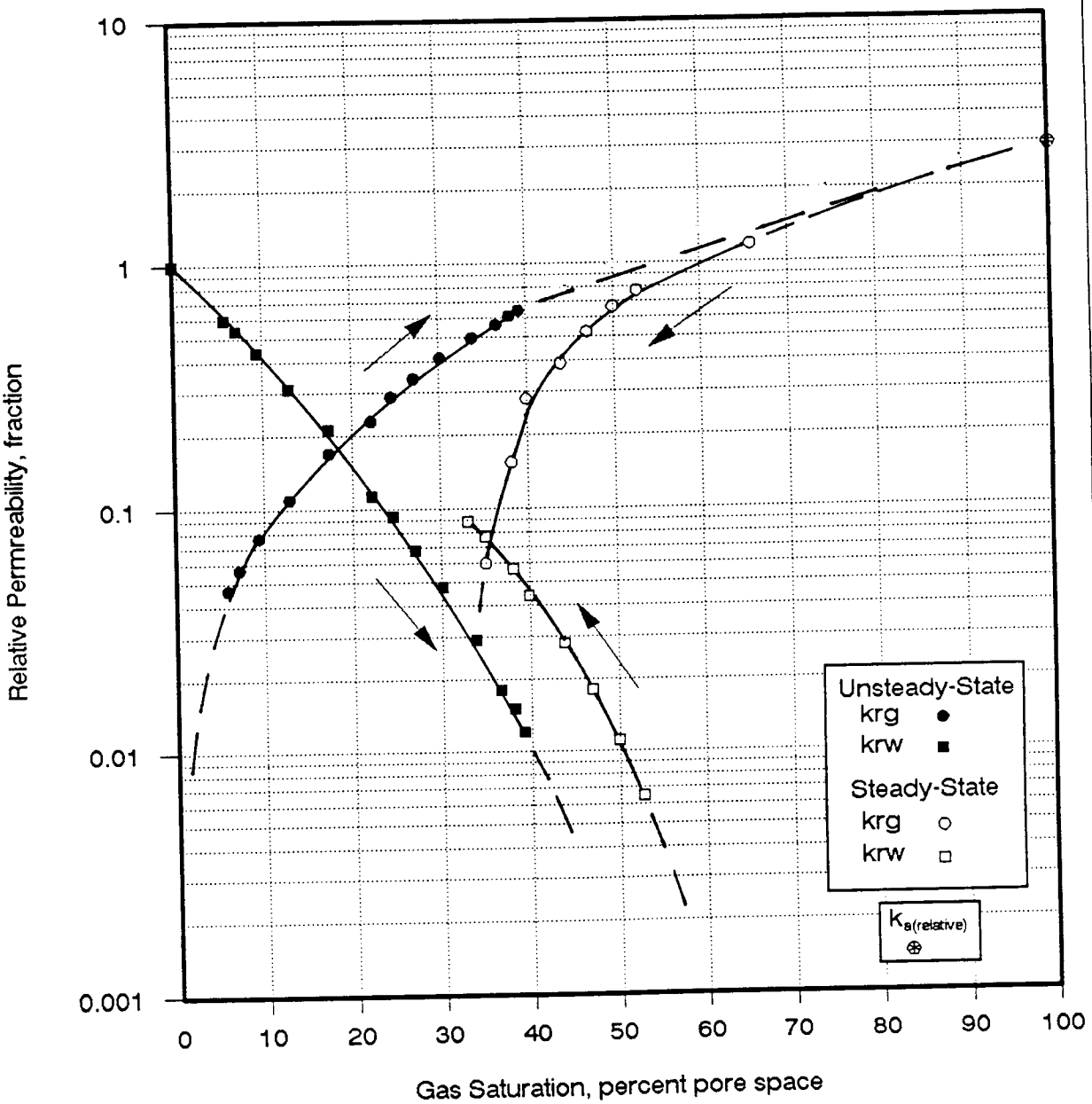
Core Laboratories

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Herrington Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	63
Sample Depth, feet:	2299.6
Klinkenberg Perm., md:	13.4
Porosity, percent:	17.7
Initial Sw, percent:	100.0
Specific kw, md:	5.4



Core Laboratories

File DRP-91226

GAS-WATER RELATIVE PERMEABILITY

Amoco Production Company
Amoco Jones Gas Unit B #3HI
Hugoton Field
Herrington Formation
Stanton County, Kansas

Sample Identification:	77	
Sample Depth:	2313.6	feet
Klinkenberg Permeability:	8.27	md
Porosity:	25.0	percent
Specific Permeability to Water:	2.0	md

Gas Saturation, percent pore space	Gas-Water Relative Permeability Ratio	Relative Permeability to Gas,* fraction	Relative Permeability to Water,* fraction
Unsteady-State Gas Displacing Water			
0.0	0.000	0.000	1.000
7.1	0.064	0.040	0.630
8.8	0.096	0.051	0.535
10.2	0.130	0.061	0.472
11.4	0.167	0.071	0.427
15.5	0.373	0.116	0.310
19.3	0.775	0.161	0.208
21.6	1.17	0.209	0.178
24.3	1.87	0.252	0.134
27.3	3.21	0.327	0.102
30.3	5.26	0.409	0.078
33.2	8.37	0.486	0.058
37.8	18.7	0.596	0.032
40.3	30.1	0.710	0.024
42.0	41.3	0.766	0.019
43.2	52.5	0.829	0.016
44.5	68.8	0.883	0.013
Steady-State Water Displacing Gas			
74.3	-	1.42	-
48.9	22.0	0.505	0.023
45.7	10.2	0.358	0.035
39.4	2.20	0.132	0.060
35.1	0.966	0.085	0.088
31.4	-	-	0.106

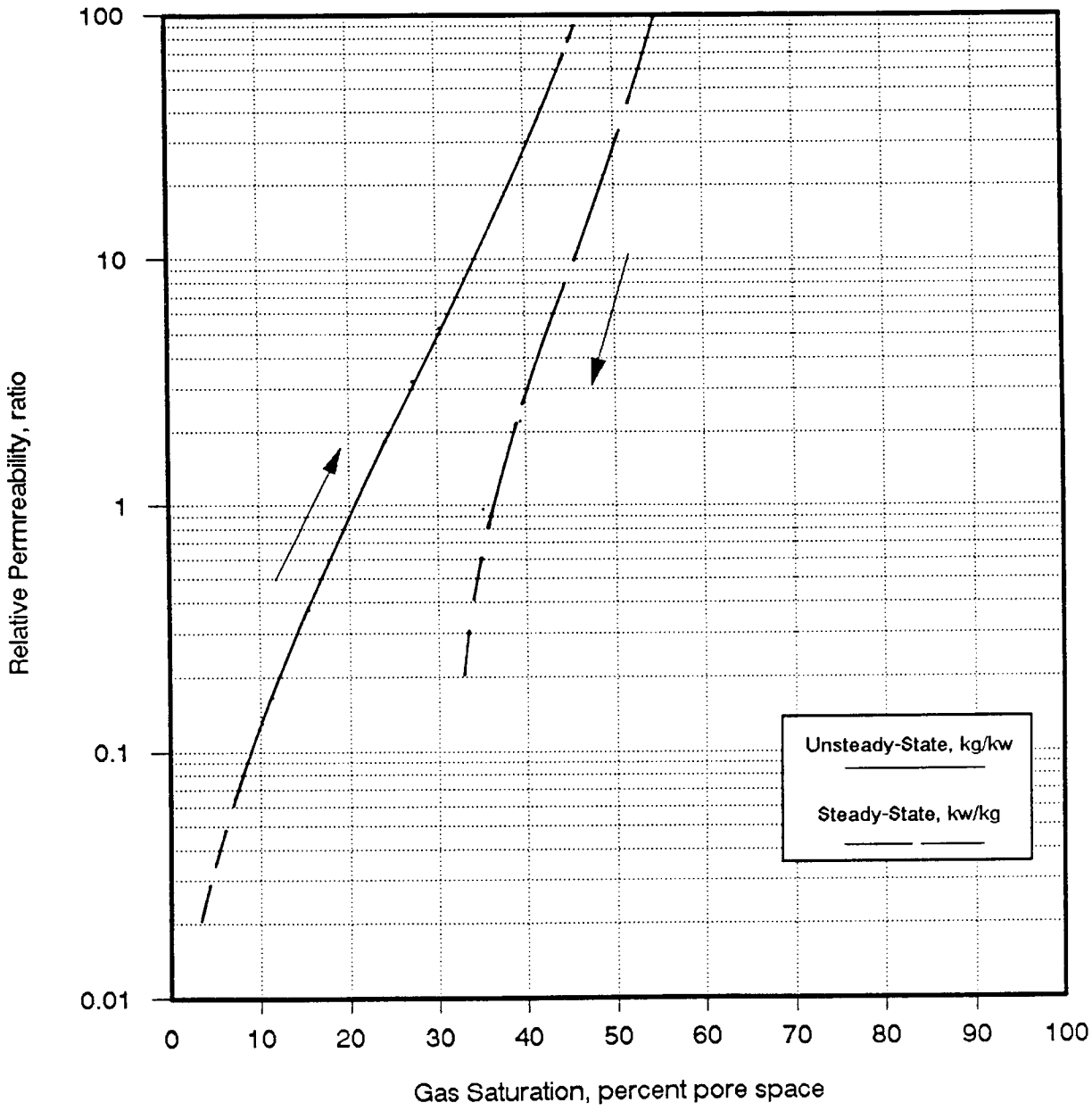
*Relative to the specific permeability to water.

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Herrington Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	77
Sample Depth, feet:	2313.6
Klinkenberg Perm., md:	8.27
Porosity, percent:	25.0
Initial Sw, percent:	100.0
Specific kw, md:	2.0

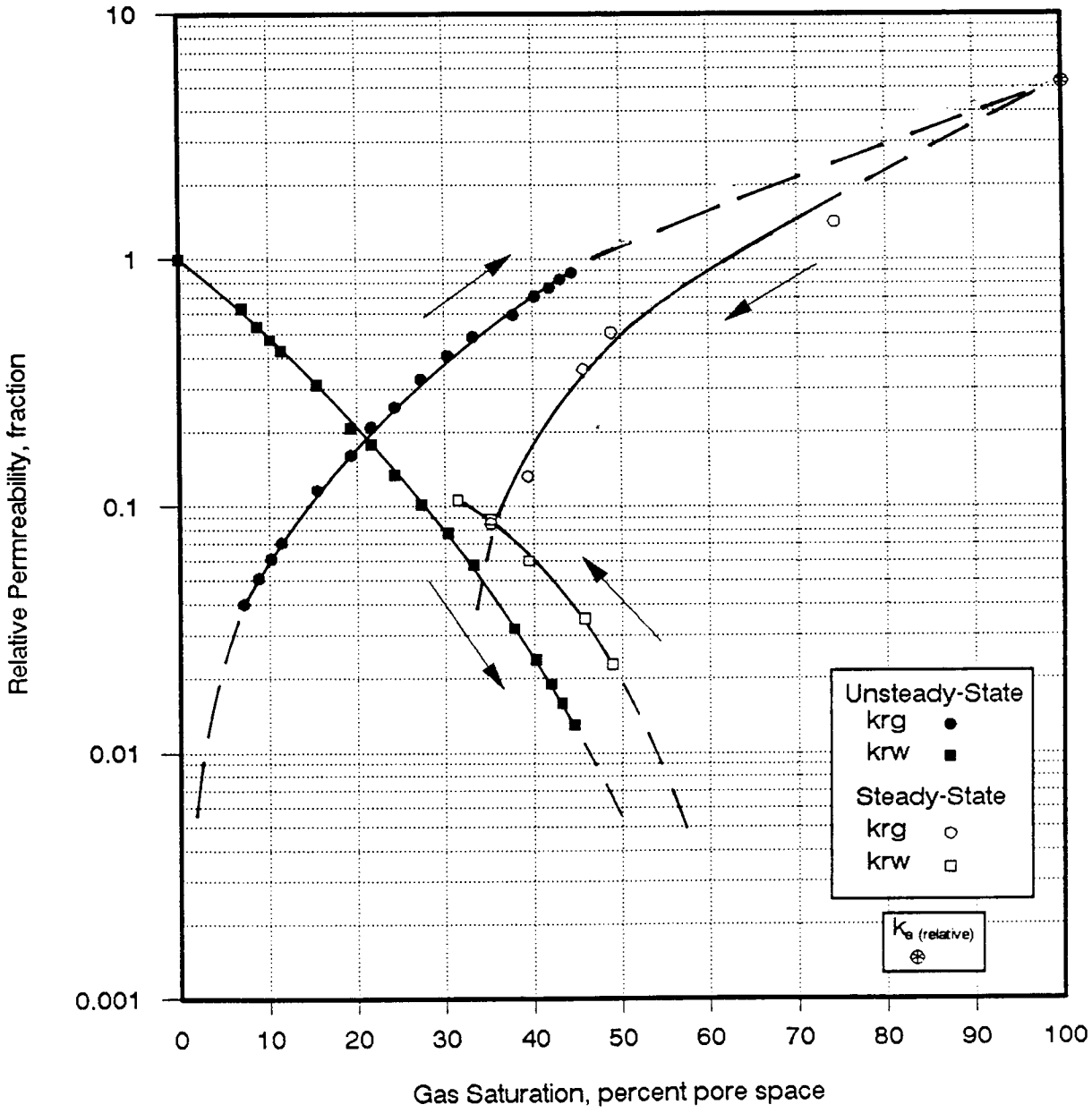


Core Laboratories

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company		Sample ID:	77
Jones G.U. B #3HI Well		Sample Depth, feet:	2313.6
Hugoton Gas Field		Klinkenberg Perm., md:	8.27
Herrington Formation		Porosity, percent:	25.0
Stanton County, Kansas		Initial Sw, percent:	100.0
Job File:	DRP-91226	Specific kw, md:	2.0



Core Laboratories

File DRP-91226

GAS-WATER RELATIVE PERMEABILITY

Amoco Production Company
Amoco Jones Gas Unit B #3HI
Hugoton Field
Lower Krider Formation
Stanton County, Kansas

Sample Identification:	121	
Sample Depth:	2357.6	feet
Klinkenberg Permeability:	6.49	md
Porosity:	20.4	percent
Specific Permeability to Water:	0.75	md

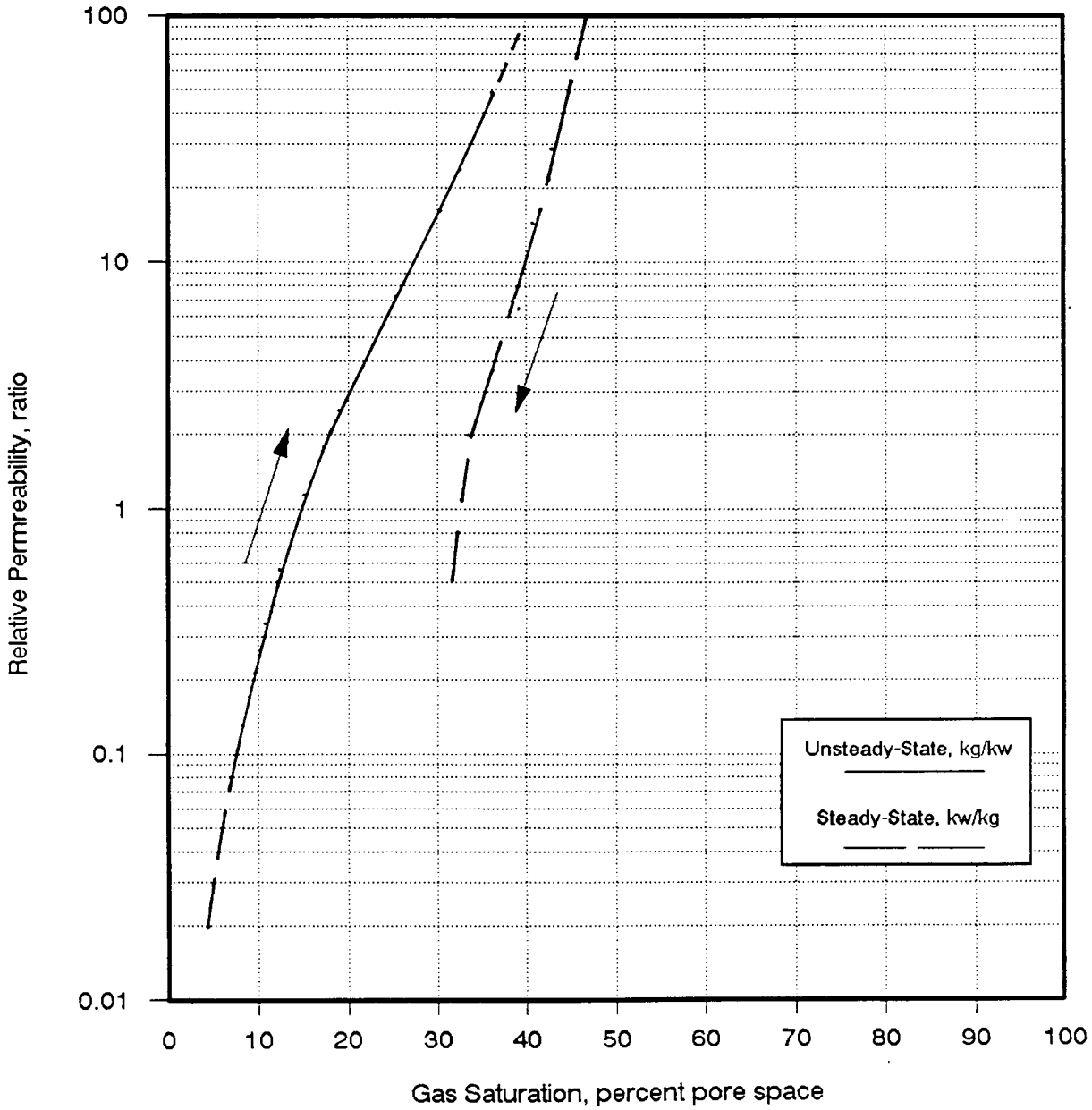
Gas Saturation, percent pore space	Gas-Water Relative Permeability Ratio	Relative Permeability to Gas,* fraction	Relative Permeability to Water,* fraction
	Unsteady-State Gas Displacing Water		
0.0	0.000	0.000	1.000
6.8	0.072	0.037	0.513
8.3	0.130	0.060	0.461
9.0	0.171	0.072	0.423
9.6	0.213	0.085	0.399
10.8	0.339	0.123	0.363
12.4	0.563	0.178	0.316
15.2	1.14	0.300	0.263
17.3	1.78	0.395	0.221
19.0	2.51	0.501	0.200
21.8	3.86	0.594	0.154
25.4	7.26	0.718	0.099
27.8	10.7	0.840	0.079
30.4	16.2	0.930	0.057
32.6	23.7	1.03	0.043
34.7	35.4	1.11	0.031
36.2	48.6	1.18	0.024
	Steady-State Water Displacing Gas		
68.2	-	4.24	-
42.8	28.8	0.865	0.030
40.7	14.5	0.580	0.040
39.1	6.51	0.371	0.057
36.2	3.67	0.235	0.064
33.5	1.98	0.164	0.083
30.0	-	-	0.117

*Relative to the specific permeability to water.

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company		Sample ID:	121
Jones G.U. B #3HI Well		Sample Depth, feet:	2357.6
Hugoton Gas Field		Klinkenberg Perm., md:	6.49
Lower Krider Formation		Porosity, percent:	20.4
Stanton County, Kansas		Initial Sw, percent:	100.0
Job File:	DRP-91226	Specific kw, md:	0.75



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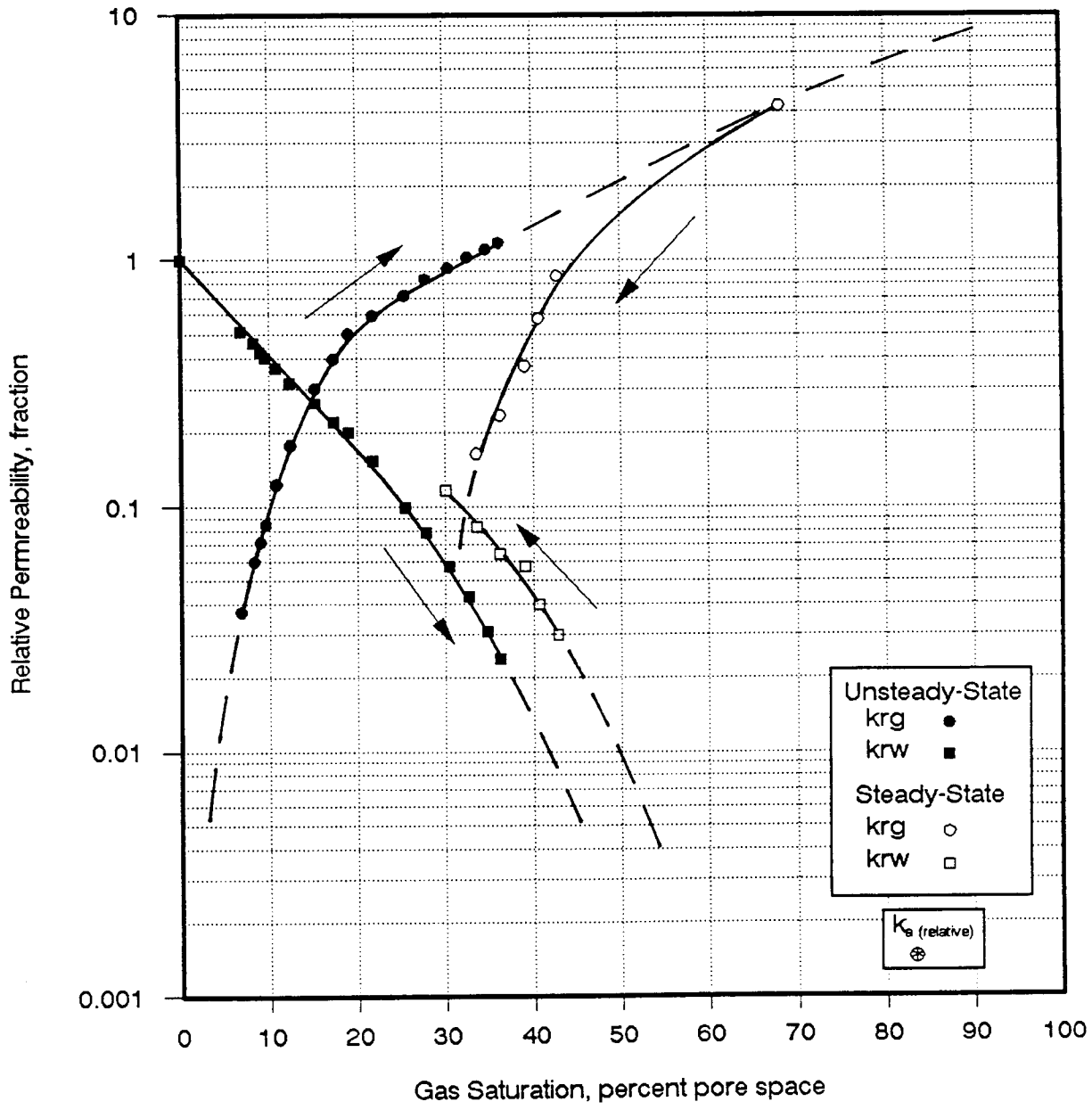
Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company		Sample ID:	121
Jones G.U. B #3HI Well		Sample Depth, feet:	2357.6
Hugoton Gas Field		Klinkenberg Perm., md:	6.49
Lower Krider Formation		Porosity, percent:	20.4
Stanton County, Kansas		Initial Sw, percent:	100.0
Job File:	DRP-91226	Specific kw, md:	0.75



Core Laboratories

File DRP-91226

GAS-WATER RELATIVE PERMEABILITY

Amoco Production Company
Amoco Jones Gas Unit B #3HI
Hugoton Field
Winfield Formation
Stanton County, Kansas

Sample Identification:	150	
Sample Depth:	2386.6	feet
Klinkenberg Permeability:	1.20	md
Porosity:	14.8	percent
Specific Permeability to Water:	0.14	md

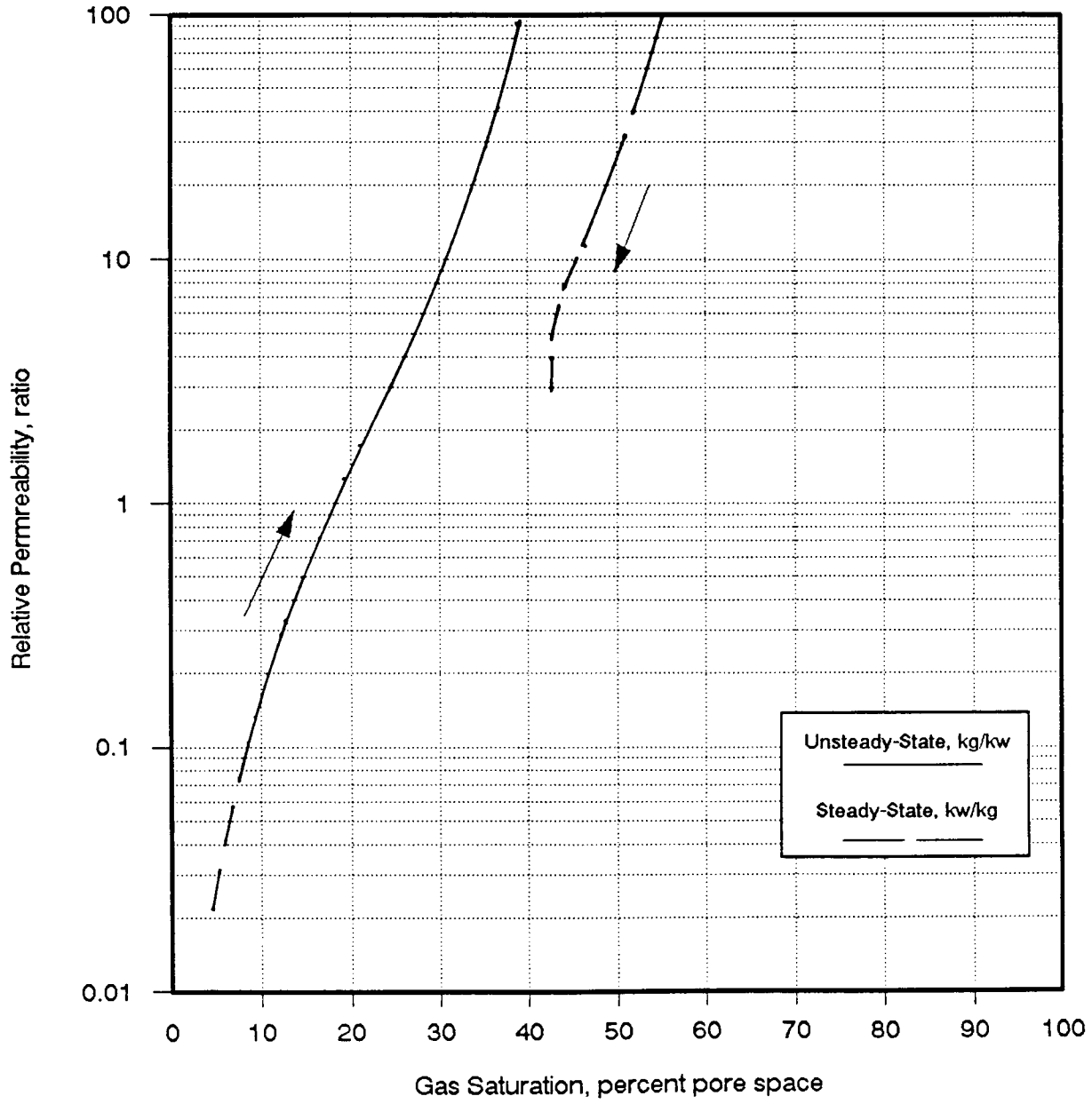
Gas Saturation, percent pore space	Gas-Water Relative Permeability Ratio	Relative Permeability to Gas,* fraction	Relative Permeability to Water,* fraction
		Unsteady-State Gas Displacing Water	
0.0	0.000	0.000	1.000
7.5	0.075	0.044	0.581
8.5	0.104	0.055	0.529
9.3	0.133	0.066	0.499
10.1	0.164	0.078	0.472
10.8	0.199	0.089	0.446
12.7	0.330	0.124	0.375
14.6	0.498	0.176	0.354
16.6	0.722	0.214	0.297
19.3	1.26	0.275	0.218
21.1	1.73	0.347	0.200
24.4	2.92	0.411	0.141
29.8	8.10	0.554	0.068
34.1	21.0	0.655	0.031
35.3	28.7	0.727	0.025
36.7	41.4	0.792	0.019
38.8	91.9	0.877	0.0095
		Steady-State Water Displacing Gas	
63.4	-	3.43	-
53.3	56.8	0.795	0.014
46.5	11.4	0.381	0.028
44.0	7.66	0.245	0.032
41.4	-	-	0.036

*Relative to the specific permeability to water.

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company		Sample ID:	150
Jones G.U. B #3HI Well		Sample Depth, feet:	2386.6
Hugoton Gas Field		Klinkenberg Perm., md:	1.20
Winfield Formation		Porosity, percent:	14.8
Stanton County, Kansas		Initial Sw, percent:	100.0
Job File:	DRP-91226	Specific kw, md:	0.14



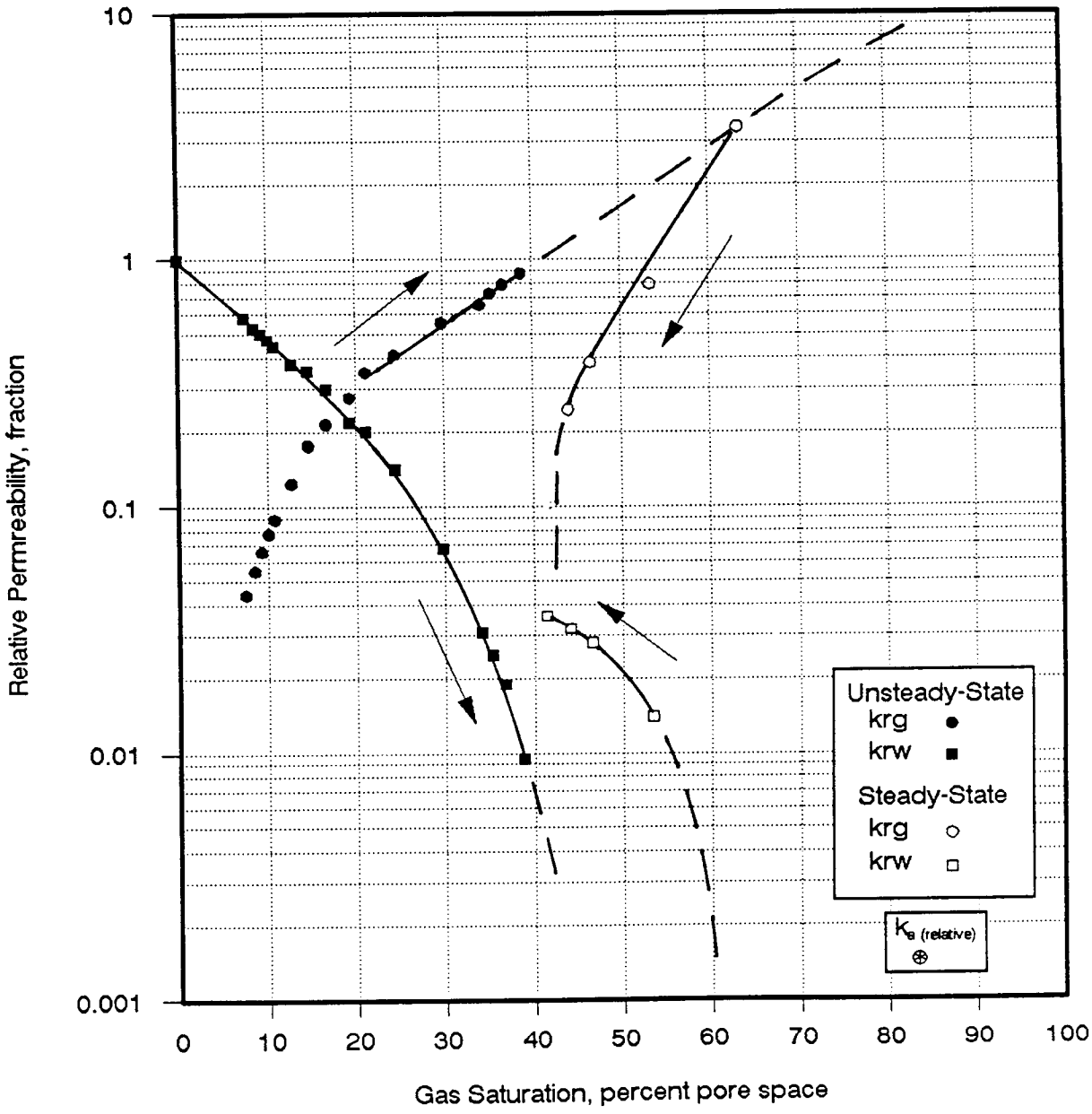
Core Laboratories

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Winfield Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	150
Sample Depth, feet:	2386.6
Klinkenberg Perm., md:	1.20
Porosity, percent:	14.8
Initial Sw, percent:	100.0
Specific kw, md:	0.14



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File DRP-91226

GAS-WATER RELATIVE PERMEABILITY

Amoco Production Company
Amoco Jones Gas Unit B #3HI
Hugoton Field
Fort Riley Formation
Stanton County, Kansas

Sample Identification:	284	
Sample Depth:	2520.6	feet
Klinkenberg Permeability:	28.1	md
Porosity:	21.0	percent
Specific Permeability to Water:	7.9	md

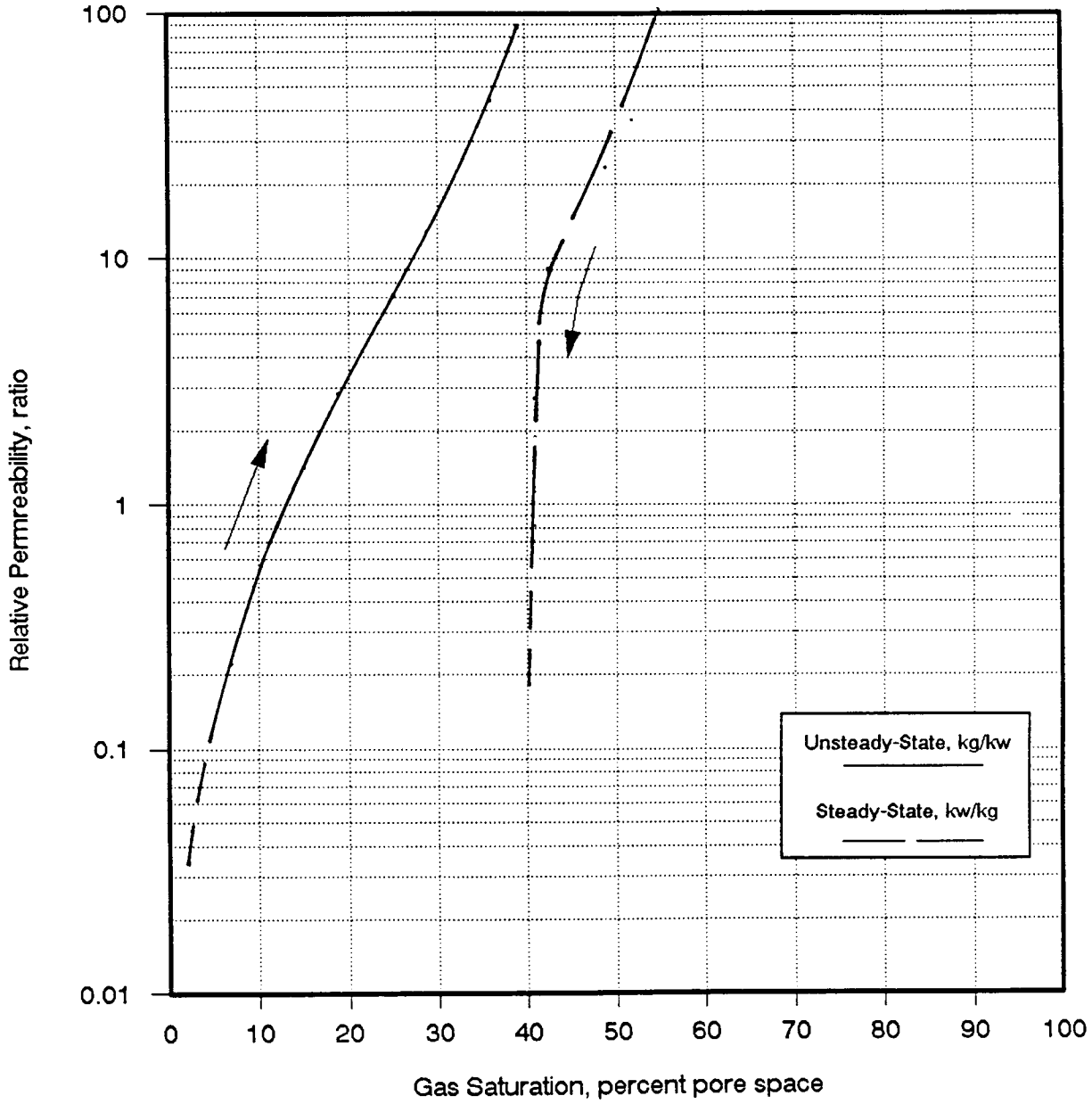
Gas Saturation, percent pore space	Gas-Water Relative Permeability Ratio	Relative Permeability to Gas,* fraction	Relative Permeability to Water,* fraction
	Unsteady-State Gas Displacing Water		
0.0	0.000	0.000	1.000
4.6	0.111	0.066	0.593
6.9	0.222	0.100	0.449
7.9	0.301	0.116	0.385
8.8	0.384	0.131	0.341
9.4	0.460	0.145	0.315
10.6	0.600	0.180	0.300
15.1	1.41	0.258	0.183
18.9	2.83	0.331	0.117
21.6	4.22	0.404	0.096
25.1	7.21	0.463	0.064
28.8	12.8	0.551	0.043
33.4	28.0	0.639	0.023
36.0	44.0	0.710	0.016
39.2	89.5	0.757	0.0085
	Steady-State Water Displacing Gas		
64.0	-	1.44	-
57.6	260.	1.22	0.0047
55.3	100.	0.855	0.0085
51.9	36.6	0.513	0.014
48.9	23.6	0.402	0.017
42.4	9.13	0.274	0.030
40.8	2.71	0.111	0.041
40.6	0.580	0.029	0.050
37.0	-	-	0.057

*Relative to the specific permeability to water.

