GECO

GEOPHYSICAL COMPANY OF NORWAY A·S

STATOIL

EVALUATION OF CORE DATA

WELL. 34/10-11

DATE: JANUARY 1982

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COMMENTS.

The samples were extracted with methanol, followed by toluene and finally methanol. The samples were dried at 60°C and 40 % relative humidity.

Helium Porosity and Klinkenberg corrected air permeability were measured.

The samples were saturated with simulated formation-water containing the following ions, Na 14400 ppm, Ca 1000 ppm, Mg 295 ppm, Ba 50 ppm, K 320 ppm, and Sr 216 ppm.
All Chlorid-salts.

The measurements of gas/water capillary pressure were performed with air and the simulated formation-water.
Stability time at each pressure level varied from 2 to 3 days.
An air trap showed that no production of gas occured.
The different water saturations were determined by the weights of the samples.

The resistivity index and capillary pressure were measured at the same time.
After resaturation formation resistivity factor, porosity and brine permeability reduction were measured.

During the tests sample 2A and 40 broke down and could not be replaced.

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SAMPLE LIST

Sample no.	Depth (m)
2A	1899.25-30
40	1900.34-57
42	1900.80-88
50	1891.55
53	1893.45

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POROSITY AND GRAIN DENSITY

Sample no.	% Porosity	Grain Density
2A	32.4	2.63
40	25.4	2.62
42	22.0	2.58
50	32.6	2.65
53	24.5	2.61

CAPILLARY PRESSURE AND RESISTIVITY INDEX.

Determination of n-exponent

Resistivity of brine at 20°C: 0.176 Ω m

$RI = b \cdot Sw^{-n}$

Sample no.	2A			40			42			50			53		
Pressure, Bar	Sw.Frac.of Pore Space	FF	RI	Sw.Frac.of Pore Space	FF	RI	Sw.Frac.of Pore Space	FF	RI	Sw.Frac.of Pore Space	FF	RI	Sw.Frac.of Pore Space	FF	RI
0	1.00	6.81		1.00	14.7		1.00	16.9		1.00	7.05		1.00	15.3	
0.025	0.952		1.03	0.963		1.03	0.956		1.01	0.964		1.05	0.968		1.06
0.05	0.950		1.04	0.961		1.04	0.950		1.01	0.966		1.05	0.970		1.05
0.10	0.835		1.84	0.954		1.09	0.944		1.02	0.945		1.11	0.964		1.09
0.25	0.452		4.60	0.925		1.23	0.906		1.21	0.612		3.47	0.907		1.19
0.50	0.386		7.82	0.850		1.54	0.827		1.52	0.508		5.83	0.828		1.53
1.00	0.300		10.77	0.729		1.97	0.680		2.14	0.400		7.77	0.709		1.98
2.00	0.294		13.94	0.695		2.15	0.669		2.18	0.377		8.70	0.683		2.04
10.0	0.246		19.42	0.621		2.40	0.646		2.21	0.360		10.16	0.579		2.89
15.0	0.234		20.12	nmp		nmp	0.628		2.24	0.347		11.00	0.544		3.43

By weighted least squares method, forced through RI = 1.0, Sw = 1.0

b	1.01	1.01	0.97	1.01	1.00
n	2.08	1.99	1.94	2.29	1.98

Capillary Pressure Curve

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