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company		Sample ID:	284
Jones G.U. B #3HI Well		Sample Depth, feet:	2520.6
Hugoton Gas Field		Klinkenberg Perm., md:	28.1
Fort Riley Formation		Porosity, percent:	21.0
Stanton County, Kansas		Initial Sw, percent:	100.0
Job File:	DRP-91226	Specific kw, md:	7.9

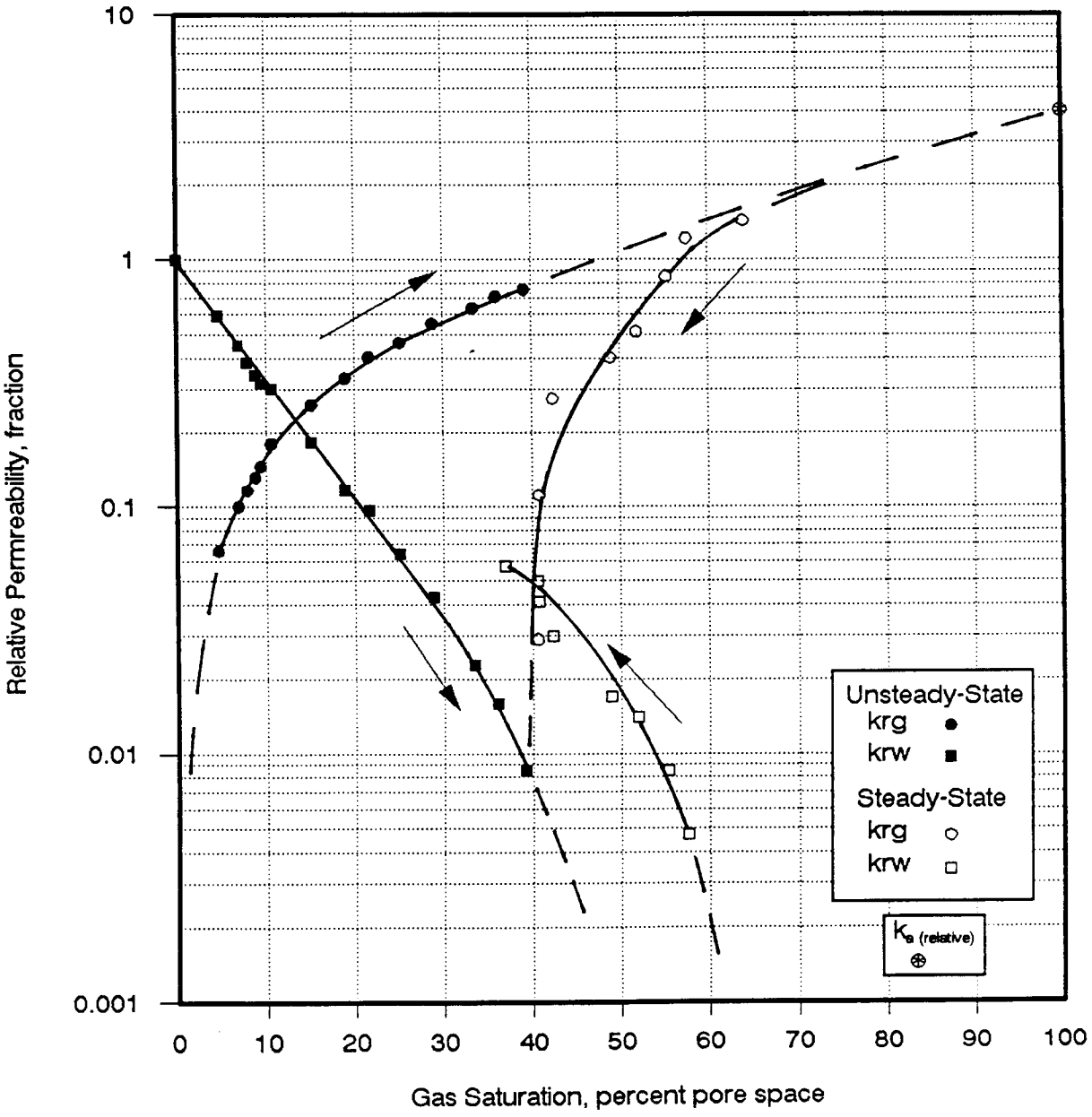


Core Laboratories

Relative Permeability vs Gas Saturation

Unsteady-State Gas Displacing Water
Steady-State Water Displacing Gas

Amoco Production Company		Sample ID:	284
Jones G.U. B #3HI Well		Sample Depth, feet:	2520.6
Hugoton Gas Field		Klinkenberg Perm., md:	28.1
Fort Riley Formation		Porosity, percent:	21.0
Stanton County, Kansas		Initial Sw, percent:	100.0
Job File:	DRP-91226	Specific kw, md:	7.9



Core Laboratories

Amoco Production Company
File: DRP-91226

SECTION 3

ELECTRICAL PROPERTIES
Formation Factor
Resistivity Index
Porous Disc Capillary Pressure

Amoco Production Company
File: DRP-91226

ELECTRICAL PROPERTIES

Sample Selection

Samples selected for electrical property testing were listed in PART 1 and PART 3 in the letter from Ms. Olson requesting analyses. The Part 1 samples were tested following relative permeability tests, while the Part 2 samples were split further into groups for different analysis sequences. All samples were 1.5 inches in diameter. Of the five samples in Part 1, only four were tested. Sample 121 split lengthwise when removed from the relative permeability coreholder and could not be used for further testing. Sample 150 was also broken, but had split across the cross section of the sample. The larger portion was leached and dried (as mentioned previously) and permeability and porosity determined. This reduced length sample was used for the electrical property tests. As mentioned, the Part 1 samples were split into four groups. Analytical procedures for groups 1, 2, and 3 included electrical property testing. These procedures included formation factor and resistivity index for Group 1, formation factor and resistivity index (with capillary pressure) for Group 2, and formation factor only for group 3. The samples were grouped as follows:

Sample	Depth, ft	Part	Group	Analytical Sequence*
62	2298.6	III	3	formation factor
63	2299.6	I		form. factor, resistivity index
77	2313.6	I		form. factor, resist. index
88	2324.6	III	1	form. factor, resist. index, capillary pressure
90	2326.6	III	3	form. factor
121	2357.6	I		broken, could not test
148	2384.6	III	3	form. factor
150	2386.6	I		form. factor, resist. index
224	2460.6	III	3	form. factor
233	2469.9	III	3	form. factor
235	2471.6	III	2	form. factor, resist. index
236	2472.6	III	2	form. factor, resist. index
254	2490.6	III	1	form. factor, resist. index, capillary pressure
264	2500.6	III	3	form. factor, resist. index
284	2520.6	I		form. factor, resist. index

* All test sequences ended with the sample being prepared for mercury injection.

Sample Preparation

The Part 1 samples were partially saturated when made available for these tests, but with the NaI traced water which had been used for the x-ray testing. The samples were each loaded into hydrostatic coreholders and flushed against backpressure with several pore volumes of 150,000 ppm sodium chloride (NaCl) brine, which had been specified by Ms. Olson. Sample 150, which had been dried and basic properties redetermined, went through the saturation process mentioned in Section 2 with the remainder of the samples. All samples were flushed against backpressure, ensuring full saturation.

Electrical Properties

The resistance of a known volume of the brine to a constant electrical current was measured. The R_w of the brine was calculated at ambient temperature and normalized to 25°C using Arp's equation. The value was determined to be: **R_w = 0.0533 ohm-m @ 25°C.** This value matches well with published values for a 150,000 ppm NaCl brine.

To prepare for capillary desaturation (resistivity index tests), individual, 1.5 inch diameter 15 bar ceramic disks were saturated with the NaCl brine, making them selectively permeable to the brine. The resistivities of these disks were determined under the same test conditions as discussed below. This was necessary because plate resistivity was used to correct 4-terminal sample/disk readings.

The samples were mounted within coreholders which were modified to allow 2 and 4 terminal electrical measurements to be made. A silver mesh screen and permeable silver membrane were placed at each end-face of the samples to ensure good contact between the sample and the electrodes. Each sample was mounted by placing it into a rubber sleeve which had been modified for 4-terminal resistivity, with a saturated ceramic disk placed against the downstream end and within the sleever. This assemblage was loaded into a hydrostatic coreholder and maintained at 2200 or 2350 psi (depth dependant) net hydrostatic confining stress. A dynamic pore pressure (with back pressure) was applied with simform and a minimum of 10 pore volumes of fresh brine injected through the sample. Sample resistance was monitored continuously to determine when electrical/ionic stability was achieved.

To determine the formation resistivity factor of each sample, the electrical resistance measurements at 100% brine saturation were measured at multiple frequencies for each sample. A resistivity value at 100% saturation (R_o) was calculated (1000 Hz) and normalized to 25°C for each sample. Formation factor (FF) was computed for each sample using the formula: $FF = R_o/R_w$. A composite plot of formation factor versus porosity was used in determining "a" and "m" values. A least squares linear regression analysis was used to determine the value of the cementation factor, "m". The value of "m" was the absolute value of the slope of the line. As the line was forced through (1.0, 1.0), the "a" value was 1.00.

The saturated ceramic disk included within each sample mounting system was used during capillary desaturation in connection with the investigation of the resistivity index versus water saturation relationship. Sample resistivity (R_t) was determined at several decreasing water saturations. Desaturation was accomplished by injecting humidified air into the upstream face of the sample at increasing pressures, with mobile water exiting the sample through the downstream face which was in capillary contact with the ceramic disk. Produced water volumes were monitored downstream to determine decremental saturations. Resistivity was monitored daily as the air pressure was increased. A maximum of 80 psi displacement pressure was used for the capillary pressure samples. The maximum used with the other samples was 40 psi.

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As capillary pressure data were to be obtained for Group 1 samples (88 and 254), each displacement pressure was maintained until saturation equilibrium was observed. When no additional water was produced downstream the pressure was increased. As saturation equilibrium was not necessary for Part I and Group 2 samples each displacement pressure was maintained for typically only one day.

All R_t values were obtained using a frequency of 1000 Hz and were normalized to 25°C. The resistivity values R_t and R_o were used to calculate the resistivity index, **RI**, at each saturation using the formula: $\mathbf{RI} = R_t/R_o$.

A least-squares linear regression plot of resistivity index versus saturation for each sample yields a line whose slope defines the saturation exponent "n". A composite graph of all eight samples is also included. An electrical property data table and all graphical analyses are included in the report.

The composite "m" value for all samples is 1.94. The highest "m" value is 2.13, while the lowest is 1.80. A breakdown of "m" by formation (see Formation Factor Table) illustrates that "m" values are fairly consistent throughout the core. Values for the Upper Krider and Fort Riley Formations average somewhat higher (2.00 and 2.02), while for the Winfield Formation they are somewhat lower (1.81). The composite "n" value is 1.63, while values range from a low of 1.07 to a high of 1.78. While one sample can't realistically establish a trend, the one sample from the Winfield Formation which underwent resistivity index testing again has the low value. The capillary pressure curves of samples 88 and 254 are similar in shape. While no work is known to have been performed comparing geological facies, the two samples are fairly similar in permeability and porosity.

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FORMATION RESISTIVITY FACTOR DATA

Amoco Jones Gas Unit B #3HI
Hugoton Gas Field

150,000 ppm NaCal
Rw = 0.0535 ohm-m @ 25°C
Frequency = 1000 Hz

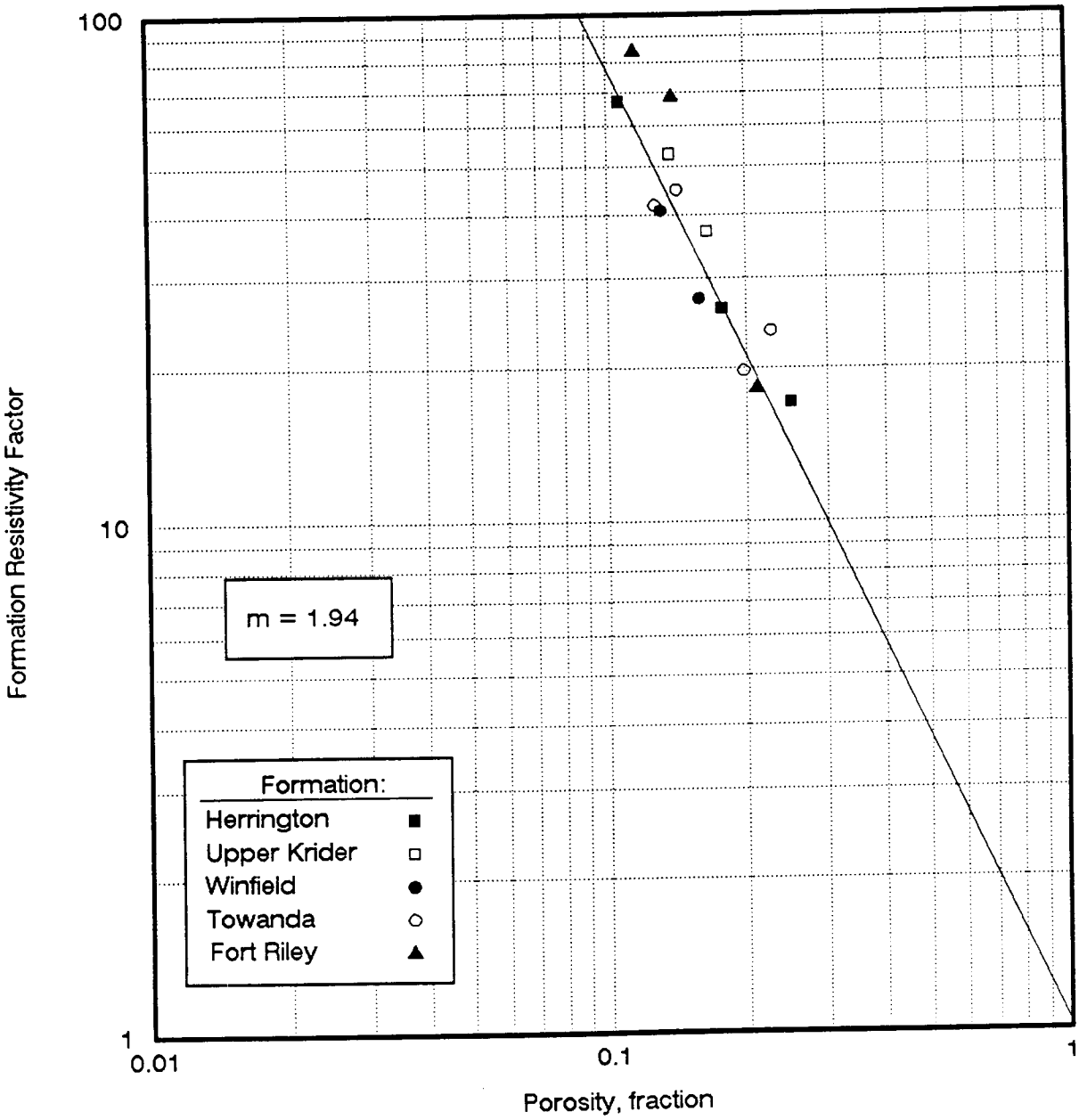
Sample I.D.	Depth, feet	Porosity, percent	FF 4-Terminal	m 4-Terminal
		Herrington Formation		
62	2298.6	10.6	67.1	1.87
63	2299.6	17.7	26.3	1.89
77	2323.6	25.0	17.1	2.05
		Upper Krider Formation		
88	2324.6	16.5	37.2	2.01
90	2326.6	13.7	52.8	2.00
		Winfield Formation		
148	2384.6	13.1	40.5	1.82
150	2386.6	15.8	27.5	1.80
224	2460.6	12.7	41.9	1.81
		Towanda Formation		
233	2469.6	19.7	19.8	1.84
235	2471.6	14.2	44.9	1.95
236	2472.6	22.6	23.7	2.13
		Fort Riley Formation		
254	2490.6	13.9	68.4	2.14
264	2500.6	11.5	84.4	2.05
284	2520.6	21.0	18.2	1.86

Formation Resistivity Factor

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Several (5) Formations
Stanton County, Kansas

Sample ID:	Composite
Depth Range, feet:	2298.6 - 2520.6
Initial Sw, percent:	100.0
Saturant:	150,000 ppm NaCl brine
Job File:	DRP-91226



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Amoco Production Company
File: DRP-91226

RESISTIVITY INDEX SUMMARY

Amoco Jones Gas Unit B #3HI
Hugoton Gas Field

150,000 ppm NaCal
Rw = 0.0535 ohm-m @ 25°C
Frequency = 1000 Hz

Sample I.D.	Depth, feet	Saturation, fraction	Capillary Pressure, psi	RI 4-Terminal	n 4-Terminal
			Herrington Formation		
63	2299.6	1.000	-	1.00	1.77
		0.971	-	1.01	
		0.885	-	1.17	
		0.876	-	1.21	
		0.601	-	2.52	
		0.599	-	2.54	
		0.430	-	4.61	
		0.404	-	4.97	
		0.355	-	6.22	
		0.330	-	6.92	
77	2323.6	1.000	-	1.00	1.50
		0.970	-	1.01	
		0.647	-	1.99	
		0.458	-	3.34	
		0.423	-	3.65	
		0.352	-	4.79	
		0.317	-	5.30	
			Upper Krider Formation		
88	2324.6	1.000	0.00	1.00	1.48
		0.973	7.00	1.00	
		0.915	10.00	1.07	
		0.743	15.00	1.71	
		0.492	30.00	3.11	
		0.349	80.00	4.42	

Amoco Production Company
File: DRP-91226

RESISTIVITY INDEX SUMMARY

Amoco Jones Gas Unit B #3HI
Hugoton Gas Field

150,000 ppm NaCal
Rw = 0.0535 ohm-m @ 25°C
Frequency = 1000 Hz

Sample I.D.	Depth, feet	Saturation, fraction	Capillary Pressure, psi	RI 4-Terminal	n 4-Terminal
			Winfield Formation		
150	2386.6	1.000	-	1.00	1.07
		0.955	-	1.01	
		0.894	-	1.08	
		0.848	-	1.17	
		0.718	-	1.46	
		0.661	-	1.56	
			Towanda Formation		
235	2471.6	1.000	-	1.00	1.57
		0.834	-	1.30	
		0.784	-	1.48	
		0.725	-	1.72	
		0.689	-	1.81	
		0.537	-	2.72	
		0.431	-	3.72	
		0.391	-	4.27	
		0.346	-	5.12	
		0.296	-	6.83	
236	2472.6	1.000	-	1.00	1.78
		0.773	-	1.31	
		0.655	-	1.75	
		0.502	-	3.03	
		0.453	-	3.84	
		0.342	-	6.65	
		0.294	-	9.90	
		0.239	-	14.32	

Amoco Production Company
File: DRP-91226

RESISTIVITY INDEX SUMMARY

Amoco Jones Gas Unit B #3HI
Hugoton Gas Field

150,000 ppm NaCal
Rw = 0.0535 ohm-m @ 25°C
Frequency = 1000 Hz

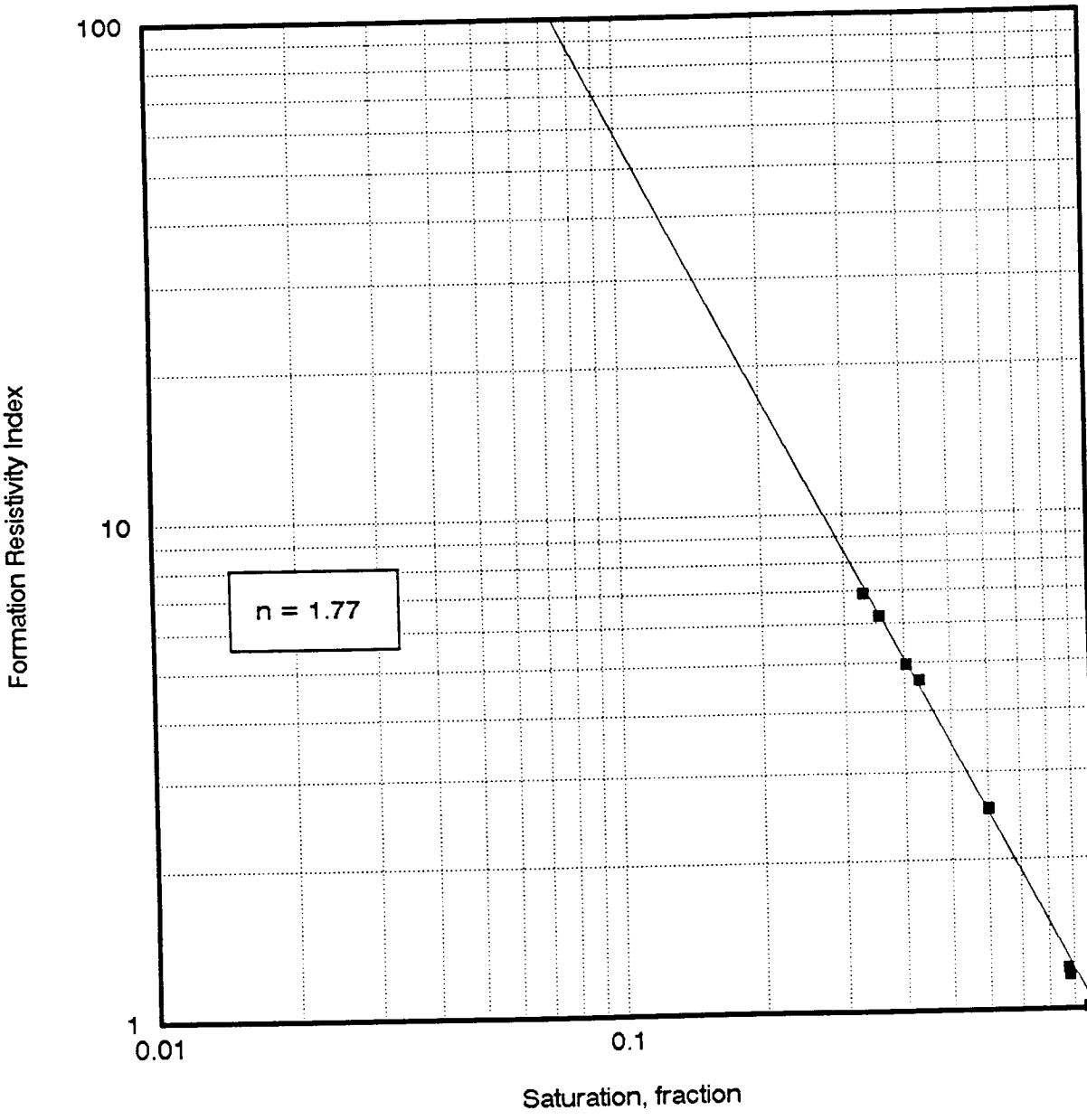
Sample I.D.	Depth, feet	Saturation, fraction	Capillary Pressure, psi	RI 4-Terminal	n 4-Terminal
			Fort Riley Formation		
254	2490.6	1.000	0.00	1.00	1.55
		0.966	7.00	1.03	
		0.868	10.00	1.21	
		0.652	15.00	1.93	
		0.477	30.00	3.28	
		0.296	80.00	6.53	
284	2520.6	1.000	-	1.00	1.54
		0.979	-	1.01	
		0.966	-	1.02	
		0.894	-	1.18	
		0.884	-	1.20	
		0.811	-	1.36	
		0.790	-	1.41	
		0.662	-	1.91	
		0.563	-	2.45	

Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Herrington Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	63
Sample Depth, feet:	2299.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	13.4
Porosity, percent:	17.7
Saturant:	150,000 ppm NaCl brine



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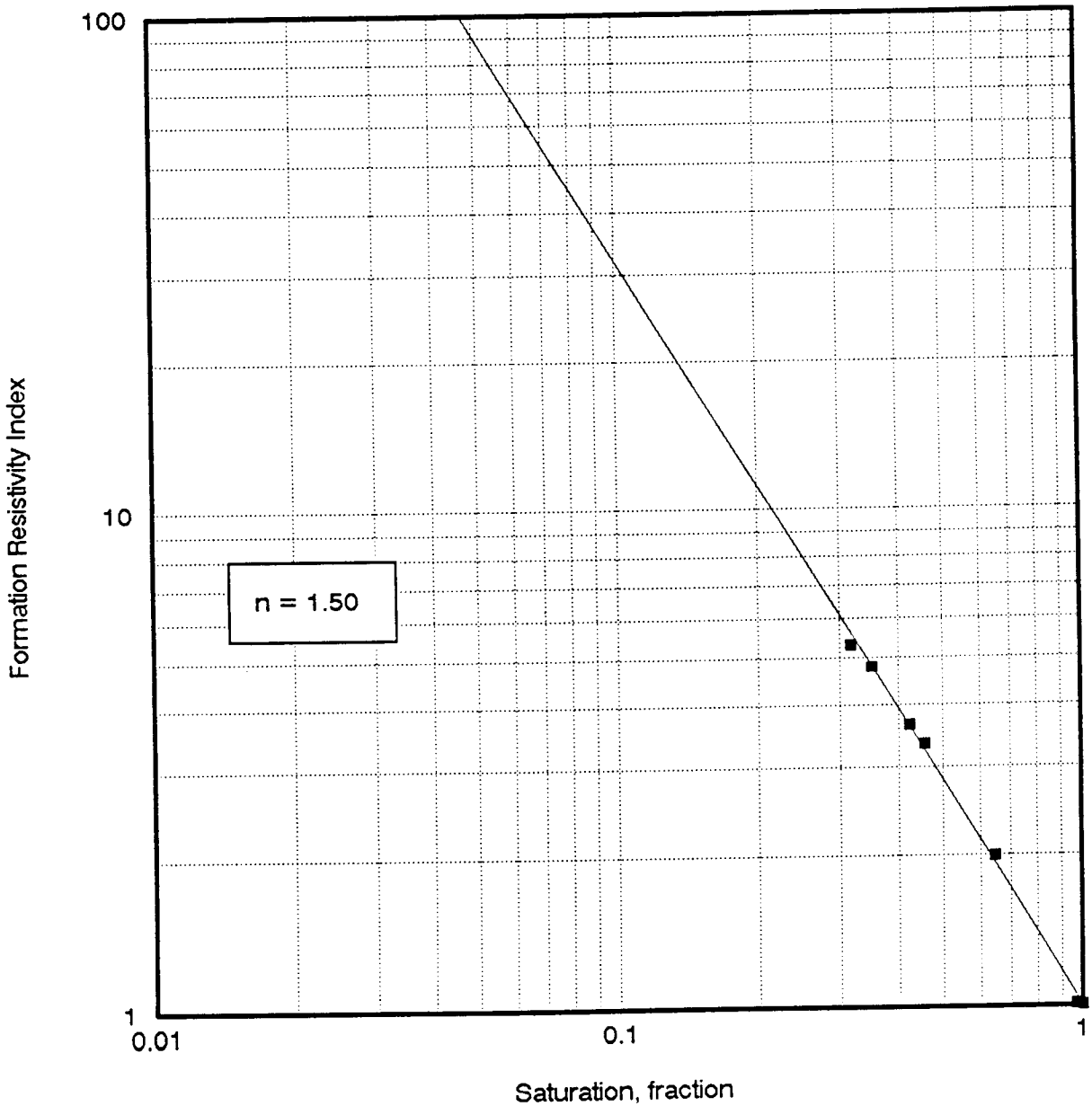
Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Herrington Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	77
Sample Depth, feet:	2323.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	8.27
Porosity, percent:	25.0
Saturant:	150,000 ppm NaCl brine



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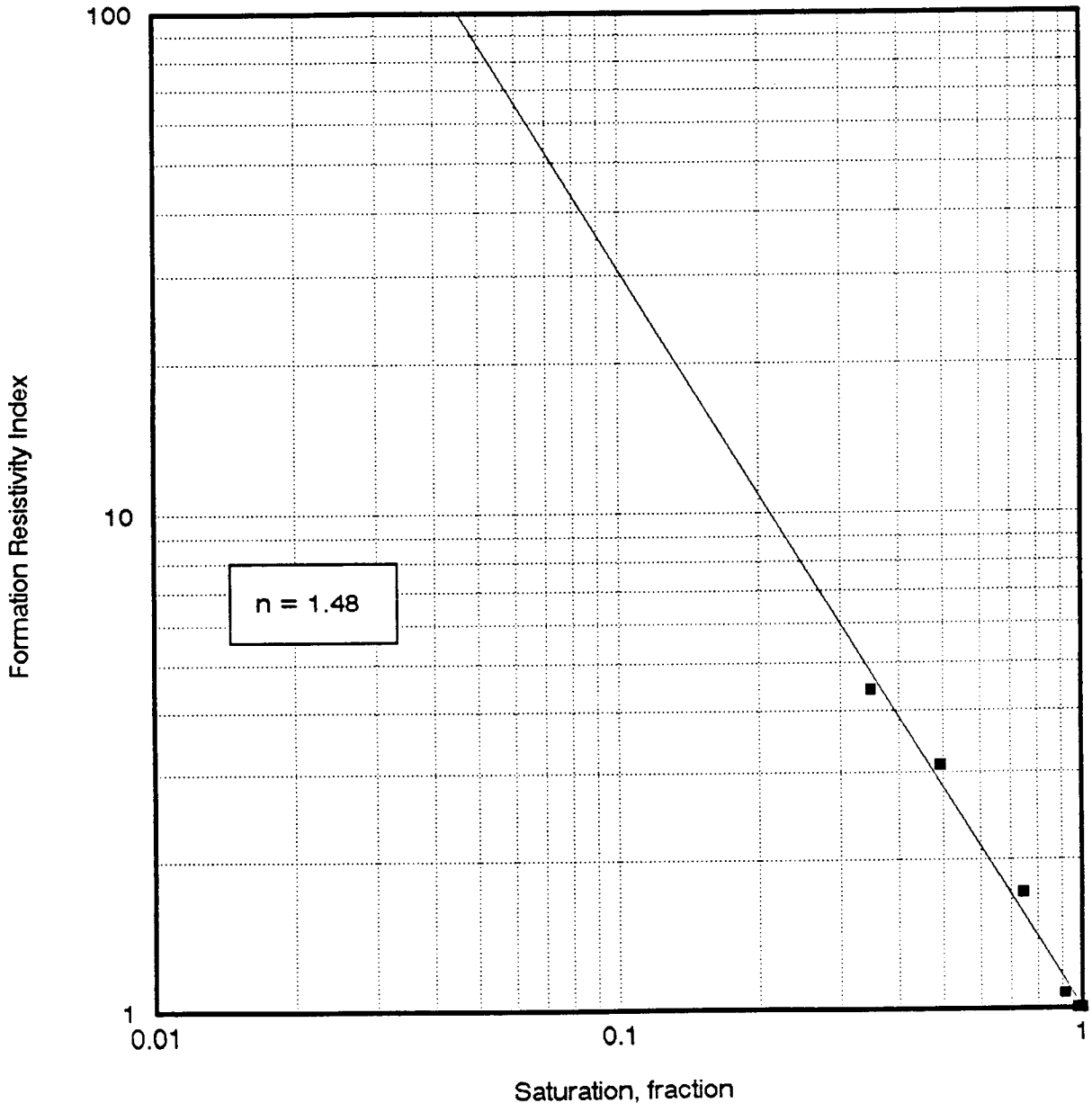
Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Upper Krider Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	88
Sample Depth, feet:	2324.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	1.19
Porosity, percent:	16.5
Saturant:	150,000 ppm NaCl brine



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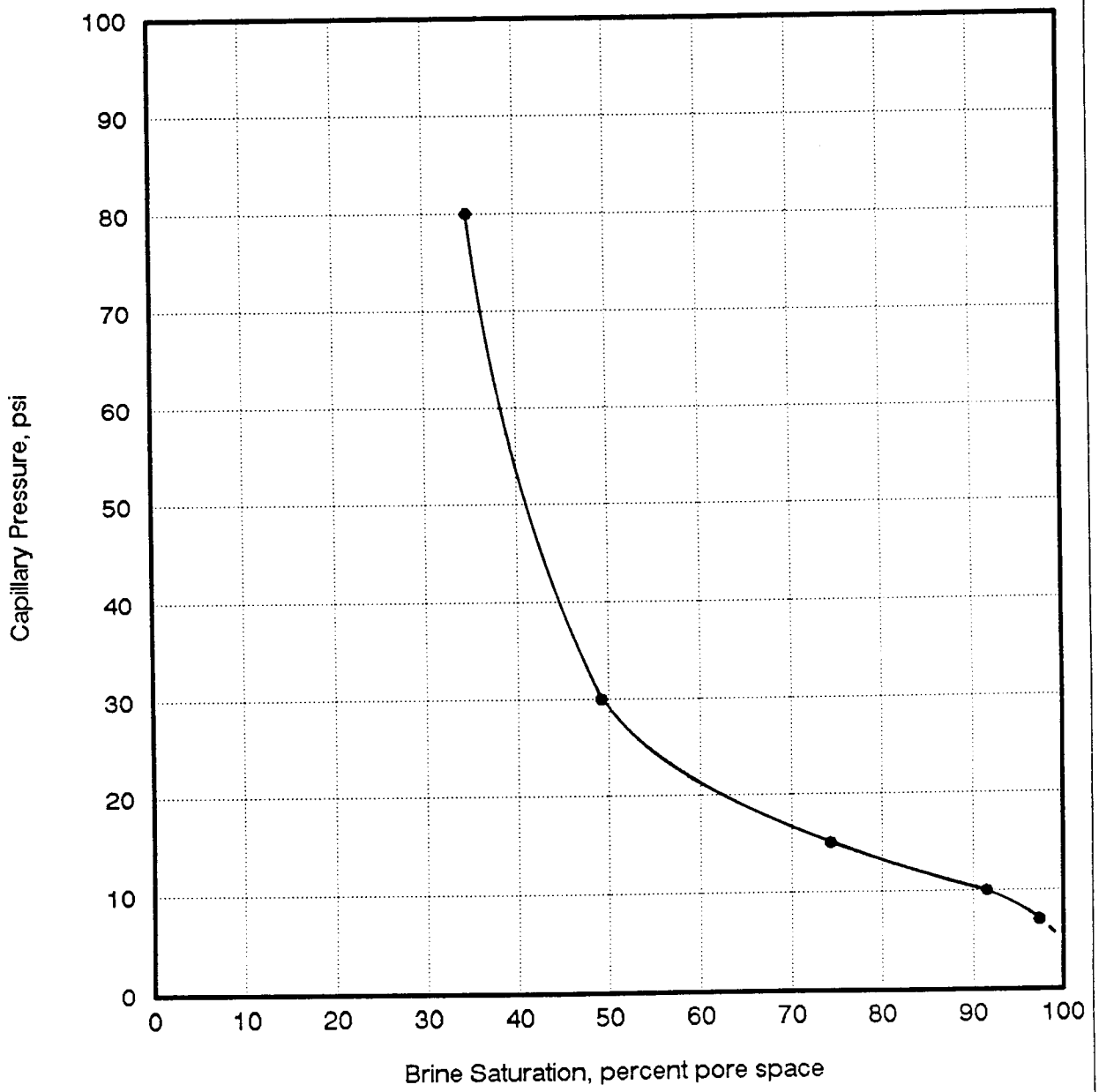
Air/Brine Capillary Pressure

Porous Disc Method

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Upper Krider Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	88
Sample Depth, feet:	2324.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	1.19
Porosity, percent:	16.5
Saturant:	150,000 ppm NaCl brine



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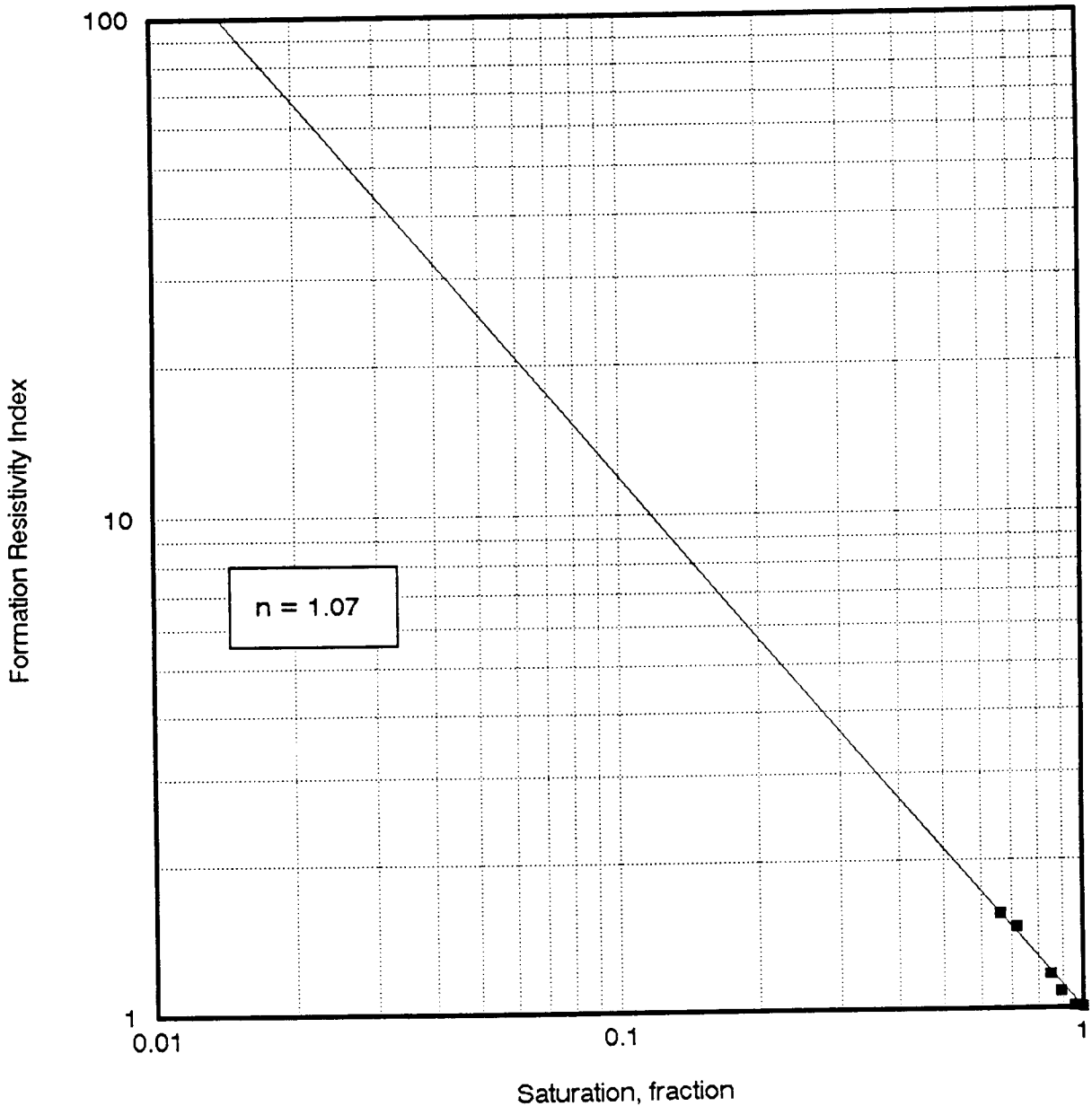
Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Winfield Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	150
Sample Depth, feet:	2386.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	1.16
Porosity, percent:	15.8
Saturant:	150,000 ppm NaCl brine



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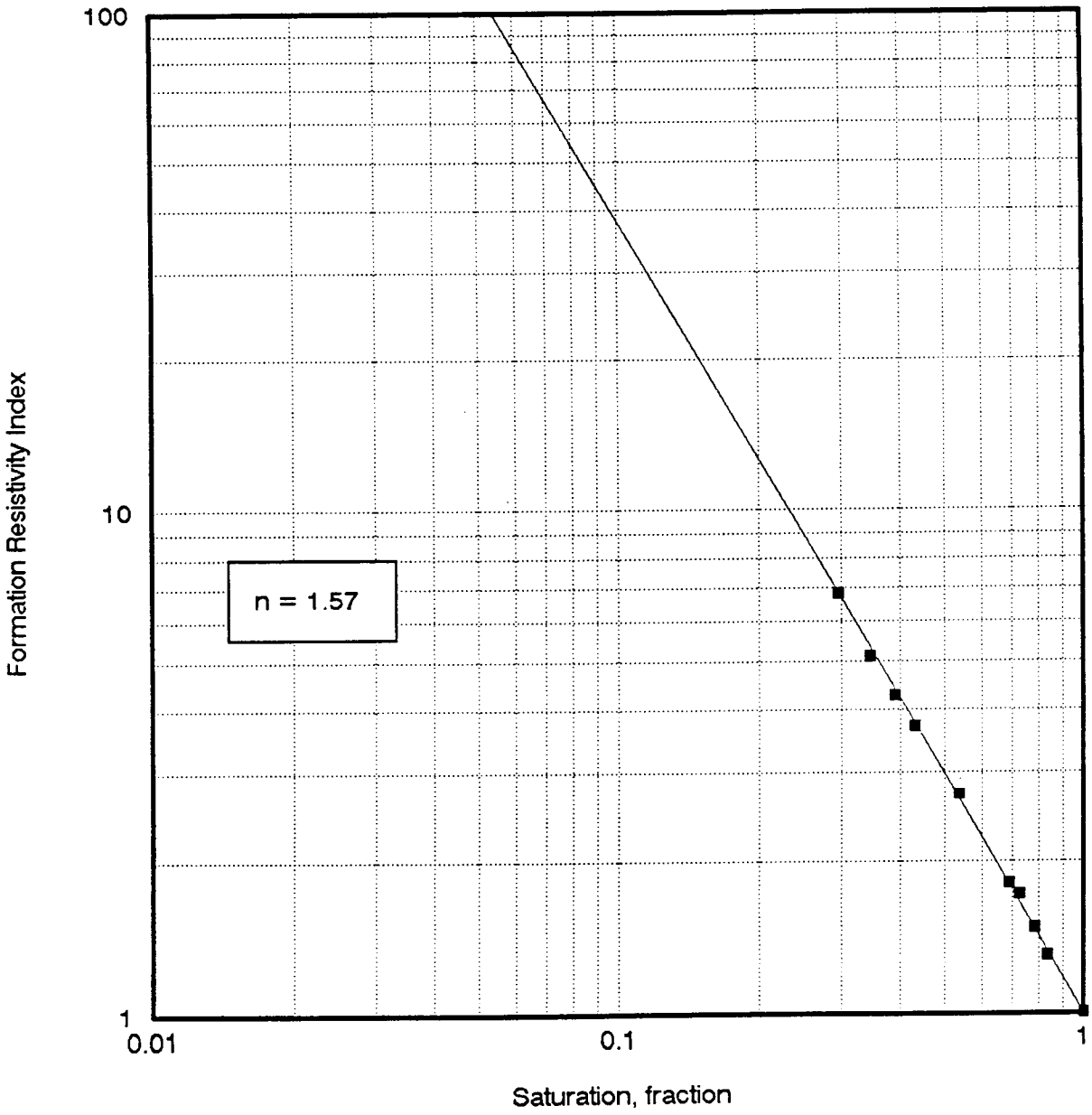
Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Towanda Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	235
Sample Depth, feet:	2471.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	1.93
Porosity, percent:	14.2
Saturant:	150,000 ppm NaCl brine



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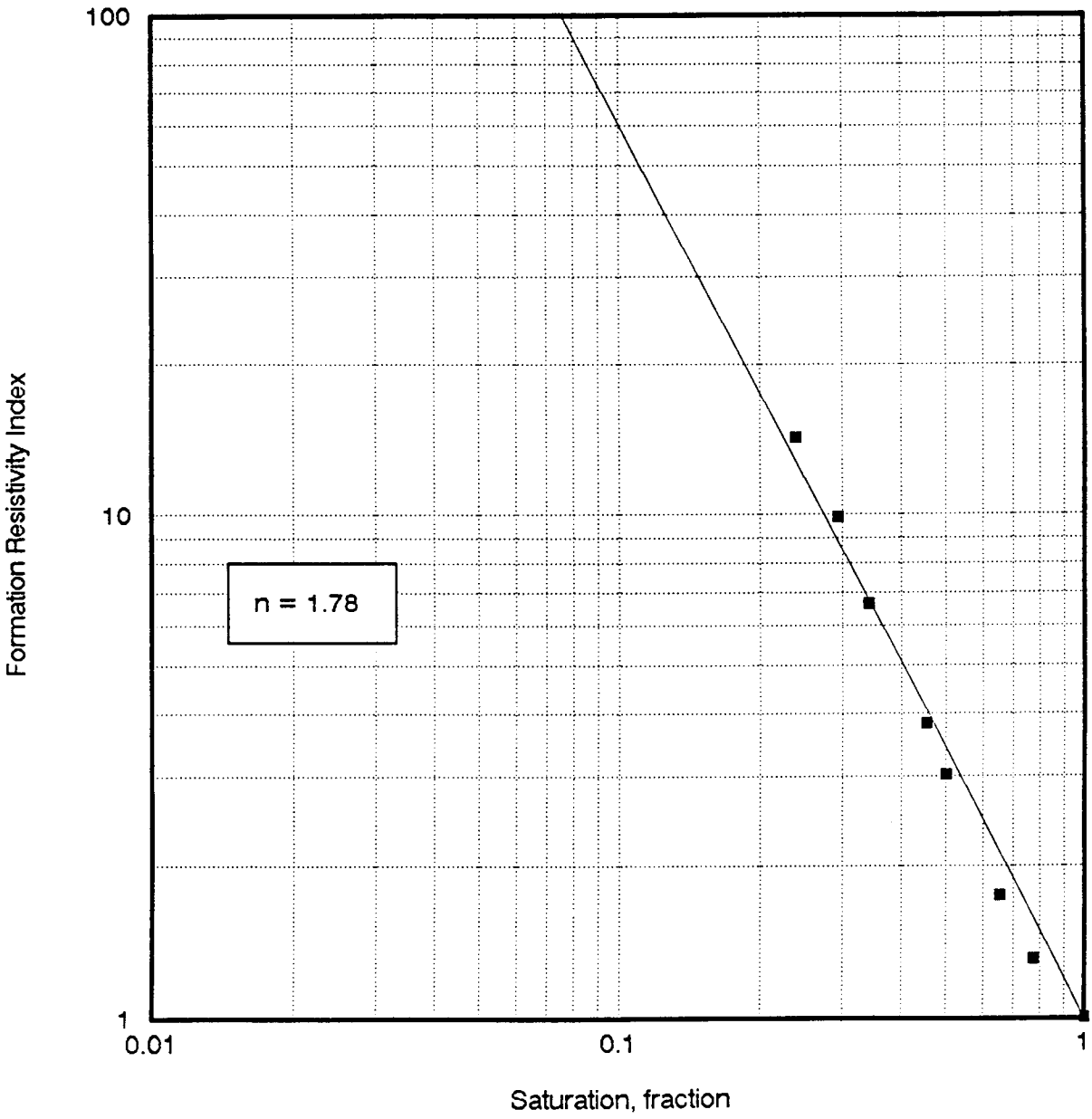
Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Towanda Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	236
Sample Depth, feet:	2472.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	10.8
Porosity, percent:	22.6
Saturant:	150,000 ppm NaCl brine



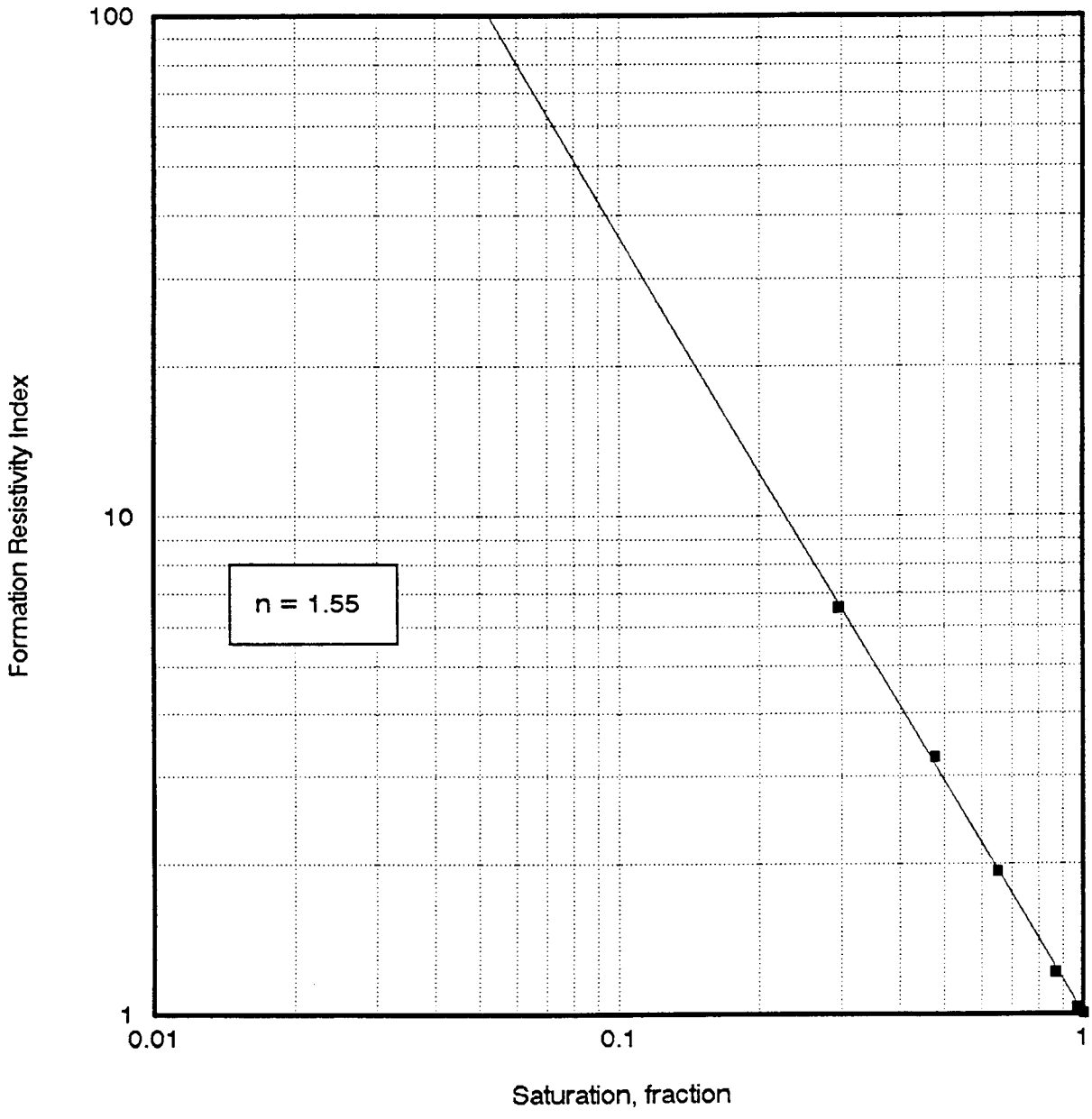
Core Laboratories

Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Fort Riley Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	254
Sample Depth, feet:	2490.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	1.01
Porosity, percent:	13.9
Saturant:	150,000 ppm NaCl brine



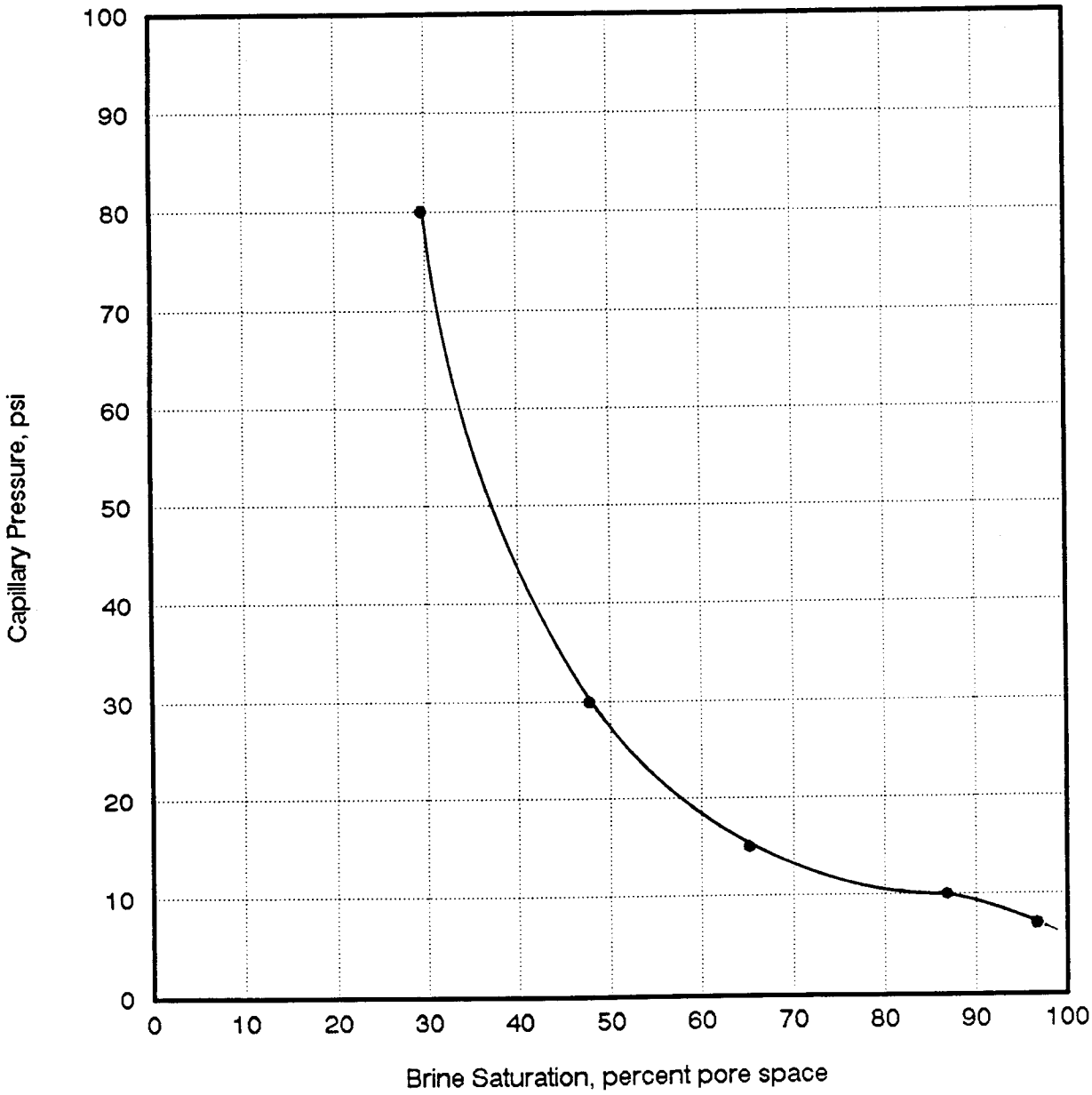
Core Laboratories

Air/Brine Capillary Pressure

Porous Disc Method

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Fort Riley Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	254
Sample Depth, feet:	2490.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	1.01
Porosity, percent:	13.9
Saturant:	150,000 ppm NaCl brine



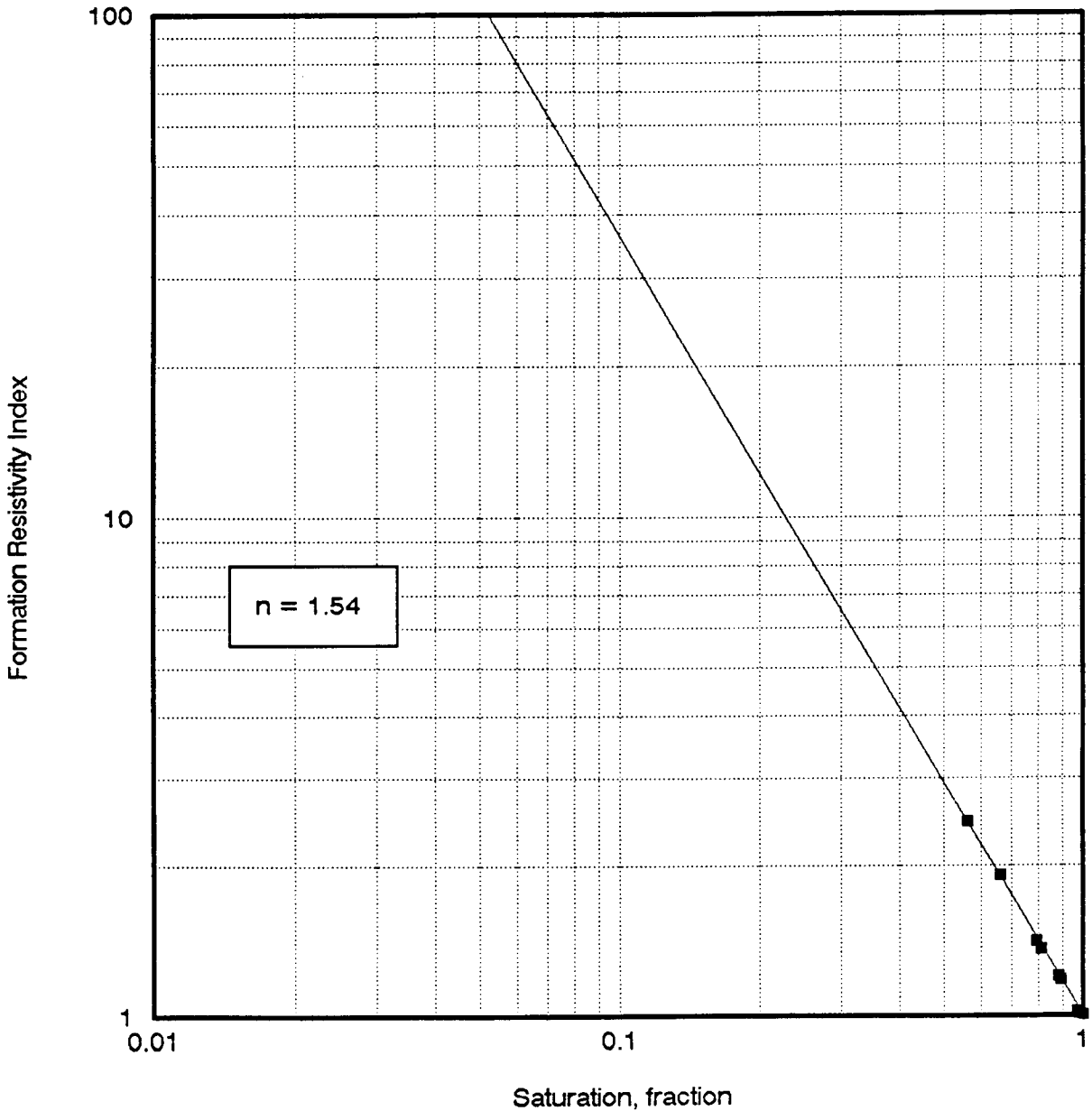
Core Laboratories

Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Fort Riley Formation
Stanton County, Kansas
Job File: DRP-91226

Sample ID:	284
Sample Depth, feet:	2520.6
Initial Sw, percent:	100.0
Klinkenberg Perm., md:	28.1
Porosity, percent:	21.0
Saturant:	150,000 ppm NaCl brine



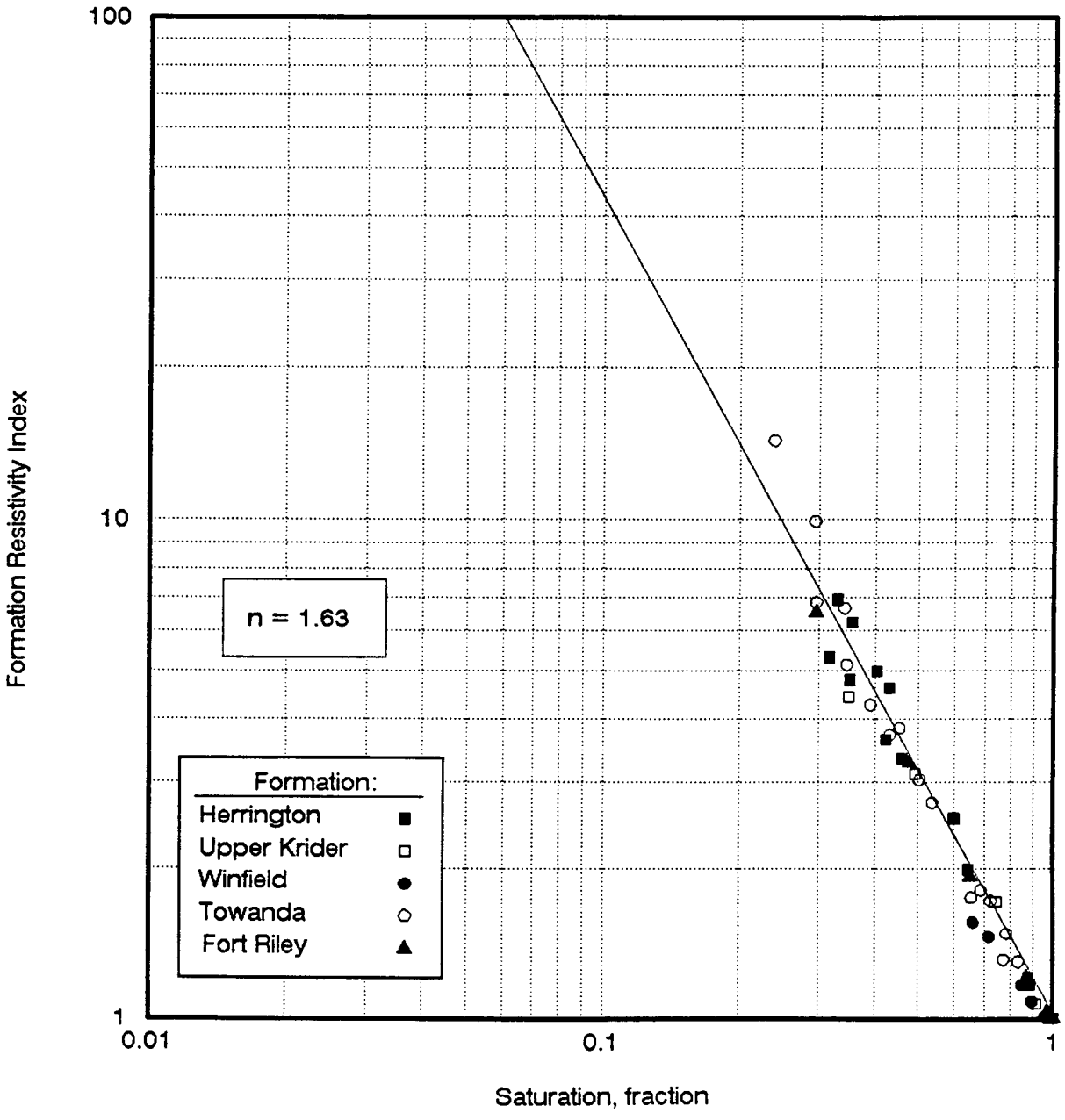
Core Laboratories

Formation Resistivity Index

4 - Terminal

Amoco Production Company
Jones G.U. B #3HI Well
Hugoton Gas Field
Several (5) Formations
Stanton County, Kansas

Sample ID: Composite
Depth Range, feet: 2299.6 - 2520.6
Initial Sw, percent: 100.0
Saturant: 150,000 ppm NaCl brine
Job File: DRP-91226



Core Laboratories

Amoco Production Company
File: DRP-91226

SECTION 4

MERCURY INJECTION
Pore Throat Distribution

Amoco Production Company
File: DRP-91226

MERCURY INJECTION

Sample Preparation

Each sample from within the test program, regardless of Part or Group number, had mercury injection performed as the final step of the program. Mercury was injected over a pressure range of 0 to 2000 psia into each of the clean, dry samples.

After its last previous procedural step, each sample was still partially or fully saturated with brine. As they reached that point, each sample underwent Dean-Stark extraction to remove the water from the sample, then was leached with methanol to remove inorganic salts. The samples were dried in a vacuum oven at 220°F. While care had been taken previously not to expose the samples to extreme heat this step was necessary. As the mercury injection test begins with a sample being vacuumed to a pressure of 50 microns or less, any adsorbed water left within the sample from humidity controlled drying is removed during the evacuation. This would make a pore volume measured with the adsorbed water in place inaccurate and allow mercury to invade space previously occupied by water.

The high pressure mercury injection system requires a sample of no larger than 1.0 inch diameter and slightly less than 1 inch in length. Therefore, the diameter of each sample was drilled down to the proper size and the sample trimmed and the sample redried. Permeability and porosity were determined for each of the reduced samples. Values are presented in the table on this page. In most cases, there is not good agreement with previous permeability and porosity data. There are likely two factors in this. The first is sample heterogeneity, for when the sample is reduced in size the properties of the tested portion are not necessarily the same as the previous full sample. The second factor is the difference in drying methods. As many of the reduced sample porosities are less than the full sample values, this was not likely very significant for most samples.

Sample	Depth, ft	Permeability To Air	Porosity, percent
62	2298.6	0.13	12.4
63	2299.6	7.8	19.8
67	2303.6	17.	20.4
77	2313.6	6.0	26.3
82	2318.6	3.3	20.9
88	2324.6	1.9	17.5
90	2326.6	0.23	14.5
121	2357.6	11.	24.0
148	2384.6	0.23	14.6
150	2386.6	0.89	17.5
224	2460.6	**	15.1
233	2469.6	0.41	21.8
235	2471.6	13.	17.4
236	2472.6	36.	22.2
254	2490.6	2.0	16.1
264	2500.6	0.09	12.2
284	2520.6	5.4	20.1

** Irregularly shaped, no permeability

Basic Properties - Mercury Injection Samples

Amoco Production Company
File: DRP-91226

Mercury Injection

Tests were performed using the Micromeritics Autopore II 9220, an automated, high pressure mercury injection device which operates at injection pressures of 0 to 50,000 psia. For these tests a maximum of 2000 psi was used. Each test sample was loaded into a glass penetrometer consisting of a sample chamber attached to a capillary stem with a cylindrical coaxial capacitor. The sample/penetrometer assembly was weighed, then placed into the low pressure system of the apparatus. The sample chamber was evacuated and filled with mercury, then the pressure was increased incrementally to atmospheric pressure, with time allowed at each pressure for saturation equilibrium. At atmospheric pressure the assembly was temporarily removed and reweighed, then it was replaced into the high pressure system of the apparatus. The pressure was increased incrementally to a maximum of approximately 2000 psia. The volume of mercury injected at each pressure was determined by the change in capacitance of the capillary stem.

Pore Size Distribution

Pore size distribution for each sample was calculated from the mercury injection tests results. Pore radii were calculated by the formula:

$$Ri = \frac{2T * \cos \Phi * C}{Pc}$$

where Ri = pore radius, microns
T = air-mercury interfacial tension = 485 dynes/cm
Φ = air-mercury contact angle = 140°
C = unit conversion constant = 0.145
Pc = mercury injection pressure, psia.

J-Function and Additional Conversions

Additional data which are presented on the tabular pages are the "J- Function" and conversions of mercury injection results to air/ brine, air/oil, and oil/brine data. Leverett J-Function values were calculated from the basic sample properties using the following equation:

$$\text{J-Function} = \frac{Pc}{(T * \cos \Phi)} * (K/\phi)^{1/2} * 0.2166$$

where Pc = injection pressure, psi
T = interfacial tension (a / Hg = 485) dynes/cm
Φ = contact angle (a / Hg = 140°)
K = permeability to air, millidarcies
ϕ = porosity, fraction.

The factor "0.2166" is used to cancel the units and make "J" dimensionless.

The conversions to the other capillary pressure systems were calculated using the example formula:

$$\text{air/brine} = \frac{(T * \cos \Phi)_{a/b}}{(T * \cos \Phi)_{a/Hg}}$$

where T = interfacial tension (a/b = 72, a/o = 24, o/b = 48, and a/Hg = 485) dynes/cm
Φ = contact angle (a/b and a/o = 0°, o/b = 30°, and a/Hg = 140°).

SUMMARY OF RESULTS

The total percentage of pore space invaded by mercury at the maximum injection pressure of 2000 psia ranged from 44.6 to 92.0 percent of pore space. Though additional evidence would be needed to understand why, there is a definite trend of percentage invasion with depth over at least much of the depth interval represented. Invasion of mercury increases with depth from the first sample, 62 (2298.6 feet) to sample 224 (2460.6 feet). The percentage of invasion then increases over the next few samples to 236 (2472.6 feet), then decreases again to the lowest depth. It is not understood at this time why so little (44.6 percent) of the pore space of sample 284 (2520.6 feet) was invaded at the maximum injection pressure. Permeability and porosity are both lower than what they were for the full, 1.5 inch diameter sample. The apparent threshold pressure ranges from a low of 6 to 9 psia for sample 284 (another anomaly) to 160 to 180 psia for sample 224 (2460.6 feet). The median pore throat radius ranges (visual inspection of graphs) from 1.5 to 0.06 microns.

CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :HERRINGTON
Well :JONES G.U.B#3HI

Sample I.D. : 62
Porosity, percent : 12.4
Permeability to Air, md: 0.13

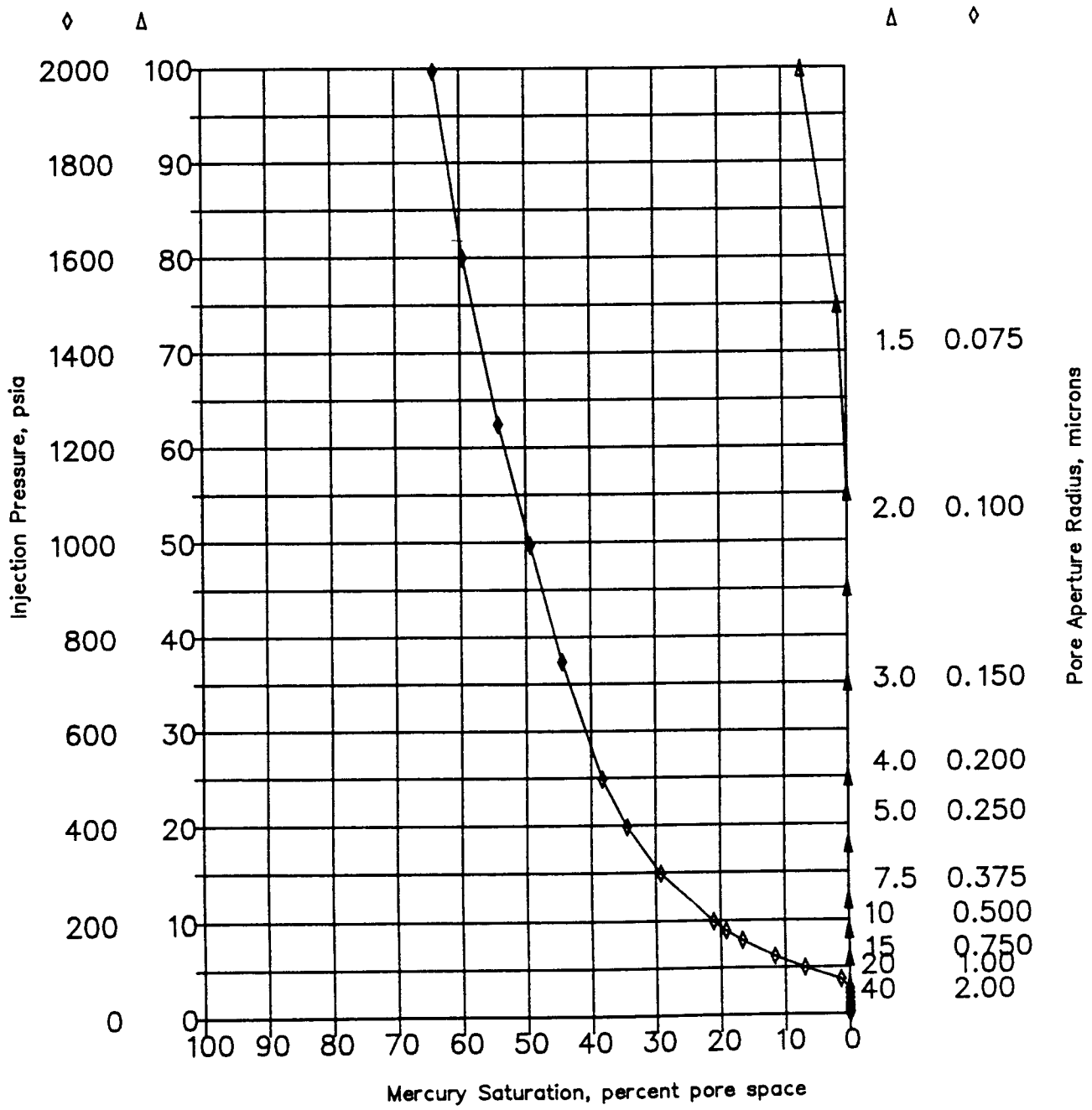
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.820	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.410	0.000	0.6	0.2	0.4
6.0	0.0	100.0	18.235	0.000	1.2	0.4	0.8
9.0	0.0	100.0	12.191	0.001	1.7	0.6	1.2
12.0	0.0	100.0	9.125	0.001	2.3	0.8	1.5
17.9	0.0	100.0	6.092	0.001	3.5	1.2	2.3
24.9	0.0	100.0	4.383	0.001	4.8	1.6	3.2
35.1	0.0	100.0	3.116	0.002	6.8	2.3	4.5
45.1	0.0	100.0	2.423	0.003	8.7	2.9	5.8
55.0	0.0	100.0	1.985	0.003	10.7	3.6	7.1
74.9	1.4	98.6	1.458	0.004	14.5	4.8	9.7
99.9	7.0	93.0	1.094	0.006	19.4	6.5	12.9
124.5	11.6	88.4	0.877	0.007	24.1	8.0	16.1
159.5	16.6	83.4	0.685	0.010	30.9	10.3	20.6
179.3	19.1	80.9	0.609	0.011	34.8	11.6	23.2
199.2	21.1	78.9	0.548	0.012	38.6	12.9	25.7
299.4	29.2	70.8	0.365	0.018	58.0	19.3	38.7
397.8	34.4	65.6	0.275	0.024	77.1	25.7	51.4
499.4	38.3	61.7	0.219	0.030	96.8	32.3	64.5
748.7	44.5	55.5	0.146	0.045	145.1	48.4	96.7
995.2	49.3	50.7	0.110	0.060	192.9	64.3	128.6
1249.3	54.1	45.9	0.087	0.075	242.1	80.7	161.4
1599.9	59.5	40.5	0.068	0.096	310.0	103.3	206.7
1994.1	64.0	36.0	0.055	0.119	386.4	128.8	257.6

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: HERRINGTON
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 62
SAMPLE DEPTH, feet: 2298.6
PERMEABILITY TO AIR, md: 0.13
POROSITY, percent: 12.4



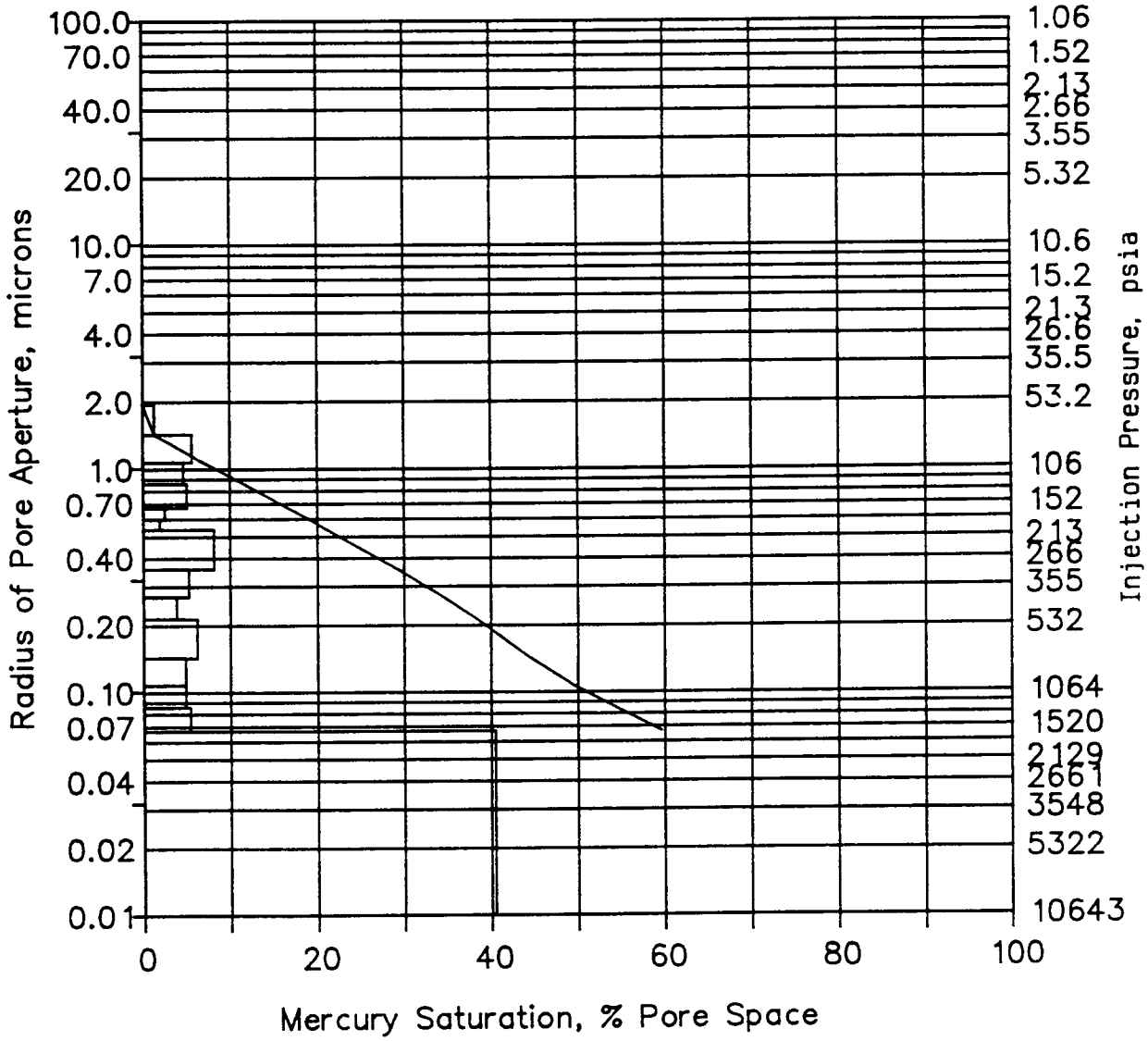
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: HERRINGTON
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 62
SAMPLE DEPTH, feet: 2298.6
PERMEABILITY TO AIR, md: 0.13
POROSITY, percent: 12.4



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :HERRINGTON
Well :JONES G.U. B#3HI

Sample I.D. : 63
Porosity, percent : 19.8
Permeability to Air, md: 7.8

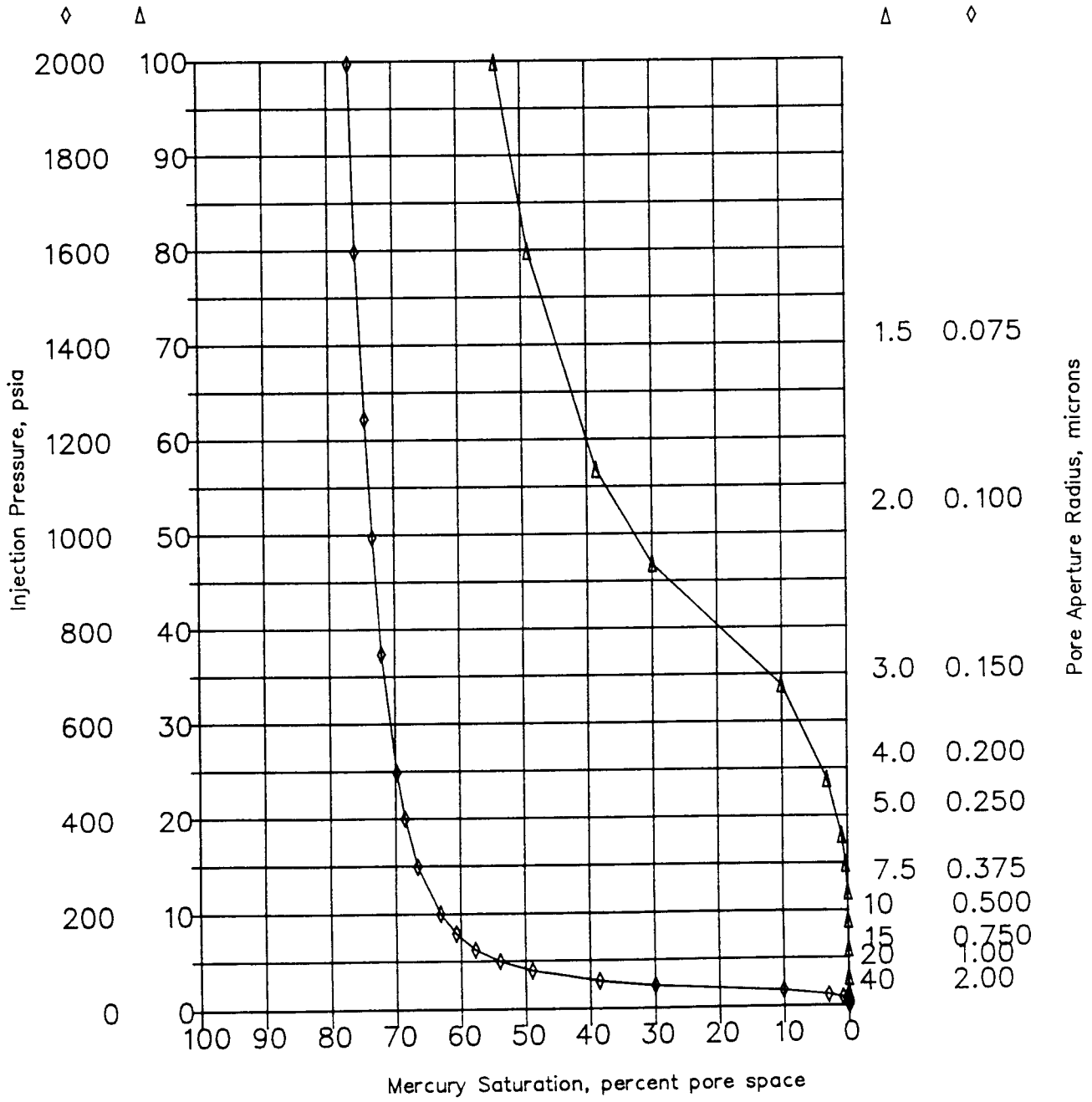
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.820	0.001	0.3	0.1	0.2
3.0	0.0	100.0	36.778	0.001	0.6	0.2	0.4
6.0	0.0	100.0	18.266	0.002	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.003	1.7	0.6	1.2
12.0	0.0	100.0	9.141	0.004	2.3	0.8	1.5
15.0	0.3	99.7	7.306	0.005	2.9	1.0	1.9
18.0	0.9	99.1	6.085	0.007	3.5	1.2	2.3
23.9	3.2	96.8	4.566	0.009	4.6	1.5	3.1
34.0	10.1	89.9	3.216	0.012	6.6	2.2	4.4
46.9	30.0	70.0	2.331	0.017	9.1	3.0	6.1
56.9	38.6	61.4	1.921	0.021	11.0	3.7	7.3
80.0	49.0	51.0	1.366	0.029	15.5	5.2	10.3
99.9	53.9	46.1	1.094	0.037	19.4	6.5	12.9
124.5	57.8	42.2	0.877	0.046	24.1	8.0	16.1
159.3	60.7	39.3	0.686	0.058	30.9	10.3	20.6
200.6	63.1	36.9	0.544	0.074	38.9	13.0	25.9
299.7	66.6	33.4	0.364	0.110	58.1	19.4	38.7
401.5	68.5	31.5	0.272	0.147	77.8	25.9	51.9
499.3	69.8	30.2	0.219	0.183	96.8	32.3	64.5
748.3	72.0	28.0	0.146	0.274	145.0	48.3	96.7
996.0	73.4	26.6	0.110	0.365	193.0	64.3	128.7
1245.3	74.4	25.6	0.088	0.456	241.3	80.4	160.9
1598.0	75.8	24.2	0.068	0.586	309.7	103.2	206.5
1994.5	76.7	23.3	0.055	0.731	386.5	128.8	257.7

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: HERRINGTON
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID:	63
SAMPLE DEPTH, feet:	2299.6
PERMEABILITY TO AIR, md:	7.8
POROSITY, percent:	19.8



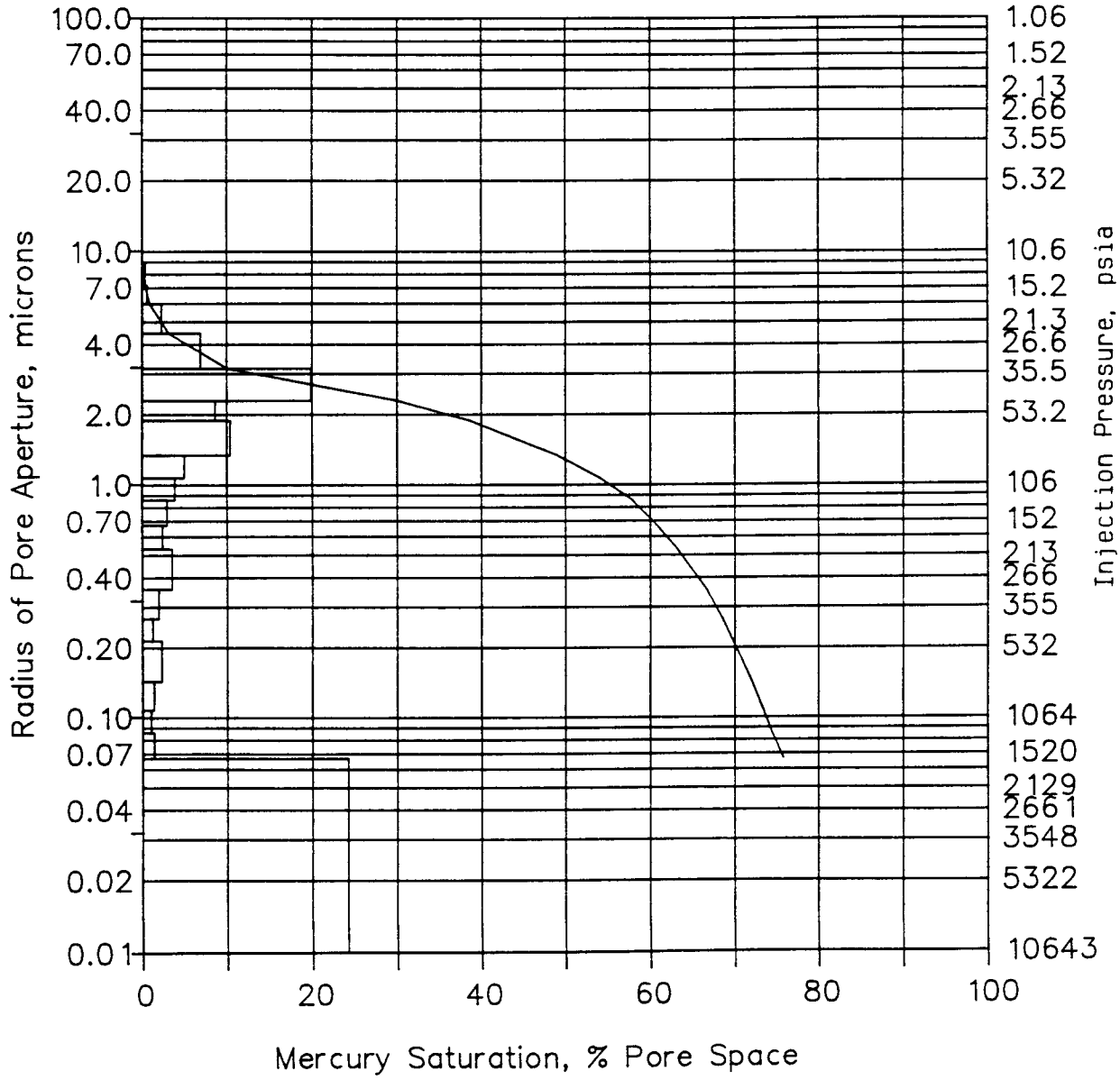
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL : JONES G.U. B#3HI
FORMATION: HERRINGTON
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID:	63
SAMPLE DEPTH, feet:	2299.6
PERMEABILITY TO AIR, md:	7.8
POROSITY, percent:	19.8



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :HERRINGTON
Well :JONES G.U. B#3HI

Sample I.D. : 67
Porosity, percent : 20.4
Permeability to Air, md: 17.

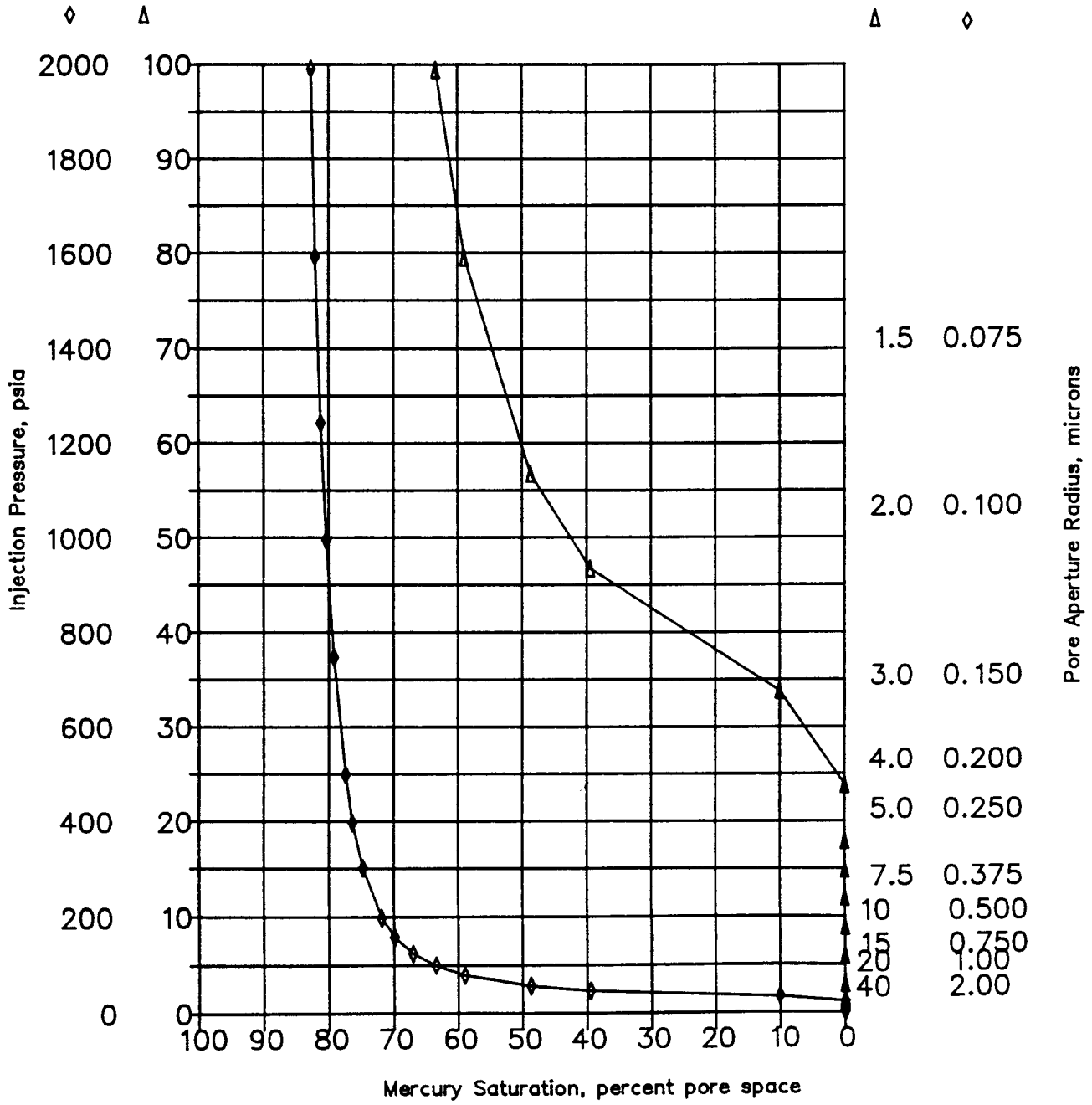
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	71.862	0.001	0.3	0.1	0.2
3.0	0.0	100.0	36.410	0.002	0.6	0.2	0.4
6.0	0.0	100.0	18.266	0.003	1.2	0.4	0.8
9.0	0.0	100.0	12.191	0.005	1.7	0.6	1.2
12.0	0.0	100.0	9.141	0.006	2.3	0.8	1.5
14.9	0.0	100.0	7.316	0.008	2.9	1.0	1.9
18.0	0.0	100.0	6.085	0.010	3.5	1.2	2.3
23.9	0.0	100.0	4.565	0.013	4.6	1.5	3.1
33.9	10.1	89.9	3.221	0.018	6.6	2.2	4.4
46.8	39.5	60.5	2.334	0.025	9.1	3.0	6.0
56.8	48.7	51.3	1.922	0.030	11.0	3.7	7.3
79.6	59.0	41.0	1.372	0.042	15.4	5.1	10.3
99.5	63.4	36.6	1.098	0.053	19.3	6.4	12.9
124.5	67.0	33.0	0.878	0.066	24.1	8.0	16.1
159.3	69.9	30.1	0.686	0.085	30.9	10.3	20.6
199.1	71.9	28.1	0.549	0.106	38.6	12.9	25.7
302.4	74.8	25.2	0.361	0.161	58.6	19.5	39.1
399.0	76.4	23.6	0.274	0.213	77.3	25.8	51.5
500.1	77.4	22.6	0.218	0.267	96.9	32.3	64.6
747.8	79.2	20.8	0.146	0.399	144.9	48.3	96.6
996.9	80.4	19.6	0.110	0.532	193.2	64.4	128.8
1243.7	81.2	18.8	0.088	0.663	241.0	80.3	160.7
1593.1	82.1	17.9	0.069	0.849	308.7	102.9	205.8
1991.0	82.7	17.3	0.055	1.062	385.8	128.6	257.2

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: HERRINGTON
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 67
SAMPLE DEPTH, feet: 2303.6
PERMEABILITY TO AIR, md: 17.
POROSITY, percent: 20.4



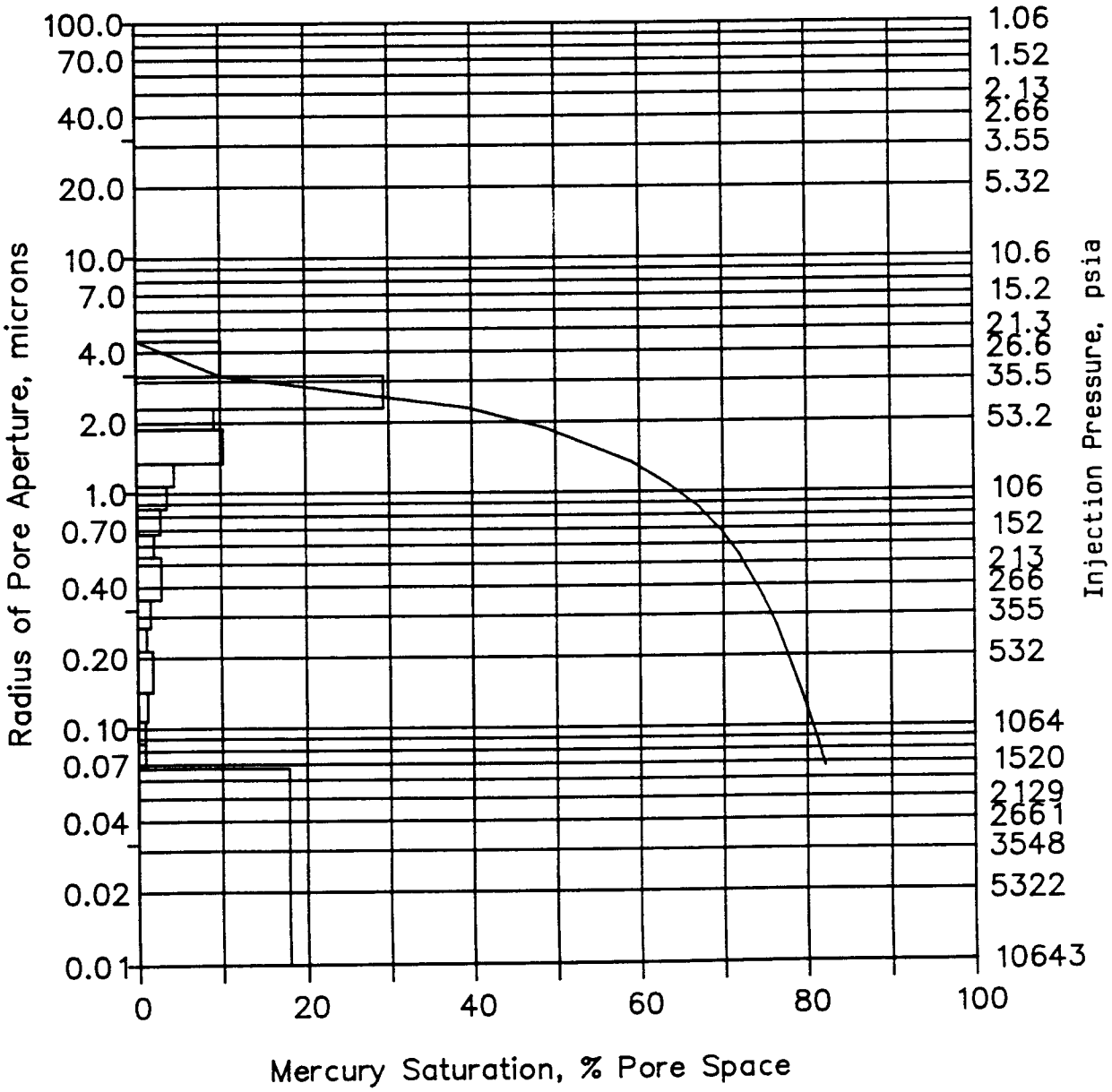
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: HERRINGTON
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 67
SAMPLE DEPTH, feet: 2303.6
PERMEABILITY TO AIR, md: 17.
POROSITY, percent: 20.4



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CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :HERRINGTON
Well :JONES G.U. B#3HI

Sample I.D. : 77
Porosity, percent : 26.3
Permeability to Air, md: 6.0

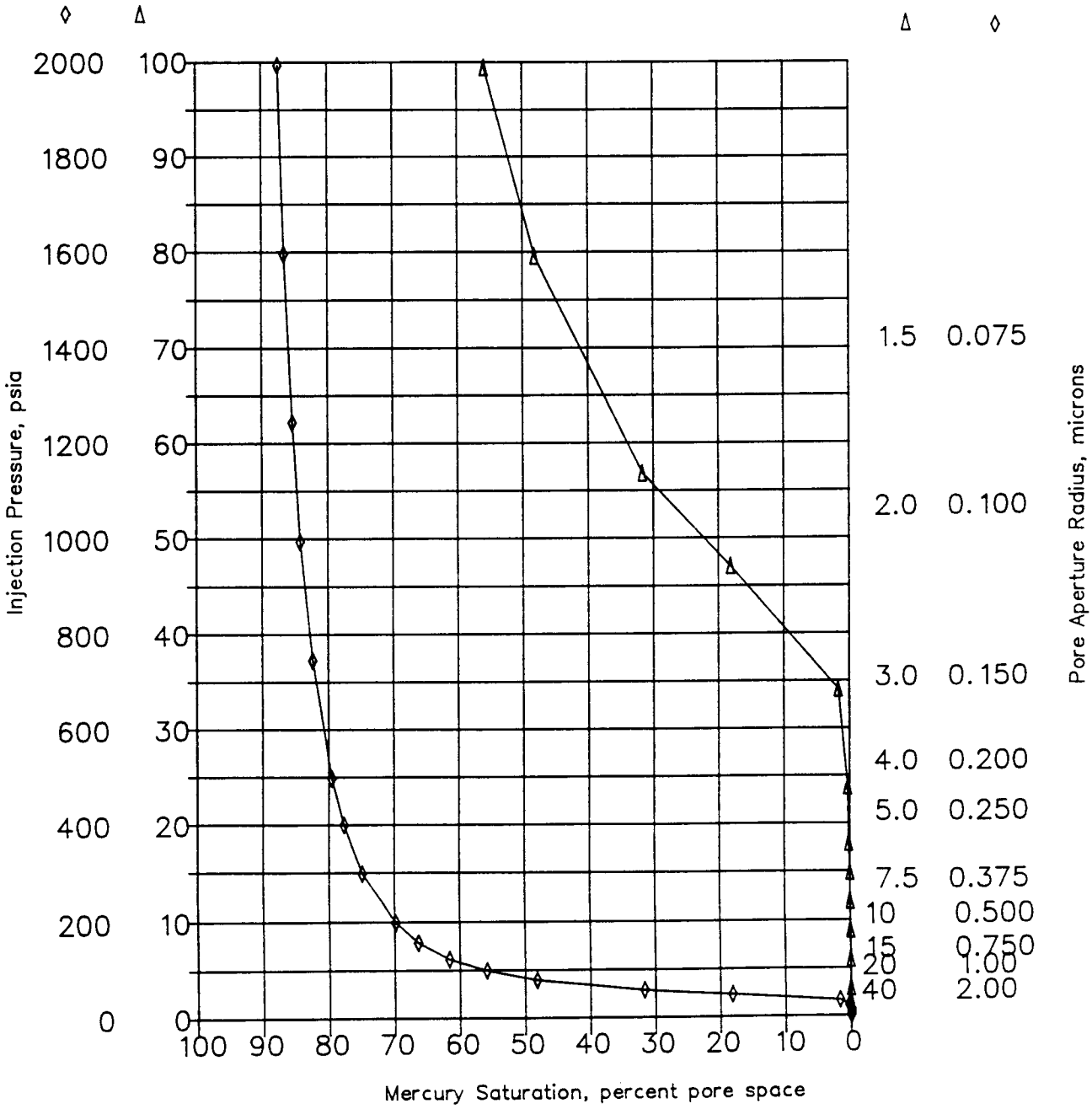
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.820	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.778	0.001	0.6	0.2	0.4
6.0	0.0	100.0	18.266	0.002	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.003	1.7	0.6	1.2
12.0	0.0	100.0	9.141	0.003	2.3	0.8	1.5
15.0	0.0	100.0	7.306	0.004	2.9	1.0	1.9
18.0	0.2	99.8	6.085	0.005	3.5	1.2	2.3
23.9	0.3	99.7	4.566	0.007	4.6	1.5	3.1
34.2	1.8	98.2	3.193	0.010	6.6	2.2	4.4
47.1	18.2	81.8	2.319	0.013	9.1	3.0	6.1
56.9	31.7	68.3	1.919	0.016	11.0	3.7	7.4
79.7	48.2	51.8	1.371	0.022	15.4	5.1	10.3
99.5	55.9	44.1	1.098	0.028	19.3	6.4	12.9
124.0	61.6	38.4	0.881	0.035	24.0	8.0	16.0
158.7	66.4	33.6	0.688	0.044	30.8	10.3	20.5
200.0	69.8	30.2	0.546	0.056	38.8	12.9	25.8
299.1	74.9	25.1	0.365	0.083	58.0	19.3	38.6
400.7	77.7	22.3	0.273	0.112	77.6	25.9	51.8
498.5	79.5	20.5	0.219	0.139	96.6	32.2	64.4
747.1	82.4	17.6	0.146	0.208	144.8	48.3	96.5
995.3	84.2	15.8	0.110	0.278	192.9	64.3	128.6
1244.6	85.3	14.7	0.088	0.347	241.2	80.4	160.8
1597.2	86.6	13.4	0.068	0.446	309.5	103.2	206.3
1993.7	87.5	12.5	0.055	0.556	386.4	128.8	257.6

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: HERRINGTON
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 77
SAMPLE DEPTH, feet: 2316.6
PERMEABILITY TO AIR, md: 6.0
POROSITY, percent: 26.3



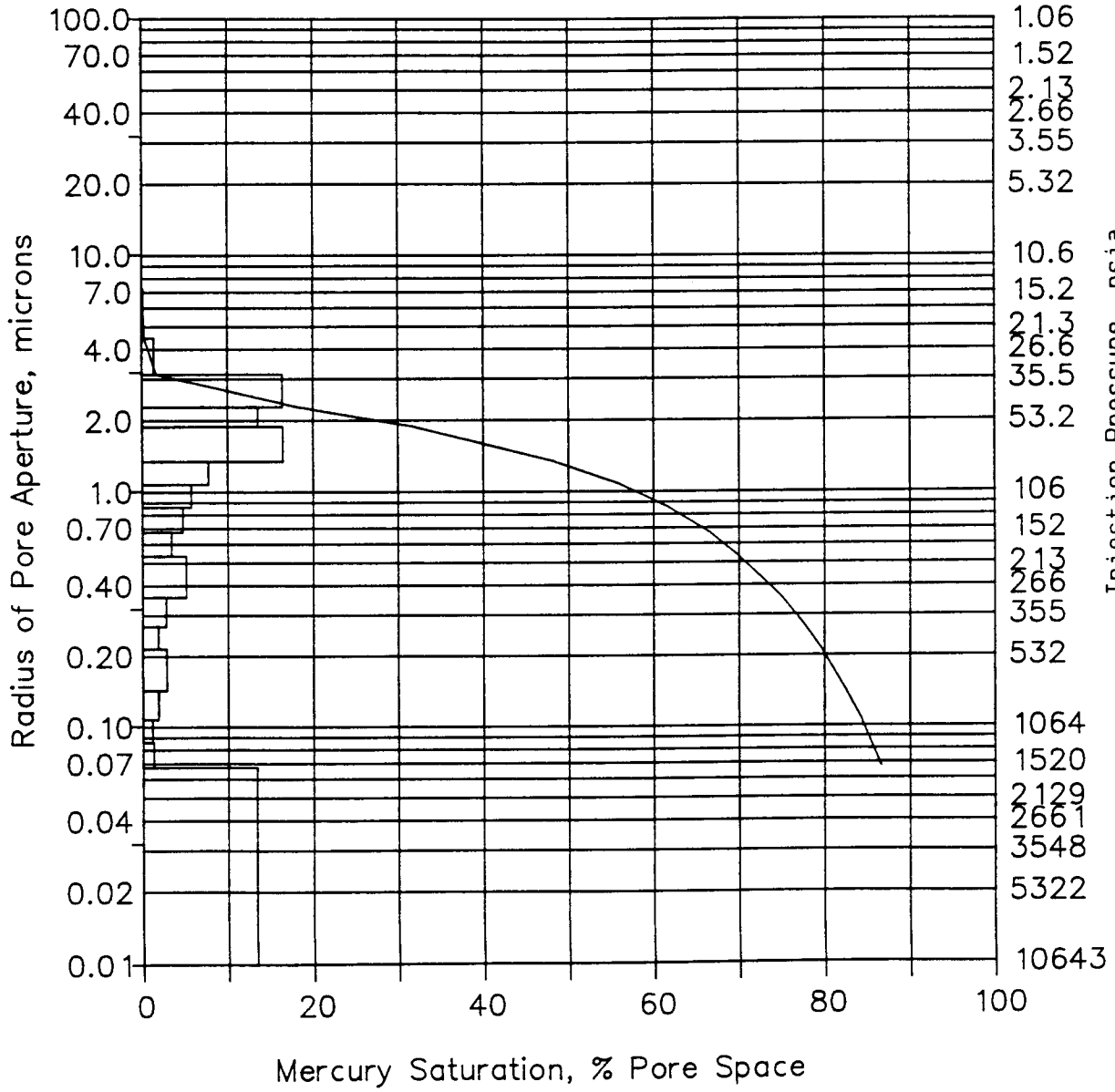
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B3#HI
FORMATION: HERRINGTON
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 77
SAMPLE DEPTH, feet: 2316.6
PERMEABILITY TO AIR, md: 6.0
POROSITY, percent: 26.3



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :UPPER KRIDER
Well :JONES G.U. B#3HI

Sample I.D. : 82
Porosity, percent : 20.9
Permeability to Air, md: 3.3

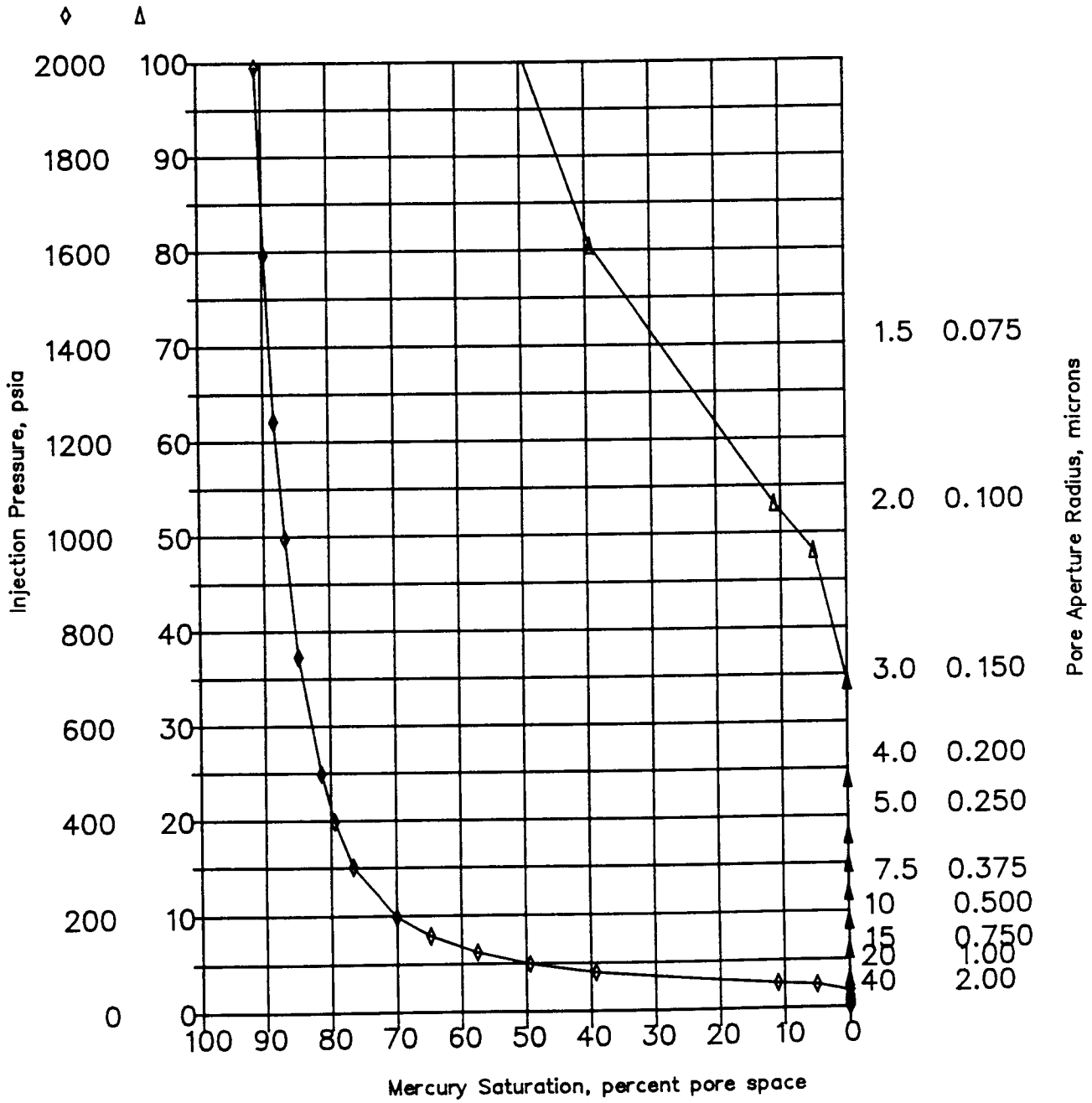
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	71.862	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.410	0.001	0.6	0.2	0.4
6.0	0.0	100.0	18.266	0.001	1.2	0.4	0.8
9.0	0.0	100.0	12.191	0.002	1.7	0.6	1.2
12.0	0.0	100.0	9.141	0.003	2.3	0.8	1.5
14.9	0.0	100.0	7.316	0.003	2.9	1.0	1.9
18.0	0.0	100.0	6.085	0.004	3.5	1.2	2.3
23.9	0.0	100.0	4.565	0.006	4.6	1.5	3.1
34.3	0.0	100.0	3.181	0.008	6.7	2.2	4.4
48.2	5.0	95.0	2.266	0.011	9.3	3.1	6.2
53.2	11.0	89.0	2.052	0.012	10.3	3.4	6.9
80.5	39.3	60.7	1.357	0.019	15.6	5.2	10.4
100.2	49.4	50.6	1.090	0.023	19.4	6.5	12.9
125.0	57.5	42.5	0.874	0.029	24.2	8.1	16.1
159.6	64.8	35.2	0.684	0.037	30.9	10.3	20.6
199.4	70.0	30.0	0.548	0.046	38.6	12.9	25.8
302.5	76.6	23.4	0.361	0.070	58.6	19.5	39.1
399.0	79.4	20.6	0.274	0.093	77.3	25.8	51.6
500.0	81.4	18.6	0.218	0.116	96.9	32.3	64.6
747.7	84.9	15.1	0.146	0.174	144.9	48.3	96.6
997.0	86.8	13.2	0.110	0.231	193.2	64.4	128.8
1243.7	88.4	11.6	0.088	0.289	241.0	80.3	160.7
1592.9	89.8	10.2	0.069	0.370	308.7	102.9	205.8
1990.7	91.0	9.0	0.055	0.462	385.8	128.6	257.2

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL : JONES G.U. B#3HI
FORMATION : UPPER KRIDER
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID:	82
SAMPLE DEPTH, feet:	2318.6
PERMEABILITY TO AIR, md:	3.3
POROSITY, percent:	20.9



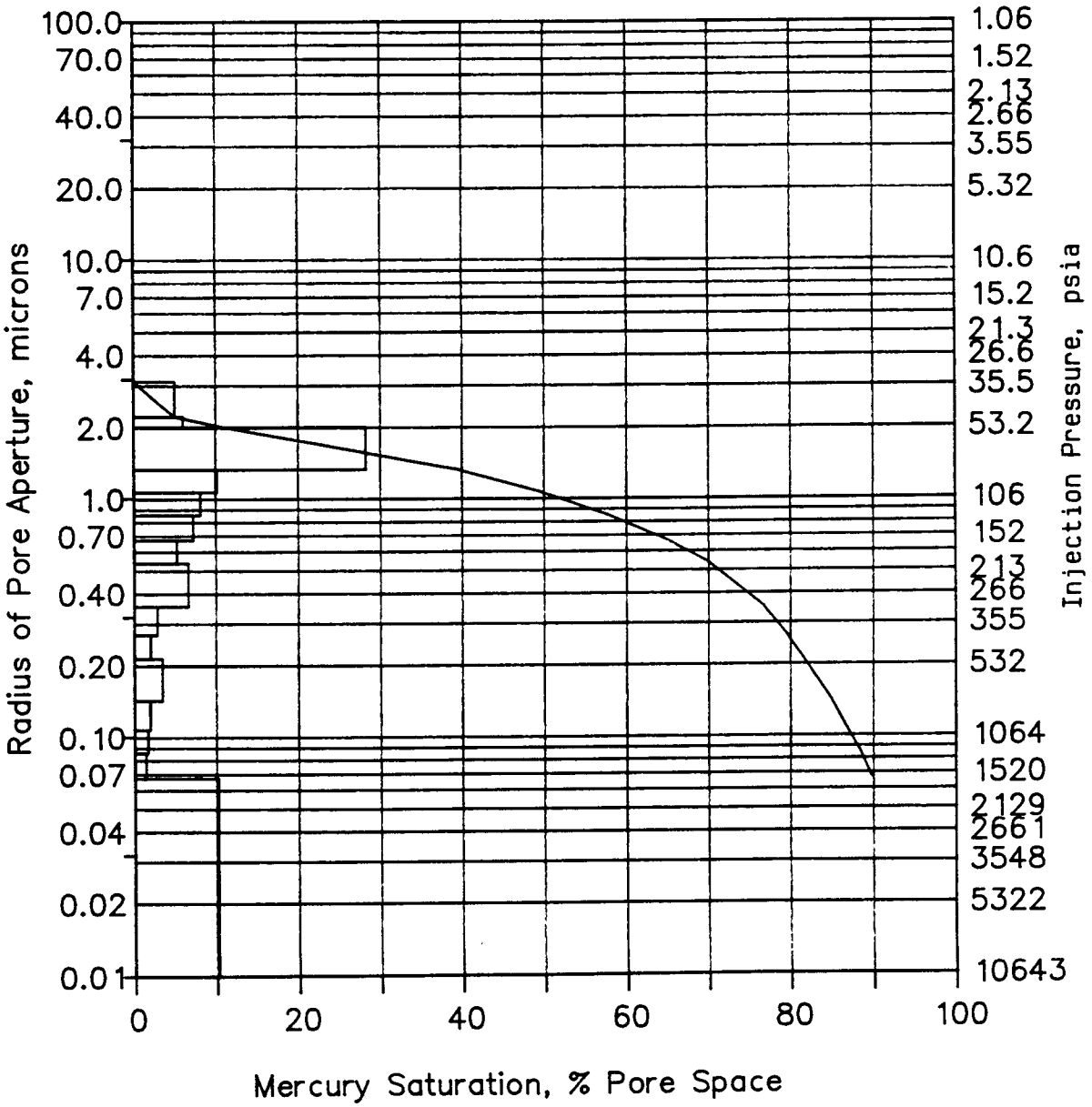
Core Laboratories

File DBP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: UPPER KRIDER
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 82
SAMPLE DEPTH, feet: 2318.6
PERMEABILITY TO AIR, md: 3.3
POROSITY, percent: 20.9



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :UPPER KRIDER
Well :JONES G.U. B#3HI

Sample I.D. : 88
Porosity, percent : 17.5
Permeability to Air, md: 1.9

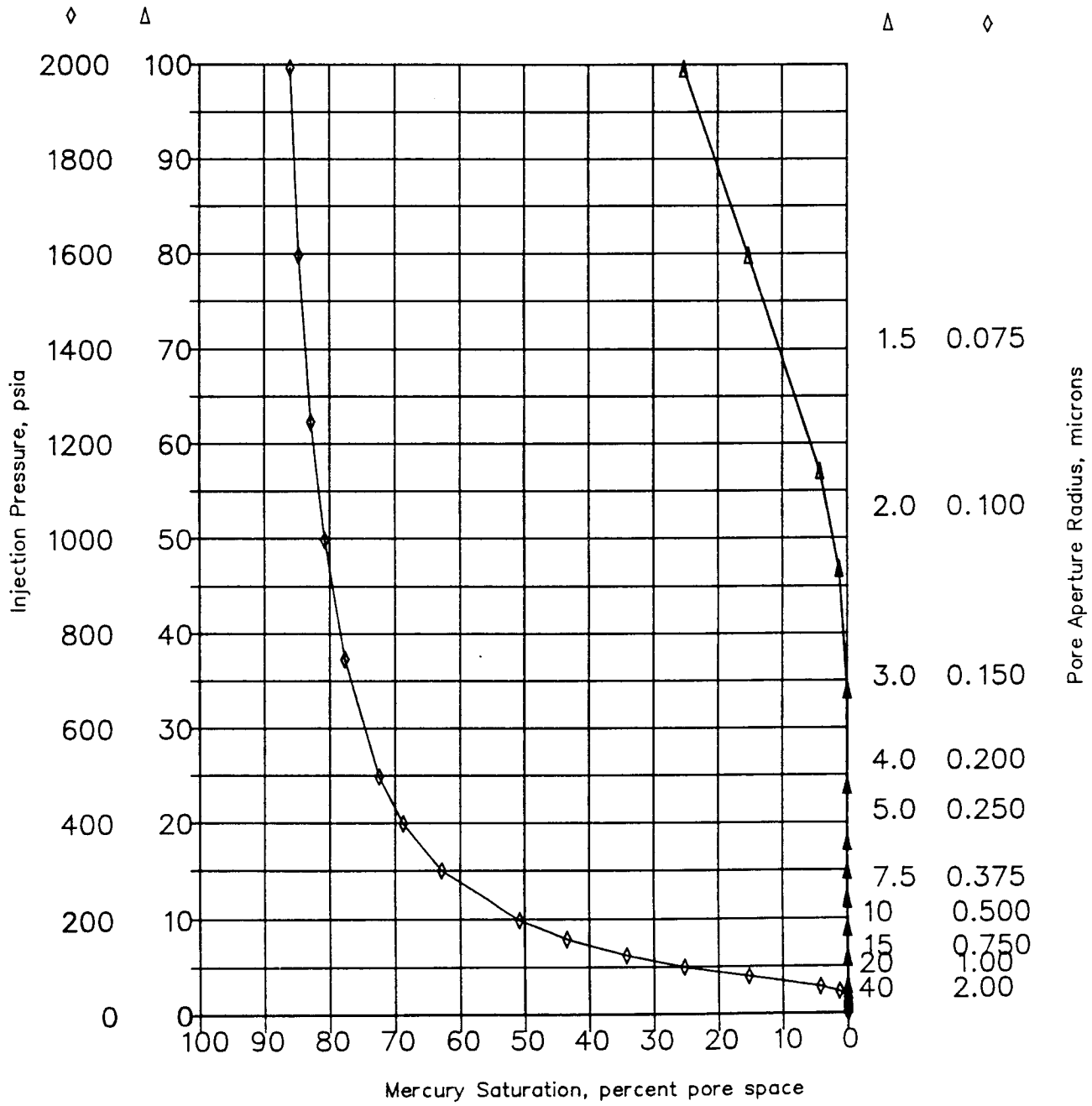
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	73.804	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.532	0.001	0.6	0.2	0.4
6.0	0.0	100.0	18.297	0.001	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.002	1.7	0.6	1.2
12.0	0.0	100.0	9.141	0.002	2.3	0.8	1.5
15.0	0.0	100.0	7.306	0.003	2.9	1.0	1.9
18.0	0.0	100.0	6.085	0.003	3.5	1.2	2.3
23.9	0.0	100.0	4.566	0.005	4.6	1.5	3.1
34.0	0.0	100.0	3.213	0.007	6.6	2.2	4.4
46.9	1.3	98.7	2.331	0.009	9.1	3.0	6.1
57.1	4.2	95.8	1.912	0.011	11.1	3.7	7.4
79.9	15.3	84.7	1.368	0.015	15.5	5.2	10.3
99.6	25.3	74.7	1.097	0.019	19.3	6.4	12.9
124.6	34.3	65.7	0.877	0.024	24.1	8.0	16.1
159.6	43.5	56.5	0.684	0.031	30.9	10.3	20.6
199.1	50.9	49.1	0.549	0.038	38.6	12.9	25.7
301.5	62.9	37.1	0.362	0.058	58.4	19.5	38.9
399.6	68.8	31.2	0.273	0.077	77.4	25.8	51.6
499.2	72.5	27.5	0.219	0.096	96.7	32.2	64.5
747.5	77.7	22.3	0.146	0.144	144.9	48.3	96.6
998.9	80.8	19.2	0.109	0.192	193.6	64.5	129.0
1247.5	82.9	17.1	0.088	0.240	241.8	80.6	161.2
1597.7	84.7	15.3	0.068	0.307	309.6	103.2	206.4
1993.4	86.0	14.0	0.055	0.384	386.3	128.8	257.5

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: **UPPER KRIDER**
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 88
SAMPLE DEPTH, feet: 2324.6
PERMEABILITY TO AIR, md: 1.9
POROSITY, percent: 17.5



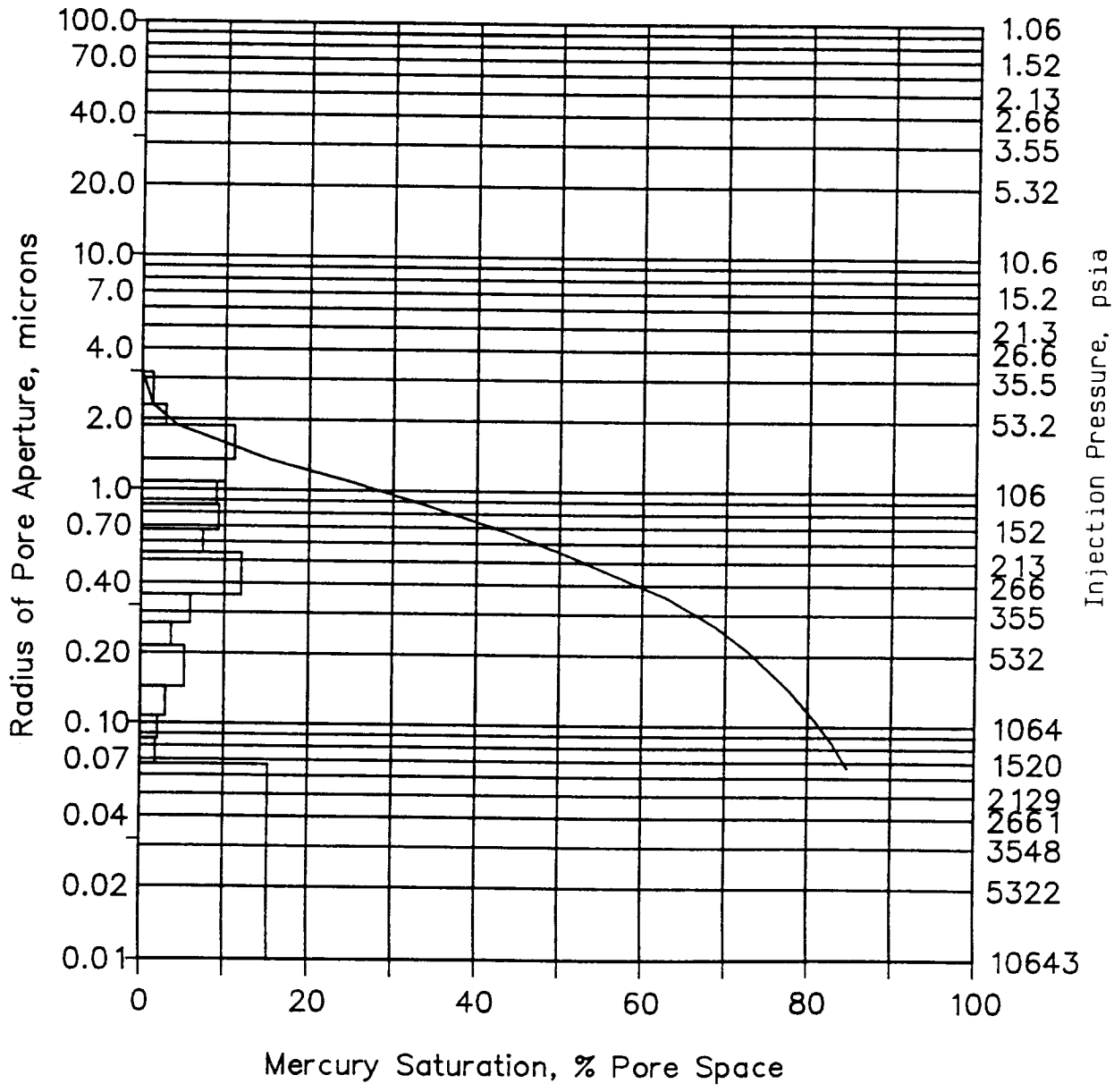
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: **UPPER KRIDER**
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID:	88
SAMPLE DEPTH, feet:	2324.6
PERMEABILITY TO AIR, md:	1.9
POROSITY, percent:	17.5



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :UPPER KRIDER
Well :JONER G.U. B#3HI

Sample I.D. : 90
Porosity, percent : 14.5
Permeability to Air, md: 0.23

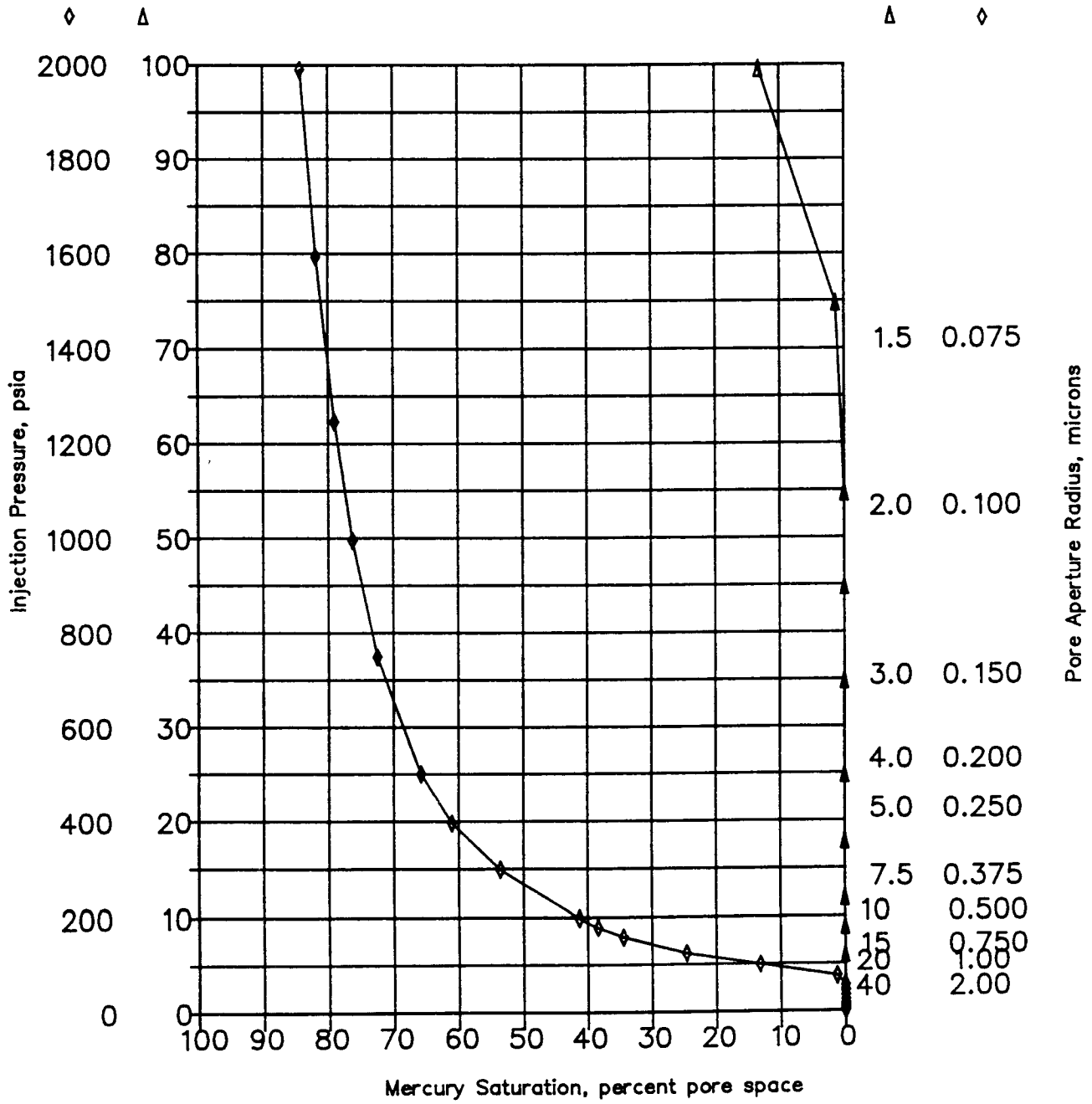
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	71.862	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.289	0.000	0.6	0.2	0.4
6.0	0.0	100.0	18.235	0.000	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.001	1.7	0.6	1.2
12.0	0.0	100.0	9.118	0.001	2.3	0.8	1.5
17.9	0.0	100.0	6.089	0.001	3.5	1.2	2.3
25.0	0.0	100.0	4.376	0.002	4.8	1.6	3.2
34.9	0.0	100.0	3.128	0.003	6.8	2.3	4.5
44.9	0.0	100.0	2.435	0.003	8.7	2.9	5.8
54.8	0.0	100.0	1.993	0.004	10.6	3.5	7.1
74.9	1.3	98.7	1.459	0.006	14.5	4.8	9.7
99.6	13.2	86.8	1.097	0.007	19.3	6.4	12.9
124.8	24.7	75.3	0.875	0.009	24.2	8.1	16.1
159.5	34.5	65.5	0.685	0.012	30.9	10.3	20.6
179.5	38.4	61.6	0.608	0.013	34.8	11.6	23.2
199.4	41.3	58.7	0.548	0.015	38.6	12.9	25.8
299.7	53.6	46.4	0.364	0.022	58.1	19.4	38.7
397.9	61.1	38.9	0.275	0.029	77.1	25.7	51.4
502.0	65.8	34.2	0.218	0.037	97.3	32.4	64.8
750.7	72.5	27.5	0.146	0.056	145.5	48.5	97.0
996.1	76.3	23.7	0.110	0.074	193.0	64.3	128.7
1246.7	79.0	21.0	0.088	0.092	241.6	80.5	161.1
1594.3	81.8	18.2	0.069	0.118	309.0	103.0	206.0
1990.6	84.3	15.7	0.055	0.147	385.8	128.6	257.2

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: UPPER KRIDER
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 90
SAMPLE DEPTH, feet: 2326.6
PERMEABILITY TO AIR, md: 0.233
POROSITY, percent: 14.5



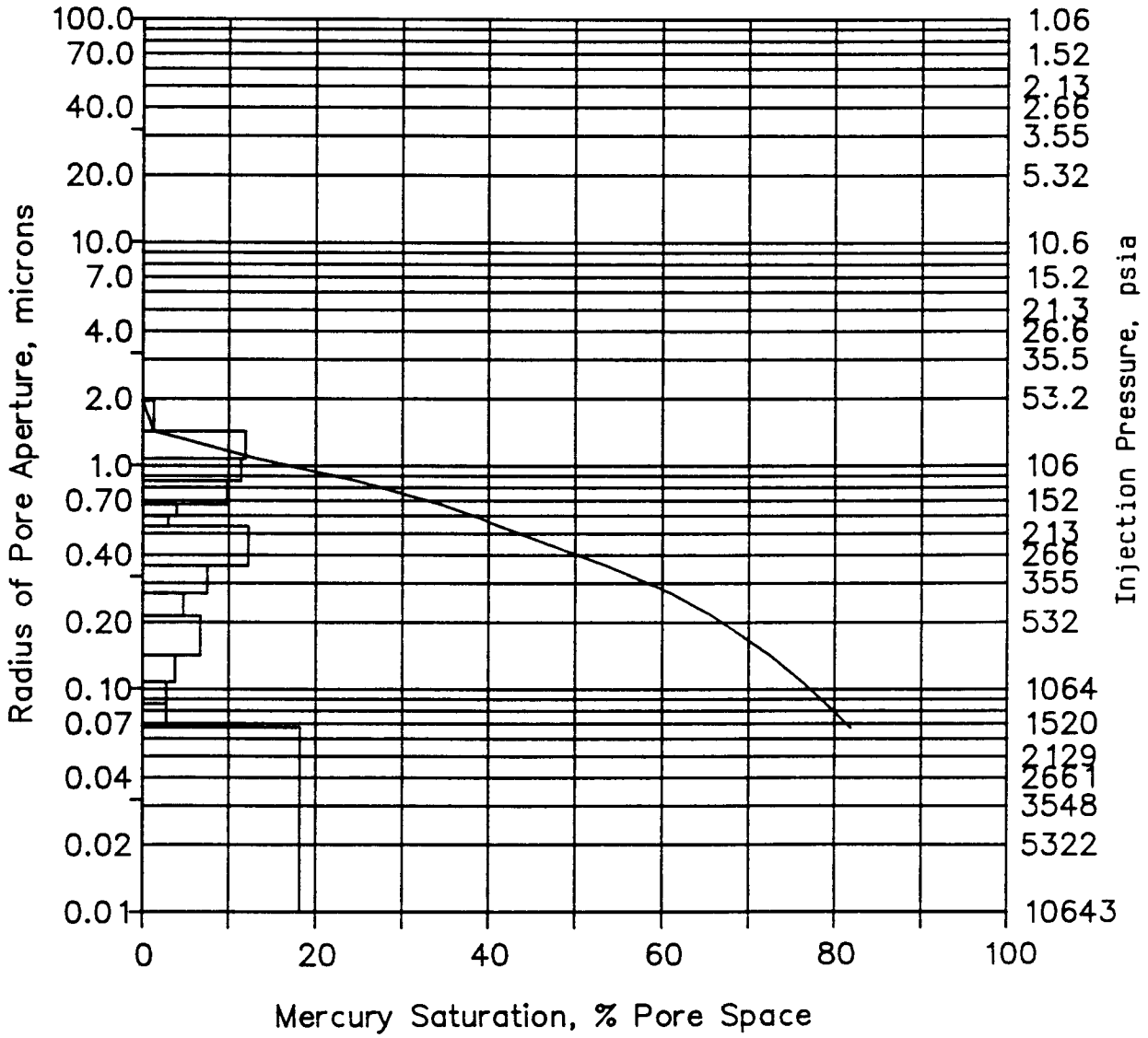
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: UPPER KRIDER
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 90
SAMPLE DEPTH, feet: 2326.6
PERMEABILITY TO AIR, md: 0.233
POROSITY, percent: 14.5



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :LOWER KRIDER
Well :JONES G.U.B#3HI

Sample I.D. : 121
Porosity, percent : 24.0
Permeability to Air, md: 11.

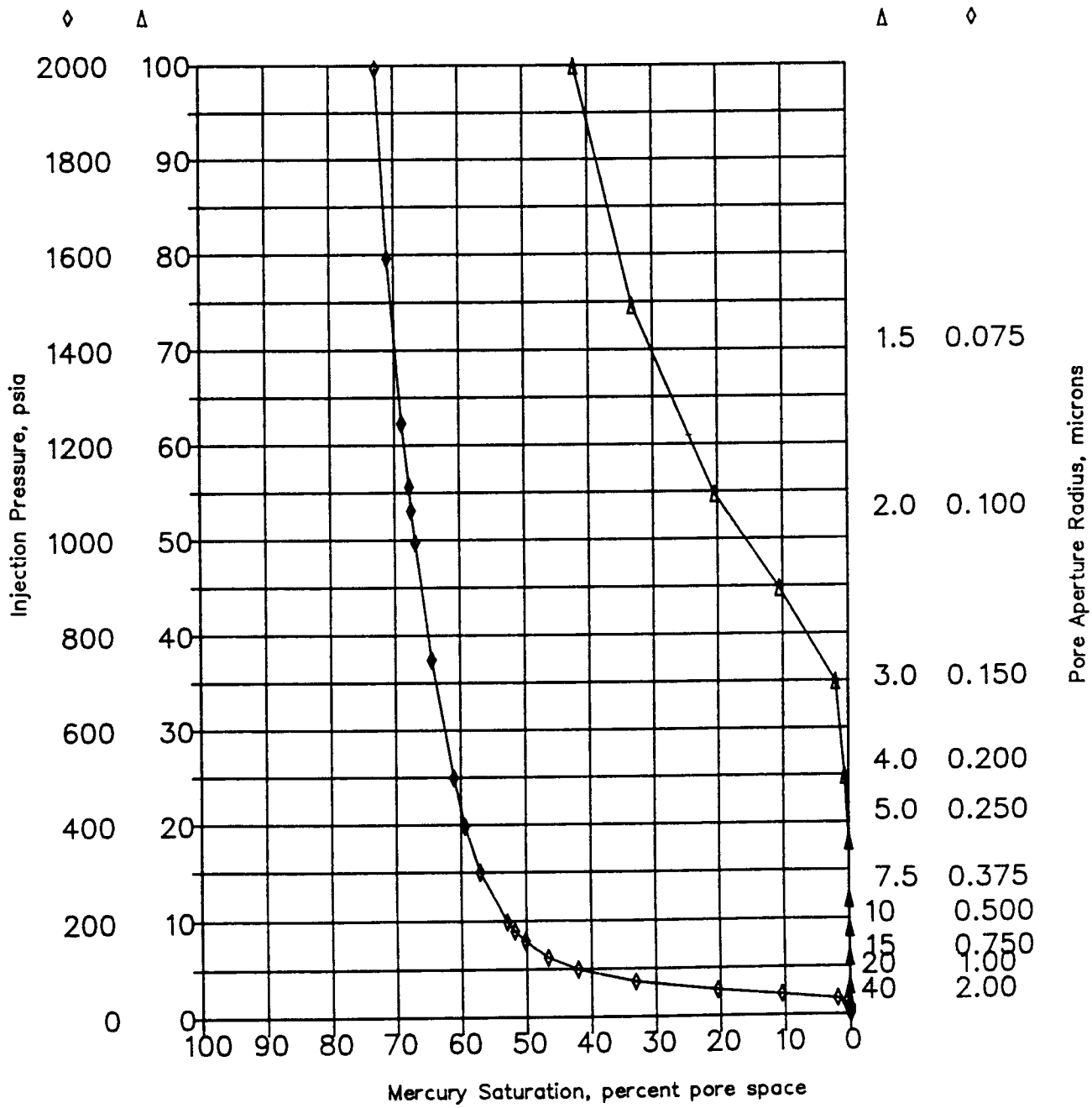
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.338	0.001	0.3	0.1	0.2
3.0	0.0	100.0	36.169	0.001	0.6	0.2	0.4
6.0	0.0	100.0	18.327	0.002	1.2	0.4	0.8
9.0	0.0	100.0	12.191	0.004	1.7	0.6	1.2
12.0	0.0	100.0	9.133	0.005	2.3	0.8	1.5
18.0	0.0	100.0	6.085	0.007	3.5	1.2	2.3
24.9	0.6	99.4	4.383	0.010	4.8	1.6	3.2
35.0	2.0	98.0	3.122	0.014	6.8	2.3	4.5
44.8	10.5	89.5	2.437	0.018	8.7	2.9	5.8
54.8	20.5	79.5	1.994	0.022	10.6	3.5	7.1
74.6	33.1	66.9	1.463	0.030	14.5	4.8	9.6
99.9	42.1	57.9	1.093	0.040	19.4	6.5	12.9
124.3	46.6	53.4	0.878	0.050	24.1	8.0	16.1
159.4	50.2	49.8	0.685	0.064	30.9	10.3	20.6
179.3	51.8	48.2	0.609	0.072	34.7	11.6	23.2
199.3	52.9	47.1	0.548	0.080	38.6	12.9	25.7
301.4	57.1	42.9	0.362	0.120	58.4	19.5	38.9
398.2	59.4	40.6	0.274	0.159	77.2	25.7	51.4
499.9	61.1	38.9	0.218	0.199	96.9	32.3	64.6
749.2	64.4	35.6	0.146	0.299	145.2	48.4	96.8
995.7	66.9	33.1	0.110	0.397	193.0	64.3	128.6
1062.9	67.5	32.5	0.103	0.424	206.0	68.7	137.3
1113.6	67.7	32.3	0.098	0.444	215.8	71.9	143.9
1247.3	68.9	31.1	0.088	0.498	241.7	80.6	161.1
1593.4	71.0	29.0	0.069	0.636	308.8	102.9	205.9
1993.0	72.8	27.2	0.055	0.795	386.2	128.7	257.5

File DRP-9.1226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: LOWER KRIDER
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 121
SAMPLE DEPTH, feet: 2357.6
PERMEABILITY TO AIR, md: 11.
POROSITY, percent: 24.0



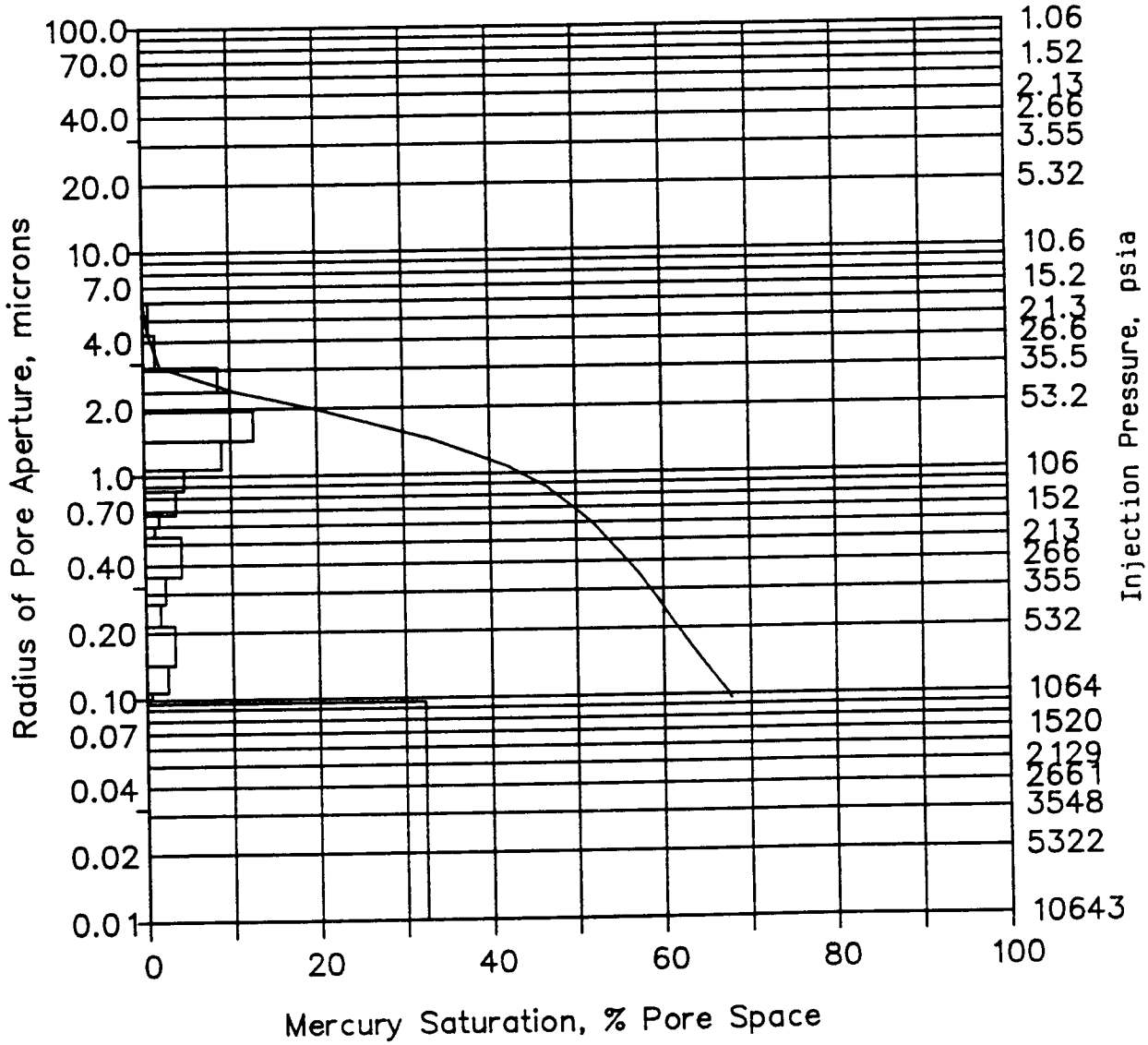
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION
WELL: JONES G.U. B#3HI
FORMATION: LOWER KRIDER
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 121
SAMPLE DEPTH, feet: 2357.6
PERMEABILITY TO AIR, md: 11.
POROSITY, percent: 24.0



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :WINFIELD
Well :JONES G.U.B#3HI

Sample I.D. : 148
Porosity, percent : 14.6
Permeability to Air, md: 0.23

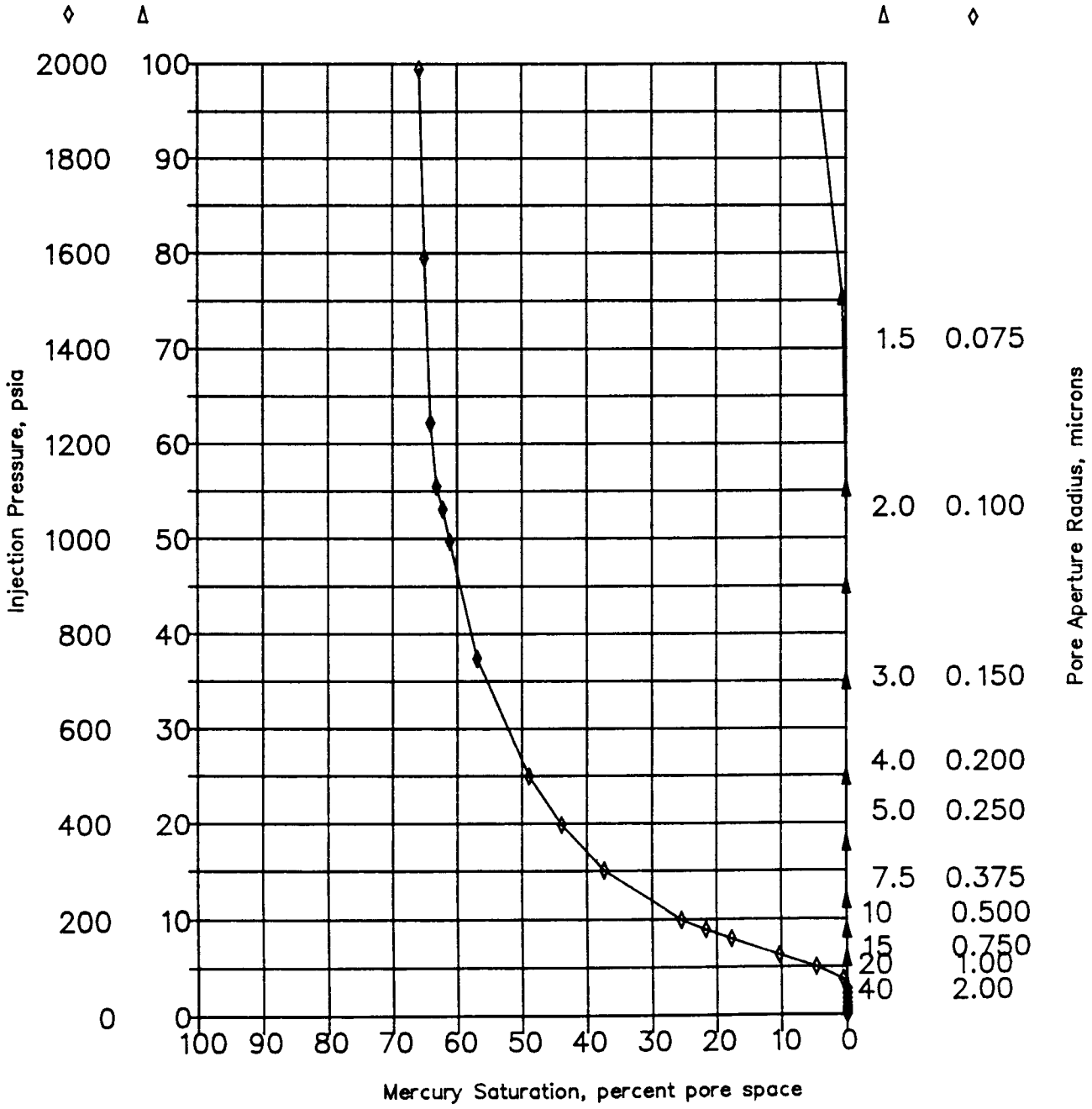
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.338	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.169	0.000	0.6	0.2	0.4
6.0	0.0	100.0	18.327	0.000	1.2	0.4	0.8
9.0	0.0	100.0	12.191	0.001	1.7	0.6	1.2
12.0	0.0	100.0	9.133	0.001	2.3	0.8	1.5
18.0	0.0	100.0	6.085	0.001	3.5	1.2	2.3
24.9	0.0	100.0	4.383	0.002	4.8	1.6	3.2
35.1	0.0	100.0	3.116	0.003	6.8	2.3	4.5
45.1	0.0	100.0	2.421	0.003	8.7	2.9	5.8
55.3	0.0	100.0	1.975	0.004	10.7	3.6	7.1
75.5	0.6	99.4	1.447	0.006	14.6	4.9	9.8
100.9	4.7	95.3	1.082	0.007	19.6	6.5	13.0
125.3	10.4	89.6	0.872	0.009	24.3	8.1	16.2
160.2	17.7	82.3	0.682	0.012	31.1	10.4	20.7
180.1	21.6	78.4	0.607	0.013	34.9	11.6	23.3
200.0	25.4	74.6	0.546	0.015	38.8	12.9	25.8
302.0	37.3	62.7	0.362	0.022	58.5	19.5	39.0
398.6	43.9	56.1	0.274	0.029	77.2	25.7	51.5
500.6	48.9	51.1	0.218	0.037	97.0	32.3	64.7
749.5	56.9	43.1	0.146	0.055	145.2	48.4	96.8
996.0	61.2	38.8	0.110	0.073	193.0	64.3	128.7
1063.1	62.3	37.7	0.103	0.078	206.0	68.7	137.3
1111.2	63.2	36.8	0.098	0.082	215.3	71.8	143.6
1244.7	64.2	35.8	0.088	0.092	241.2	80.4	160.8
1590.8	65.1	34.9	0.069	0.117	308.3	102.8	205.5
1990.4	65.9	34.1	0.055	0.147	385.7	128.6	257.1

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: WINFIELD
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 148
SAMPLE DEPTH, feet: 2384.6
PERMEABILITY TO AIR, md: 0.23
POROSITY, percent: 14.6



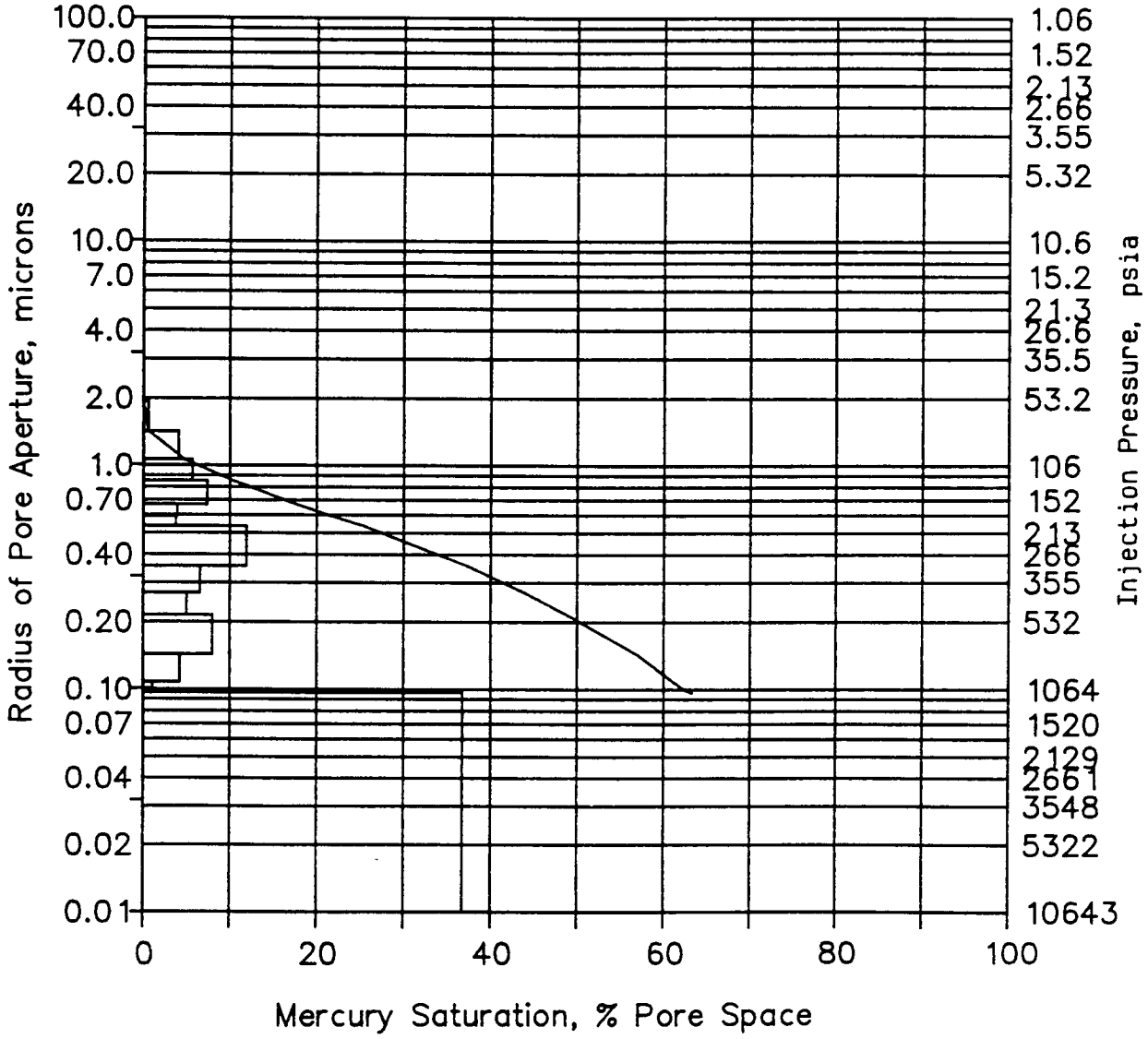
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: WINFIELD
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 148
SAMPLE DEPTH, feet: 2384.6
PERMEABILITY TO AIR, md: 0.23
POROSITY, percent: 14.6



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :WINFIELD
Well :JONES G.U. B#3HI

Sample I.D. : 150
Porosity, percent : 17.5
Permeability to Air, md: 0.89

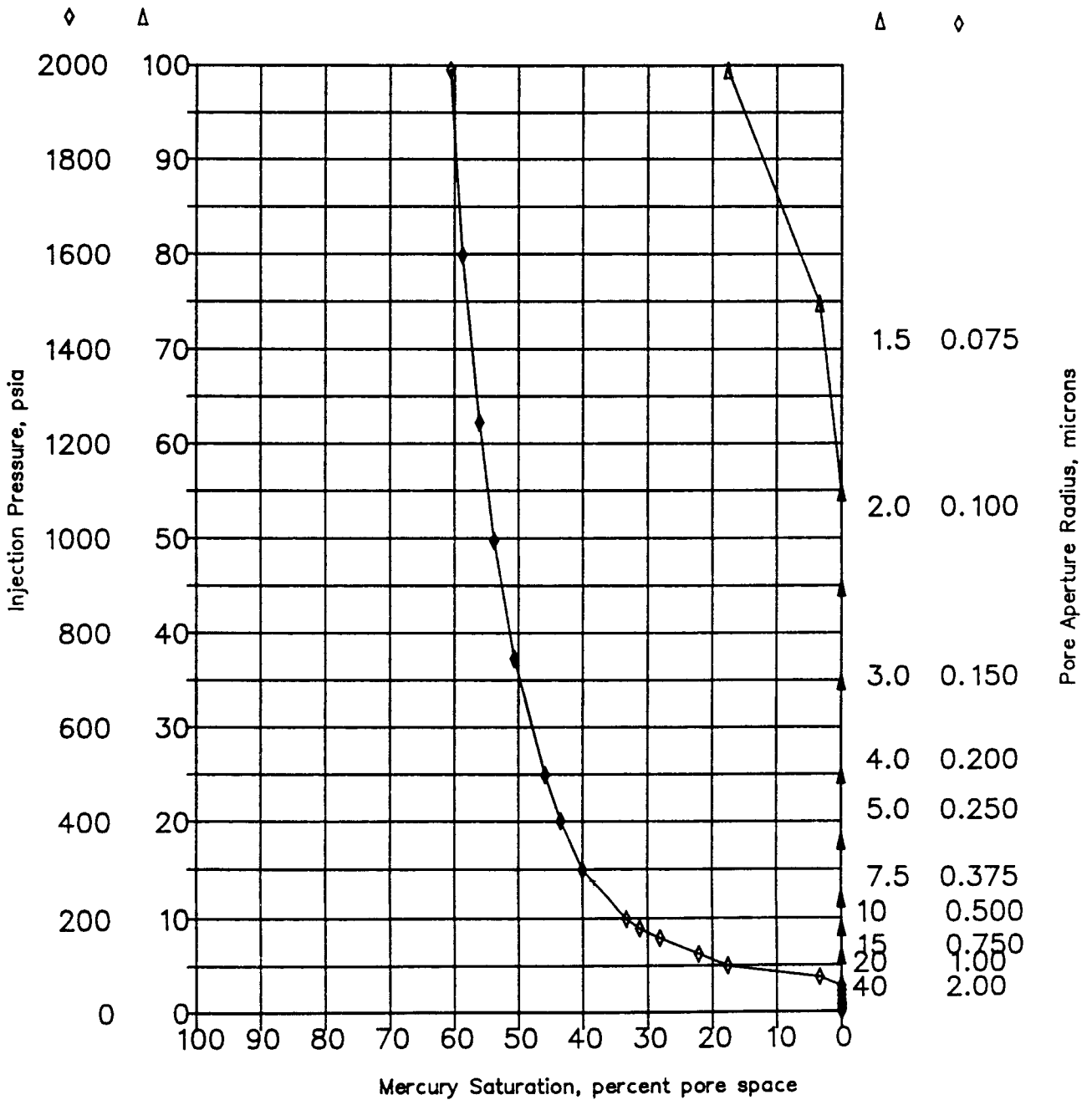
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.338	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.169	0.000	0.6	0.2	0.4
6.0	0.0	100.0	18.327	0.001	1.2	0.4	0.8
9.0	0.0	100.0	12.191	0.001	1.7	0.6	1.2
12.0	0.0	100.0	9.133	0.002	2.3	0.8	1.5
18.0	0.0	100.0	6.085	0.002	3.5	1.2	2.3
24.9	0.0	100.0	4.383	0.003	4.8	1.6	3.2
34.9	0.0	100.0	3.129	0.005	6.8	2.3	4.5
44.8	0.0	100.0	2.436	0.006	8.7	2.9	5.8
54.8	0.0	100.0	1.993	0.007	10.6	3.5	7.1
74.9	3.4	96.6	1.459	0.010	14.5	4.8	9.7
99.5	17.6	82.4	1.098	0.013	19.3	6.4	12.9
124.5	22.2	77.8	0.878	0.016	24.1	8.0	16.1
159.5	28.1	71.9	0.685	0.021	30.9	10.3	20.6
179.8	31.3	68.7	0.607	0.024	34.8	11.6	23.2
199.5	33.3	66.7	0.548	0.026	38.7	12.9	25.8
300.4	40.0	60.0	0.364	0.040	58.2	19.4	38.8
402.4	43.4	56.6	0.271	0.053	78.0	26.0	52.0
500.0	45.9	54.1	0.218	0.066	96.9	32.3	64.6
746.9	50.7	49.3	0.146	0.099	144.7	48.2	96.5
996.7	53.8	46.2	0.110	0.131	193.1	64.4	128.8
1246.3	56.1	43.9	0.088	0.164	241.5	80.5	161.0
1598.9	58.8	41.2	0.068	0.211	309.8	103.3	206.6
1991.0	60.7	39.3	0.055	0.263	385.8	128.6	257.2

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION : **WINFIELD**
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 150
SAMPLE DEPTH, feet: 2386.6
PERMEABILITY TO AIR, md: 0.89
POROSITY, percent: 17.5



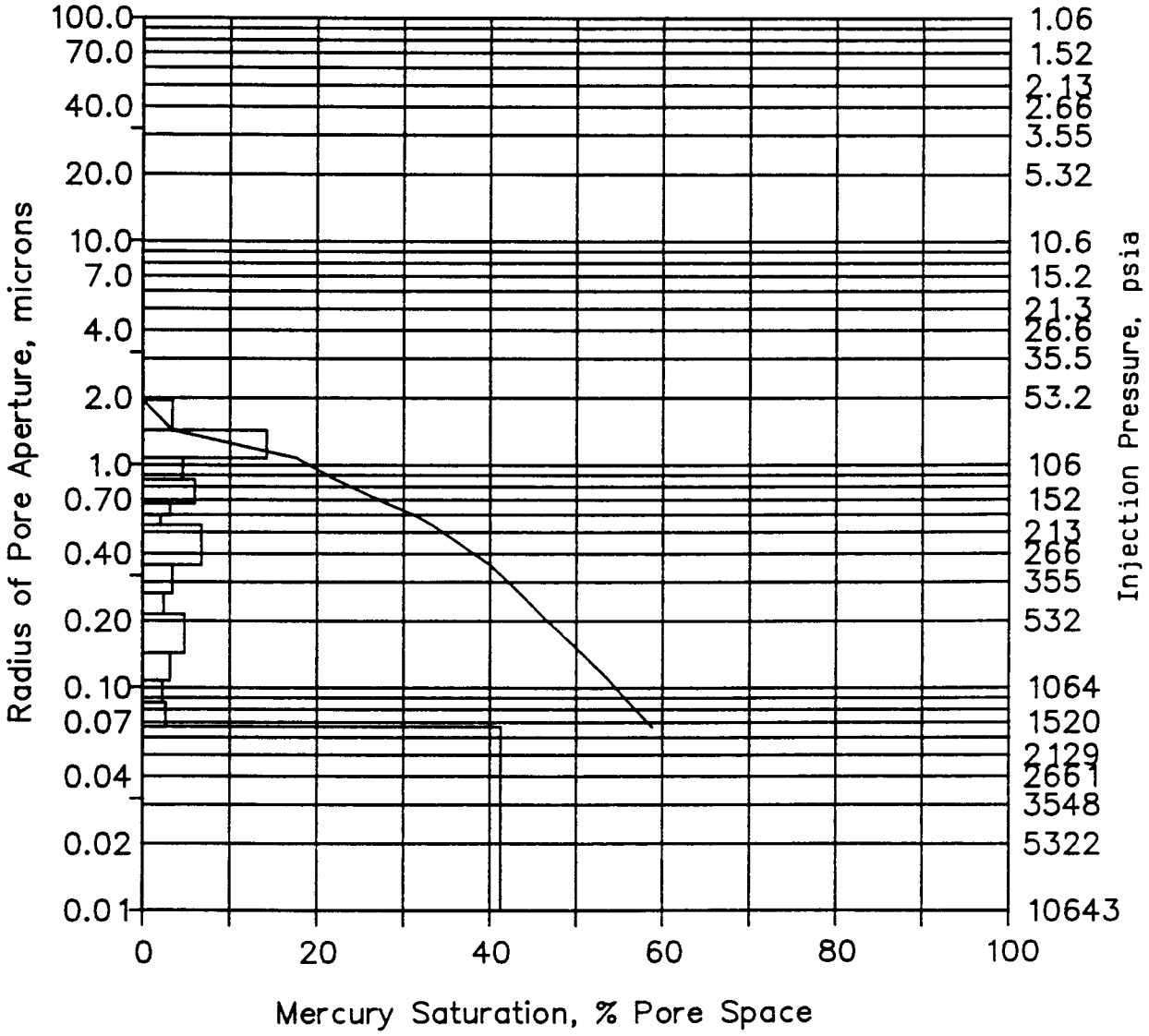
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: **WINFIELD**
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 150
SAMPLE DEPTH, feet: 2386.6
PERMEABILITY TO AIR, md: 0.89
POROSITY, percent: 17.5



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :TOWANDA
Well :JONES G.U B#3HI

Sample I.D. : 224
Porosity, percent : 15.1
Permeability to Air, md: (CUBE)

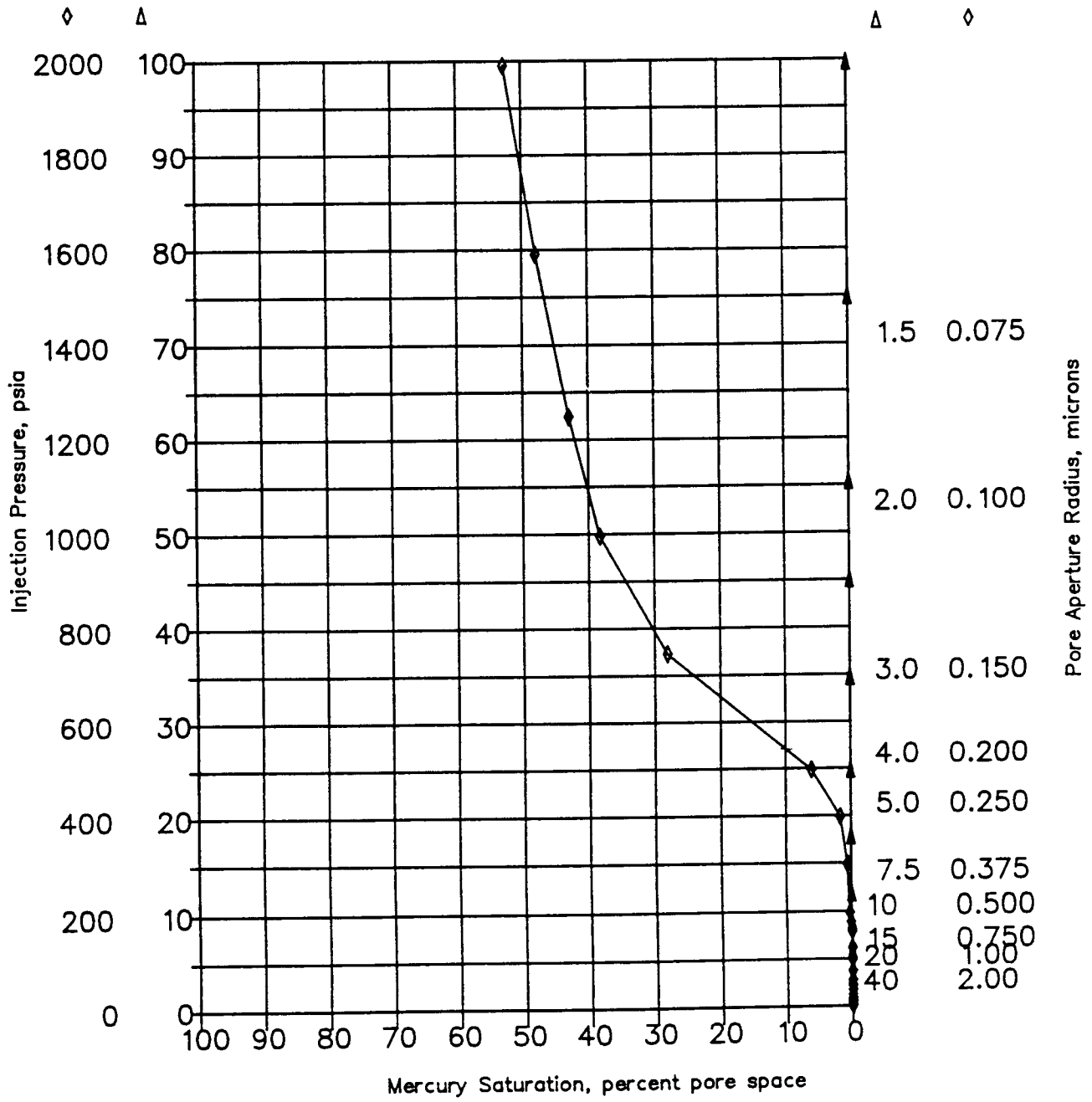
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.338	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.410	0.000	0.6	0.2	0.4
6.0	0.0	100.0	18.297	0.000	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.000	1.7	0.6	1.2
11.9	0.0	100.0	9.148	0.000	2.3	0.8	1.5
17.9	0.0	100.0	6.095	0.000	3.5	1.2	2.3
24.9	0.0	100.0	4.383	0.000	4.8	1.6	3.2
34.9	0.0	100.0	3.134	0.000	6.8	2.3	4.5
45.1	0.0	100.0	2.422	0.000	8.7	2.9	5.8
55.4	0.0	100.0	1.971	0.000	10.7	3.6	7.2
75.0	0.0	100.0	1.457	0.000	14.5	4.8	9.7
99.7	0.0	100.0	1.095	0.000	19.3	6.4	12.9
124.8	0.0	100.0	0.875	0.000	24.2	8.1	16.1
159.7	0.0	100.0	0.684	0.000	31.0	10.3	20.6
179.5	0.2	99.8	0.609	0.000	34.8	11.6	23.2
199.0	0.3	99.7	0.549	0.000	38.6	12.9	25.7
299.0	0.6	99.4	0.365	0.000	57.9	19.3	38.6
398.5	1.7	98.3	0.274	0.000	77.2	25.7	51.5
499.0	6.1	93.9	0.219	0.000	96.7	32.2	64.5
746.8	28.1	71.9	0.146	0.000	144.7	48.2	96.5
996.5	38.3	61.7	0.110	0.000	193.1	64.4	128.7
1249.2	43.0	57.0	0.087	0.000	242.1	80.7	161.4
1592.2	47.9	52.1	0.069	0.000	308.5	102.8	205.7
1991.2	52.7	47.3	0.055	0.000	385.9	128.6	257.2

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: TOWANDA
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 224
SAMPLE DEPTH, feet: 2460.6
PERMEABILITY TO AIR, md: (CUBE)
POROSITY, percent: 15.1



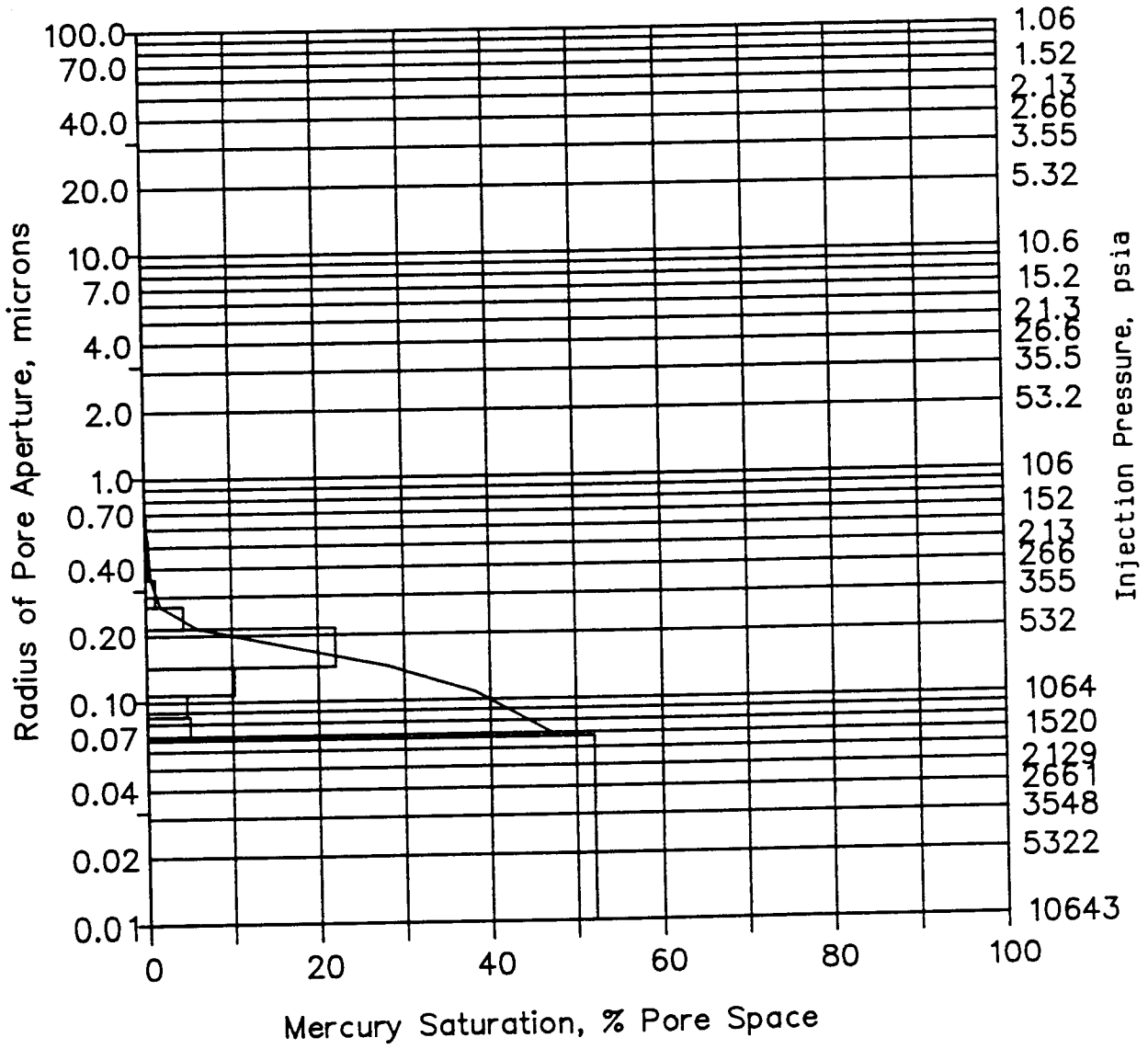
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: TOWANDA
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 224
SAMPLE DEPTH, feet: 2460.6
PERMEABILITY TO AIR, md: (CUBE)
POROSITY, percent: 15.1



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :TOWANDA
Well :JONES G.U. B#3HI

Sample I.D. : 233
Porosity, percent : 21.8
Permeability to Air, md: 0.41

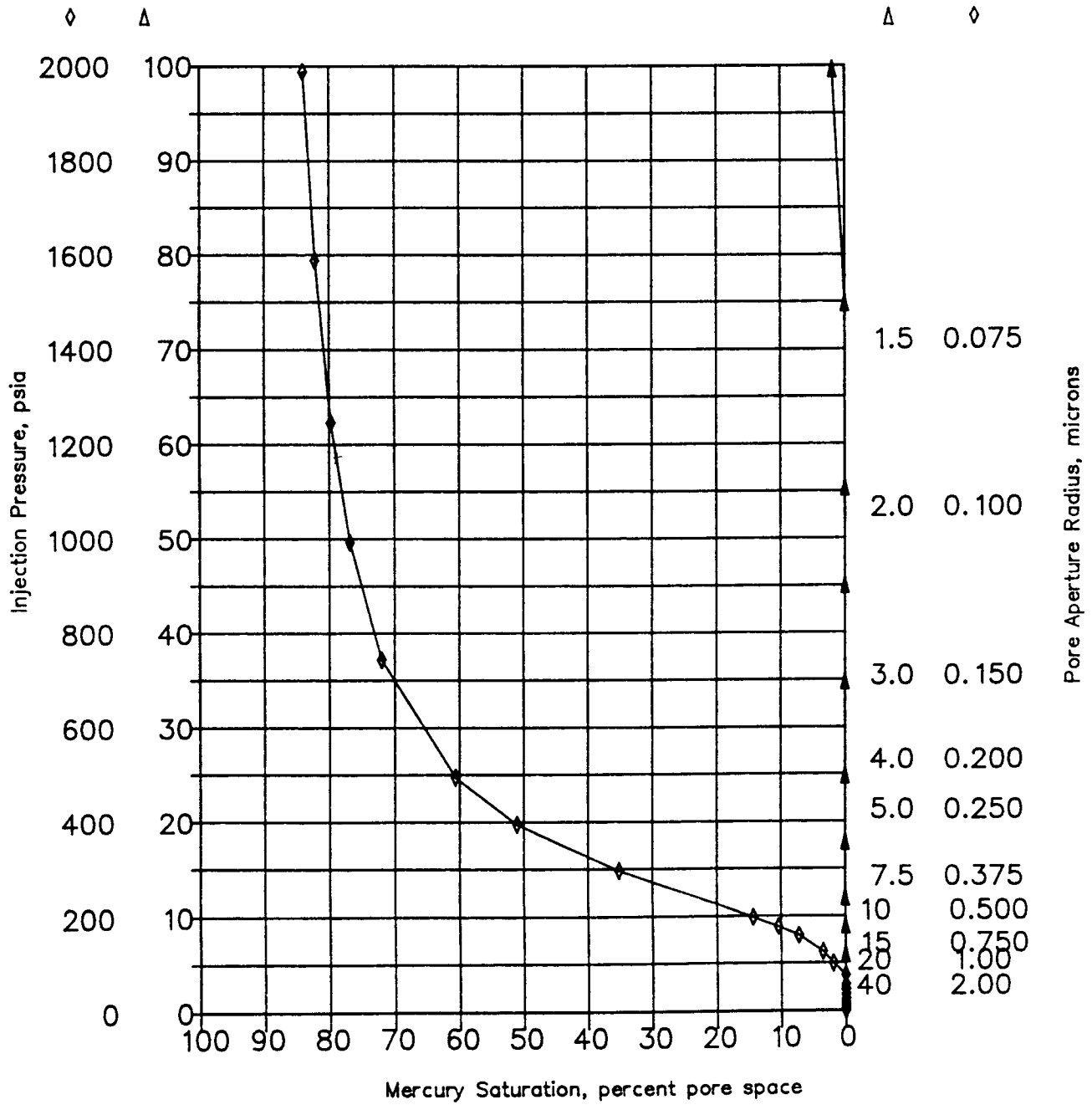
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.338	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.410	0.000	0.6	0.2	0.4
6.0	0.0	100.0	18.297	0.000	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.001	1.7	0.6	1.2
11.9	0.0	100.0	9.148	0.001	2.3	0.8	1.5
17.9	0.0	100.0	6.095	0.001	3.5	1.2	2.3
24.9	0.0	100.0	4.383	0.002	4.8	1.6	3.2
34.9	0.0	100.0	3.133	0.003	6.8	2.3	4.5
45.1	0.0	100.0	2.422	0.004	8.7	2.9	5.8
55.4	0.0	100.0	1.971	0.004	10.7	3.6	7.2
74.9	0.0	100.0	1.458	0.006	14.5	4.8	9.7
99.7	1.9	98.1	1.096	0.008	19.3	6.4	12.9
124.6	3.5	96.5	0.877	0.010	24.1	8.0	16.1
159.4	7.3	92.7	0.685	0.013	30.9	10.3	20.6
179.1	10.4	89.6	0.610	0.014	34.7	11.6	23.1
198.5	14.4	85.6	0.550	0.016	38.5	12.8	25.6
297.6	35.2	64.8	0.367	0.024	57.7	19.2	38.5
396.5	51.1	48.9	0.275	0.032	76.8	25.6	51.2
496.9	60.7	39.3	0.220	0.040	96.3	32.1	64.2
744.7	72.0	28.0	0.147	0.059	144.3	48.1	96.2
994.0	76.8	23.2	0.110	0.079	192.6	64.2	128.4
1246.8	79.8	20.2	0.088	0.100	241.6	80.5	161.1
1590.0	82.2	17.8	0.069	0.127	308.1	102.7	205.4
1988.7	84.0	16.0	0.055	0.159	385.4	128.5	256.9

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: TOWANDA
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 233
SAMPLE DEPTH, feet: 2469.6
PERMEABILITY TO AIR, md: 0.41
POROSITY, percent: 21.8



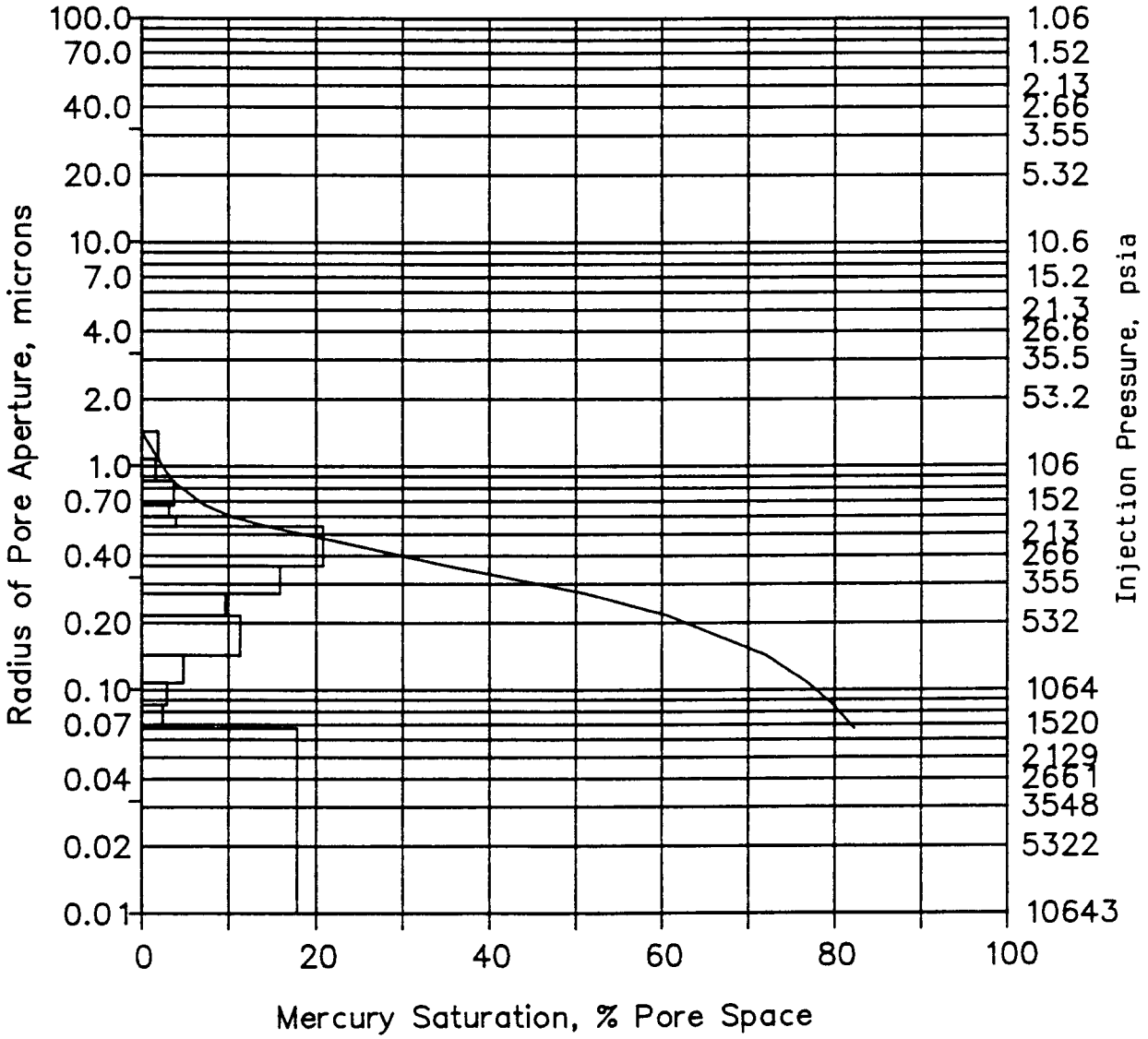
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: TOWANDA
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 233
SAMPLE DEPTH, feet: 2469.6
PERMEABILITY TO AIR, md: 0.41
POROSITY, percent: 21.8



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :TOWANDA
Well :JONES G.U. B#3HI

Sample I.D. : 235
Porosity, percent : 17.4
Permeability to Air, md: 13.

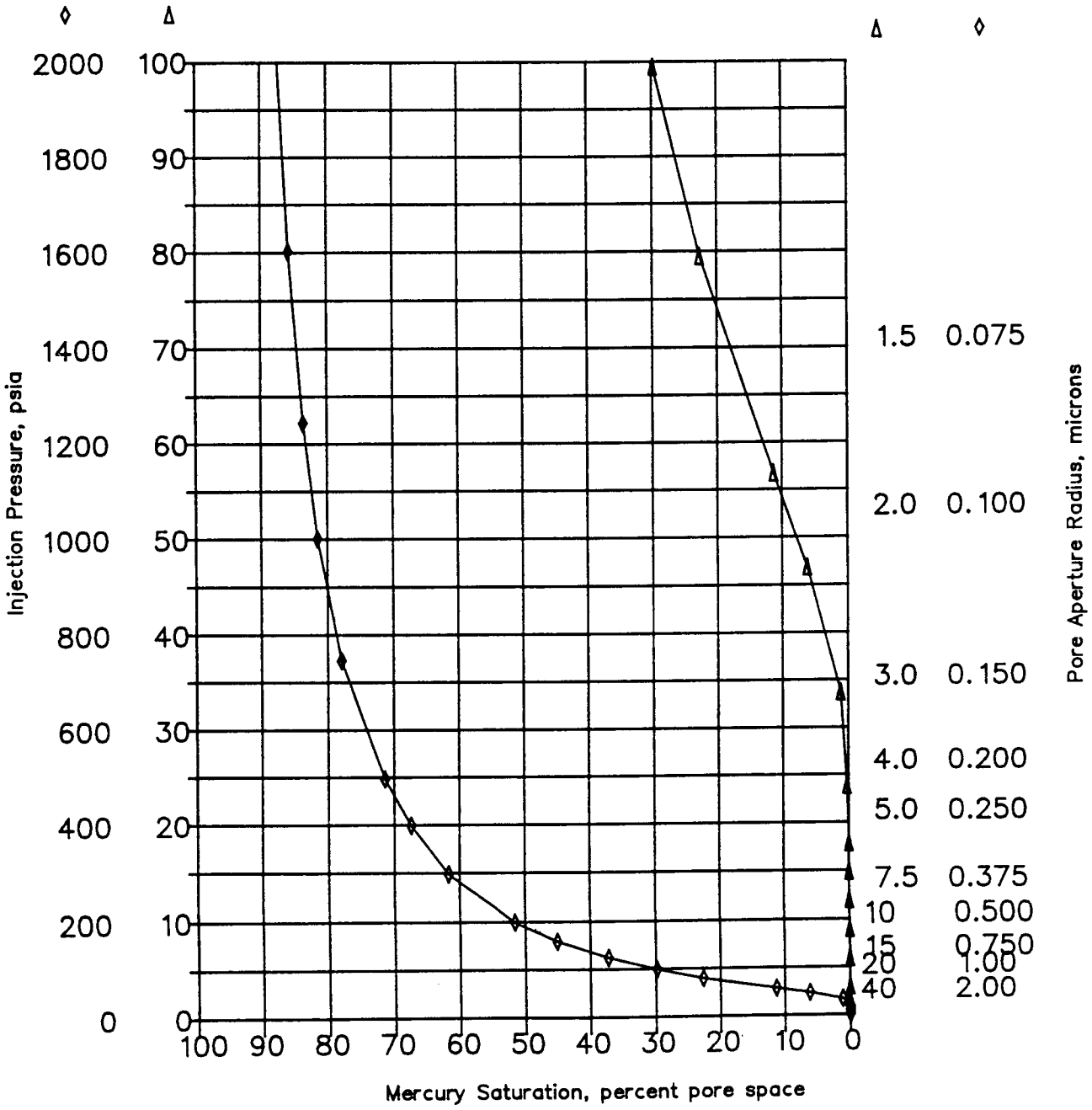
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	71.392	0.001	0.3	0.1	0.2
3.0	0.0	100.0	36.654	0.002	0.6	0.2	0.4
6.0	0.0	100.0	18.327	0.003	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.005	1.7	0.6	1.2
12.0	0.0	100.0	9.125	0.006	2.3	0.8	1.5
14.9	0.0	100.0	7.311	0.008	2.9	1.0	1.9
17.9	0.0	100.0	6.089	0.009	3.5	1.2	2.3
23.9	0.3	99.7	4.565	0.012	4.6	1.5	3.1
33.8	1.2	98.8	3.228	0.017	6.6	2.2	4.4
46.9	6.2	93.8	2.329	0.024	9.1	3.0	6.1
56.8	11.3	88.7	1.923	0.029	11.0	3.7	7.3
79.6	22.6	77.4	1.373	0.040	15.4	5.1	10.3
99.5	29.8	70.2	1.098	0.050	19.3	6.4	12.9
124.5	37.2	62.8	0.878	0.063	24.1	8.0	16.1
159.7	45.1	54.9	0.684	0.081	30.9	10.3	20.6
199.6	51.6	48.4	0.547	0.101	38.7	12.9	25.8
299.4	61.7	38.3	0.365	0.151	58.0	19.3	38.7
399.8	67.4	32.6	0.273	0.202	77.5	25.8	51.7
498.2	71.4	28.6	0.219	0.252	96.6	32.2	64.4
747.7	77.9	22.1	0.146	0.377	144.9	48.3	96.6
1001.7	81.5	18.5	0.109	0.506	194.1	64.7	129.4
1245.4	83.6	16.4	0.088	0.629	241.3	80.4	160.9
1603.6	85.7	14.3	0.068	0.810	310.8	103.6	207.2
2003.6	87.3	12.7	0.055	1.011	388.3	129.4	258.9

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: TOWANDA
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 235
SAMPLE DEPTH, feet: 2471.6
PERMEABILITY TO AIR, md: 13.
POROSITY, percent: 17.4



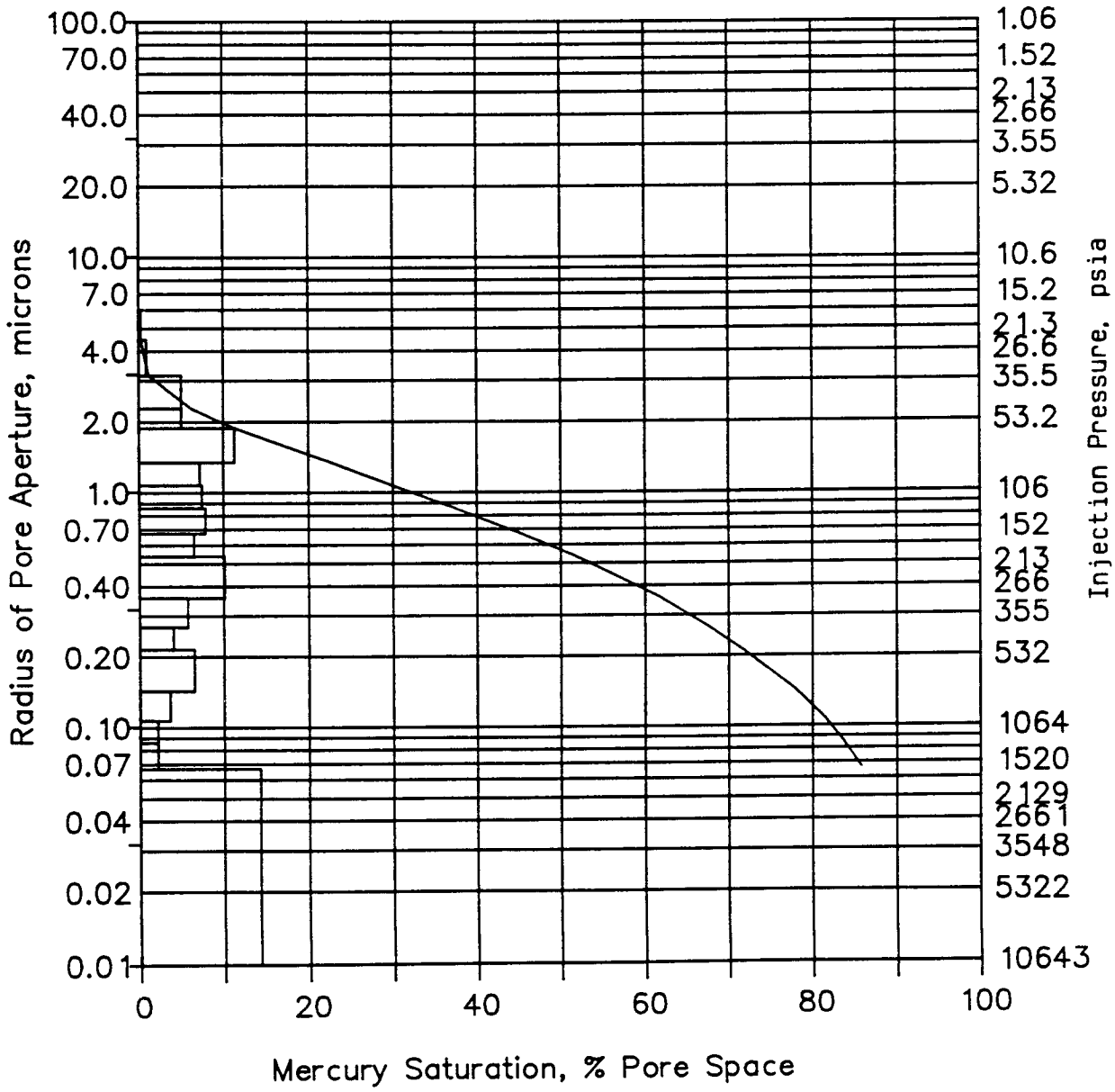
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: TOWANDA
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 235
SAMPLE DEPTH, feet: 2471.6
PERMEABILITY TO AIR, md: 13.
POROSITY, percent: 17.4



Core Laboratories

CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :TOWANDA
Well :JONES G.U. B#3HI

Sample I.D. : 236
Porosity, percent : 22.2
Permeability to Air, md: 36.

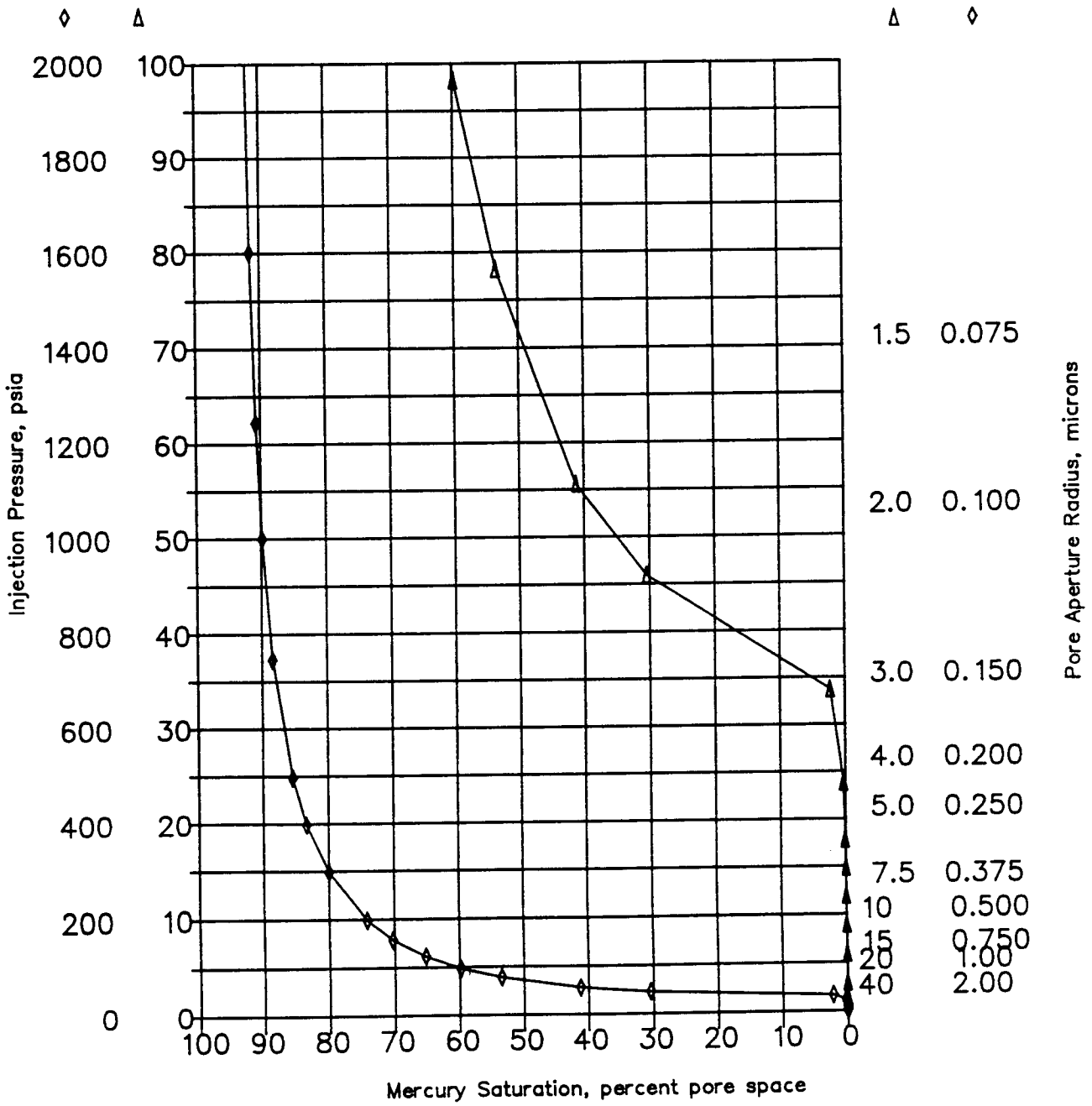
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	71.392	0.001	0.3	0.1	0.2
3.0	0.0	100.0	36.654	0.002	0.6	0.2	0.4
6.0	0.0	100.0	18.327	0.004	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.007	1.7	0.6	1.2
12.0	0.0	100.0	9.125	0.009	2.3	0.8	1.5
14.9	0.0	100.0	7.311	0.011	2.9	1.0	1.9
17.9	0.1	99.9	6.089	0.013	3.5	1.2	2.3
23.9	0.3	99.7	4.565	0.018	4.6	1.5	3.1
33.8	2.3	97.7	3.232	0.025	6.6	2.2	4.4
46.0	30.4	69.6	2.374	0.034	8.9	3.0	5.9
55.7	41.2	58.8	1.962	0.041	10.8	3.6	7.2
78.3	53.5	46.5	1.395	0.058	15.2	5.1	10.1
98.3	59.8	40.2	1.112	0.073	19.0	6.3	12.7
123.3	65.1	34.9	0.886	0.092	23.9	8.0	15.9
158.5	70.3	29.7	0.689	0.118	30.7	10.2	20.5
198.5	74.1	25.9	0.550	0.148	38.5	12.8	25.6
298.4	80.0	20.0	0.366	0.222	57.8	19.3	38.6
398.8	83.3	16.7	0.274	0.297	77.3	25.8	51.5
497.3	85.4	14.6	0.220	0.370	96.4	32.1	64.3
746.9	88.4	11.6	0.146	0.556	144.7	48.2	96.5
1000.8	89.9	10.1	0.109	0.744	194.0	64.7	129.3
1244.5	90.7	9.3	0.088	0.926	241.2	80.4	160.8
1602.8	91.5	8.5	0.068	1.192	310.6	103.5	207.1
2003.1	92.0	8.0	0.055	1.490	388.2	129.4	258.8

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL : JONES G.U. B#3HI
FORMATION : TOWANDA
FIELD : HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 236
SAMPLE DEPTH, feet: 2472.6
PERMEABILITY TO AIR, md: 36.
POROSITY, percent: 22.2



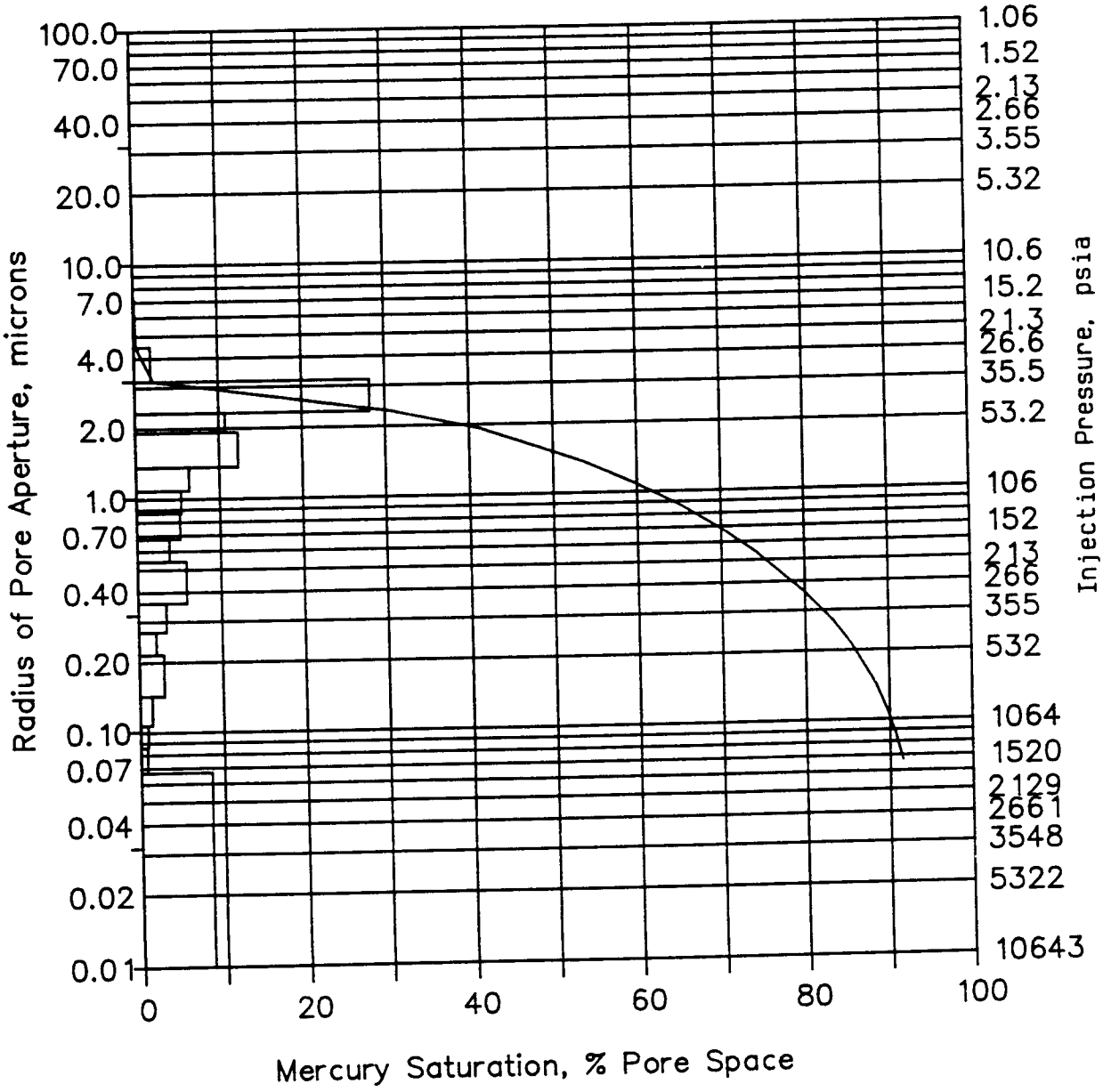
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: TOWANDA
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 236
SAMPLE DEPTH, feet: 2472.6
PERMEABILITY TO AIR, md: 36.
POROSITY, percent: 22.2



Core Laboratories

CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :FORT RILEY
Well :JONES G.U. B#3HI

Sample I.D. : 254
Porosity, percent : 16.1
Permeability to Air, md: 1.99

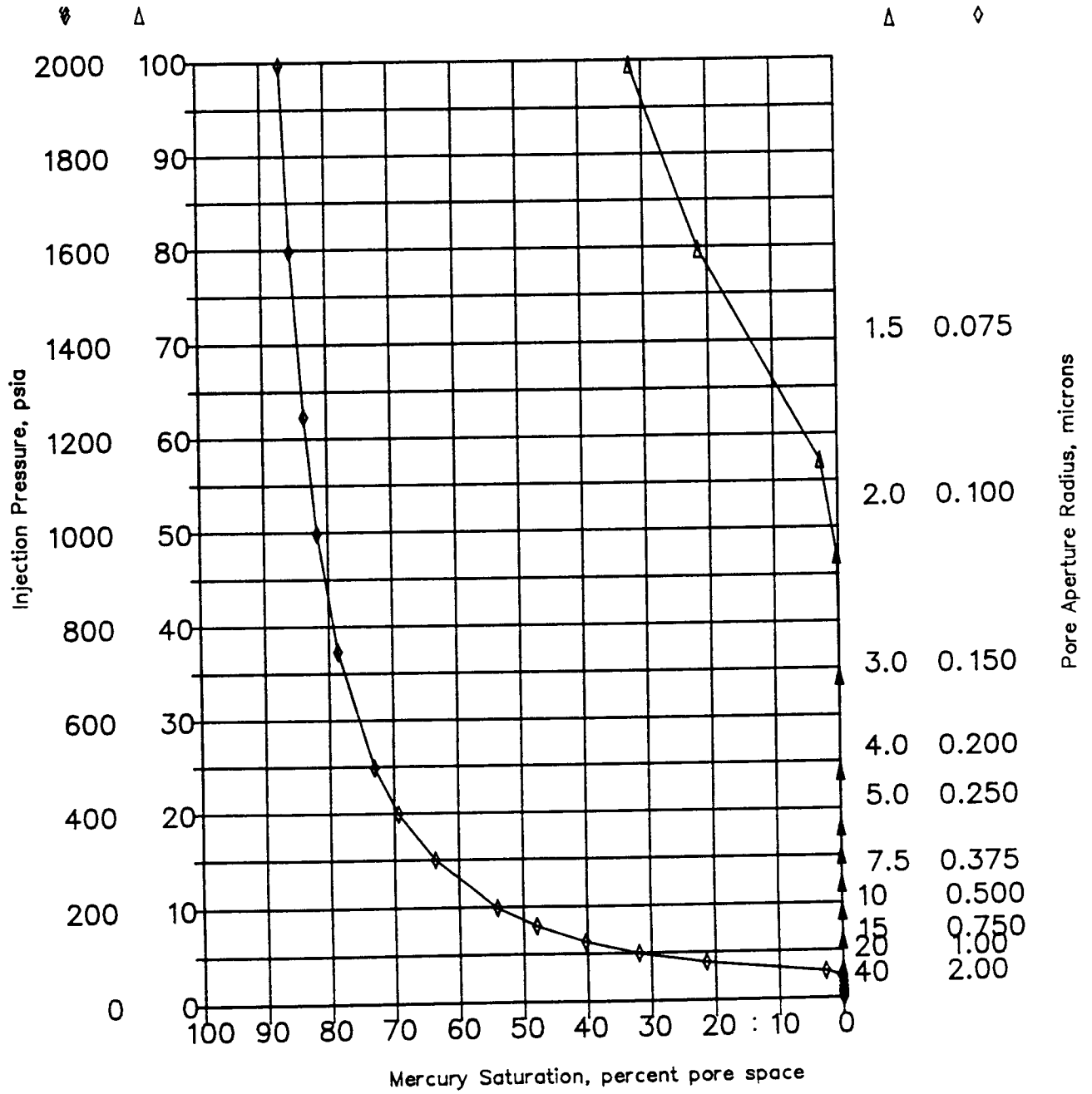
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	73.804	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.532	0.001	0.6	0.2	0.4
6.0	0.0	100.0	18.297	0.001	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.002	1.7	0.6	1.2
12.0	0.0	100.0	9.141	0.002	2.3	0.8	1.5
15.0	0.0	100.0	7.306	0.003	2.9	1.0	1.9
18.0	0.0	100.0	6.085	0.004	3.5	1.2	2.3
23.9	0.0	100.0	4.566	0.005	4.6	1.5	3.1
34.1	0.0	100.0	3.205	0.007	6.6	2.2	4.4
47.0	0.3	99.7	2.324	0.010	9.1	3.0	6.1
57.2	2.7	97.3	1.909	0.012	11.1	3.7	7.4
79.7	21.4	78.6	1.370	0.016	15.4	5.1	10.3
99.5	31.9	68.1	1.098	0.020	19.3	6.4	12.9
124.4	40.3	59.7	0.878	0.026	24.1	8.0	16.1
159.5	47.9	52.1	0.685	0.033	30.9	10.3	20.6
199.0	54.0	46.0	0.549	0.041	38.6	12.9	25.7
301.5	63.7	36.3	0.362	0.062	58.4	19.5	38.9
399.6	69.3	30.7	0.273	0.082	77.4	25.8	51.6
499.3	73.0	27.0	0.219	0.103	96.8	32.3	64.5
747.5	78.6	21.4	0.146	0.153	144.9	48.3	96.6
999.0	81.7	18.3	0.109	0.205	193.6	64.5	129.1
1247.5	83.5	16.5	0.088	0.256	241.8	80.6	161.2
1597.7	85.5	14.5	0.068	0.328	309.6	103.2	206.4
1993.5	86.9	13.1	0.055	0.409	386.3	128.8	257.5

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B3#HI
FORMATION: FORT RILEY
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 254
SAMPLE DEPTH, feet: 2490.6
PERMEABILITY TO AIR, md: 1.99
POROSITY, percent: 16.1



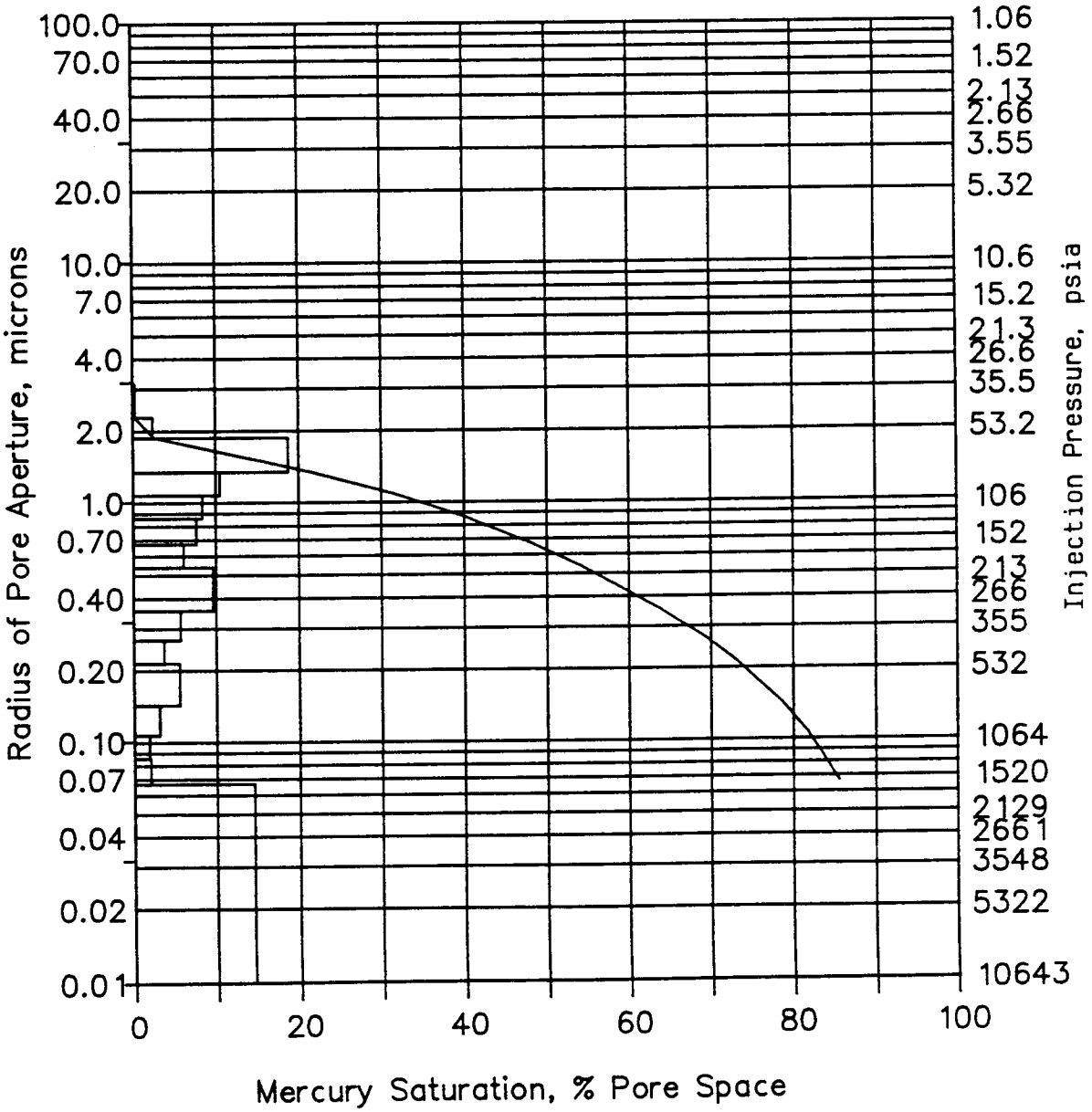
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B3#HI
FORMATION: FORT RILEY
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 254
SAMPLE DEPTH, feet: 2490.6
PERMEABILITY TO AIR, md: 1.99
POROSITY, percent: 16.1



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :FORT RILEY
Well :JONES G.U. B#3HI

Sample I.D. : 264
Porosity, percent : 12.2
Permeability to Air, md: 0.09

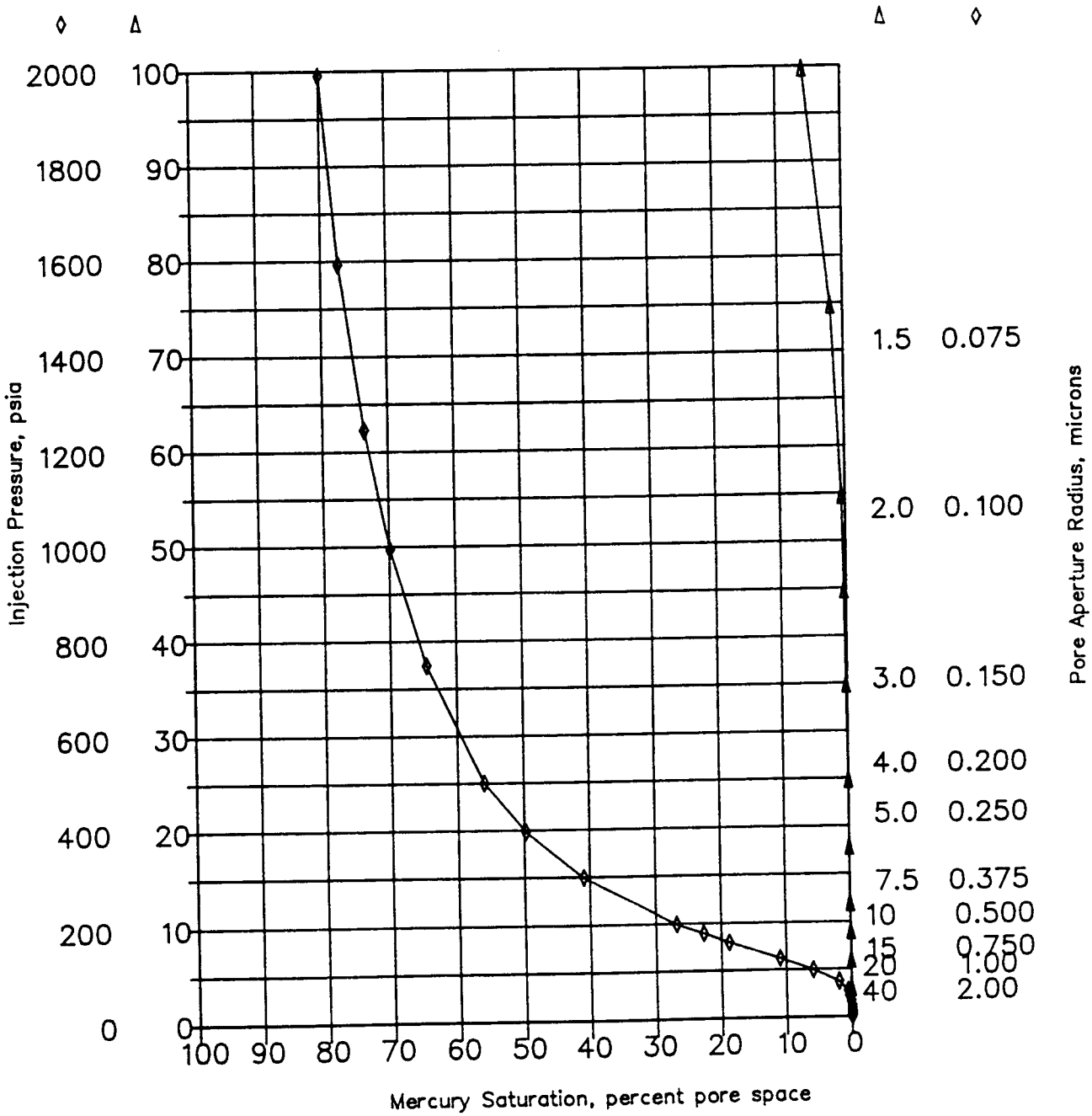
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	71.862	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.289	0.000	0.6	0.2	0.4
6.0	0.0	100.0	18.235	0.000	1.2	0.4	0.8
9.0	0.0	100.0	12.177	0.000	1.7	0.6	1.2
12.0	0.0	100.0	9.118	0.001	2.3	0.8	1.5
17.9	0.0	100.0	6.089	0.001	3.5	1.2	2.3
25.0	0.0	100.0	4.376	0.001	4.8	1.6	3.2
35.0	0.2	99.8	3.125	0.002	6.8	2.3	4.5
44.9	0.4	99.6	2.435	0.002	8.7	2.9	5.8
54.8	0.6	99.4	1.993	0.003	10.6	3.5	7.1
74.9	2.0	98.0	1.459	0.004	14.5	4.8	9.7
99.8	5.9	94.1	1.095	0.005	19.3	6.4	12.9
125.1	11.0	89.0	0.873	0.006	24.2	8.1	16.2
159.8	18.8	81.2	0.684	0.008	31.0	10.3	20.6
179.8	22.7	77.3	0.608	0.009	34.8	11.6	23.2
199.6	26.8	73.2	0.547	0.010	38.7	12.9	25.8
299.9	40.9	59.1	0.364	0.015	58.1	19.4	38.7
398.0	49.7	50.3	0.274	0.020	77.1	25.7	51.4
502.1	56.0	44.0	0.218	0.025	97.3	32.4	64.9
750.6	64.6	35.4	0.146	0.037	145.5	48.5	97.0
995.9	69.9	30.1	0.110	0.049	193.0	64.3	128.7
1246.6	73.6	26.4	0.088	0.061	241.6	80.5	161.1
1594.9	77.3	22.7	0.068	0.079	309.1	103.0	206.0
1990.8	80.1	19.9	0.055	0.098	385.8	128.6	257.2

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B3#HI
FORMATION: FORT RILEY
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 264
SAMPLE DEPTH, feet: 2500.6
PERMEABILITY TO AIR, md: 0.087
POROSITY, percent: 12.2



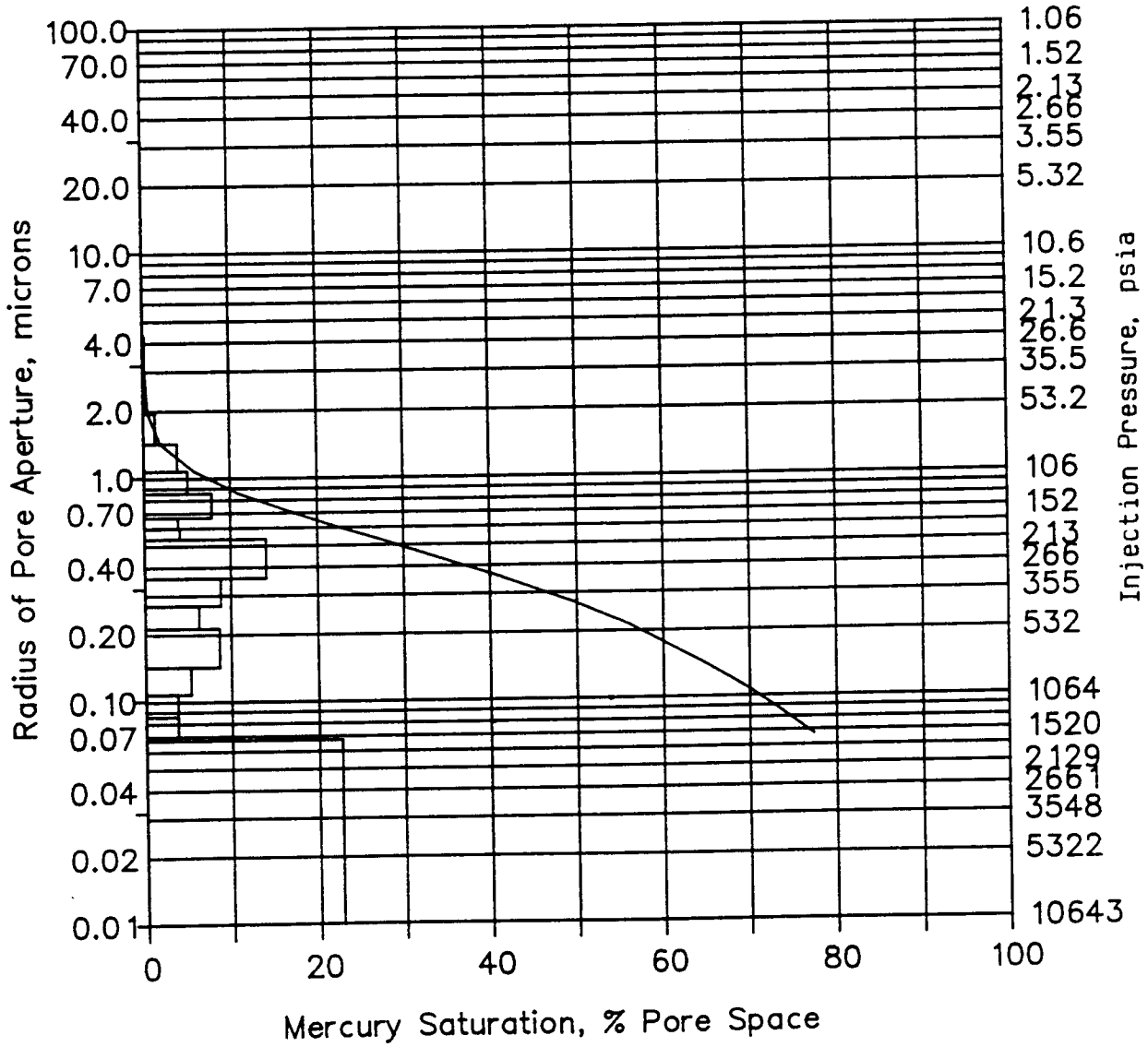
Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B3#HI
FORMATION: FORT RILEY
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 264
SAMPLE DEPTH, feet: 2500.6
PERMEABILITY TO AIR, md: 0.087
POROSITY, percent: 12.2



CORE LABORATORIES
Special Core Analysis Laboratory
Dallas, Texas

SUMMARY OF MERCURY INJECTION DATA

Company :AMOCO PRODUCTION COMPANY
Formation :FORT RILEY
Well :JONES G.U. B#3HI

Sample I.D. : 284
Porosity, percent : 20.1
Permeability to Air, md: 5.4

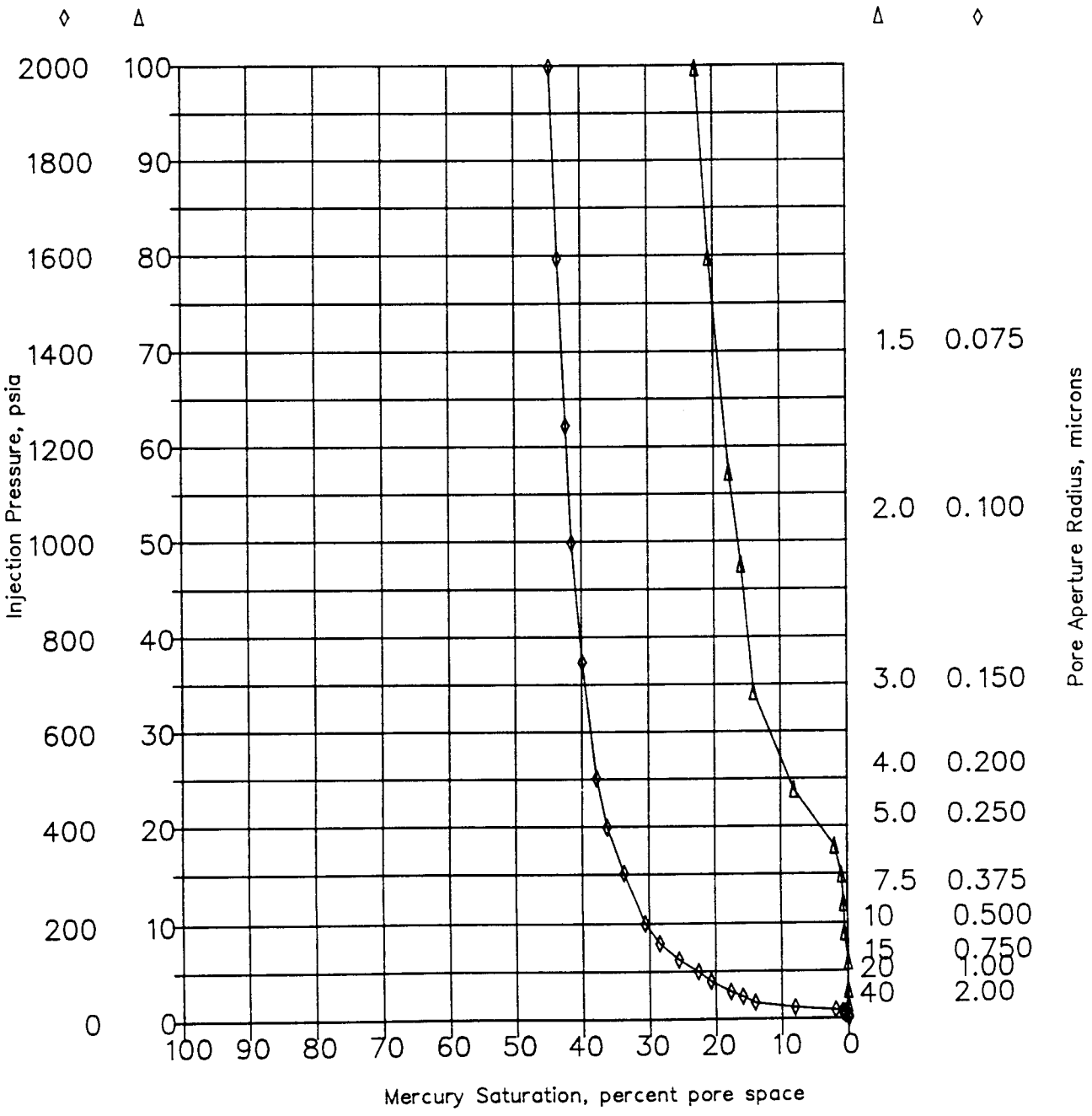
Injection Pressure psia	Mercury Saturation percent	100-Mercury Saturation percent	Pore Radius microns	J Function (dimensionless)	Air/Brine System psia	Air/Oil System psia	Oil/Brine System psia
1.5	0.0	100.0	72.820	0.000	0.3	0.1	0.2
3.0	0.0	100.0	36.778	0.001	0.6	0.2	0.4
6.0	0.0	100.0	18.266	0.002	1.2	0.4	0.8
9.0	0.5	99.5	12.177	0.003	1.7	0.6	1.2
12.0	0.6	99.4	9.141	0.004	2.3	0.8	1.5
15.0	0.9	99.1	7.306	0.005	2.9	1.0	1.9
18.0	2.0	98.0	6.085	0.005	3.5	1.2	2.3
23.9	12.8	87.2	4.566	0.007	4.6	1.5	3.1
34.3	14.1	85.9	3.189	0.010	6.6	2.2	4.4
47.6	15.9	84.1	2.293	0.014	9.2	3.1	6.2
57.3	17.7	82.3	1.905	0.017	11.1	3.7	7.4
79.8	20.7	79.3	1.368	0.024	15.5	5.2	10.3
99.8	22.6	77.4	1.095	0.030	19.3	6.4	12.9
124.5	25.5	74.5	0.877	0.038	24.1	8.0	16.1
160.1	28.5	71.5	0.682	0.048	31.0	10.3	20.7
200.8	30.6	69.4	0.544	0.061	38.9	13.0	25.9
303.8	33.8	66.2	0.360	0.092	58.9	19.6	39.3
399.7	36.3	63.7	0.273	0.121	77.5	25.8	51.6
503.4	37.8	62.2	0.217	0.152	97.6	32.5	65.0
748.2	39.9	60.1	0.146	0.227	145.0	48.3	96.7
998.8	41.5	58.5	0.109	0.302	193.6	64.5	129.0
1244.4	42.3	57.7	0.088	0.377	241.2	80.4	160.8
1594.9	43.5	56.5	0.068	0.483	309.1	103.0	206.1
1996.7	44.6	55.4	0.055	0.604	386.9	129.0	258.0

File DRP-91226

Injection Pressure vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B#3HI
FORMATION: FORT RILEY
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID:	284
SAMPLE DEPTH, feet:	2520.6
PERMEABILITY TO AIR, md:	5.4
POROSITY, percent:	20.1



Core Laboratories

File DRP-91226

Pore Aperture Radius vs Mercury Saturation

COMPANY: AMOCO PRODUCTION COMPANY
WELL: JONES G.U. B3#HI
FORMATION: FORT RILEY
FIELD: HUGOTON
COUNTY, STATE: STANTON COUNTY, KANSAS

SAMPLE ID: 284
SAMPLE DEPTH, feet: 2520.6
PERMEABILITY TO AIR, md: 5.4
POROSITY, percent: 20.1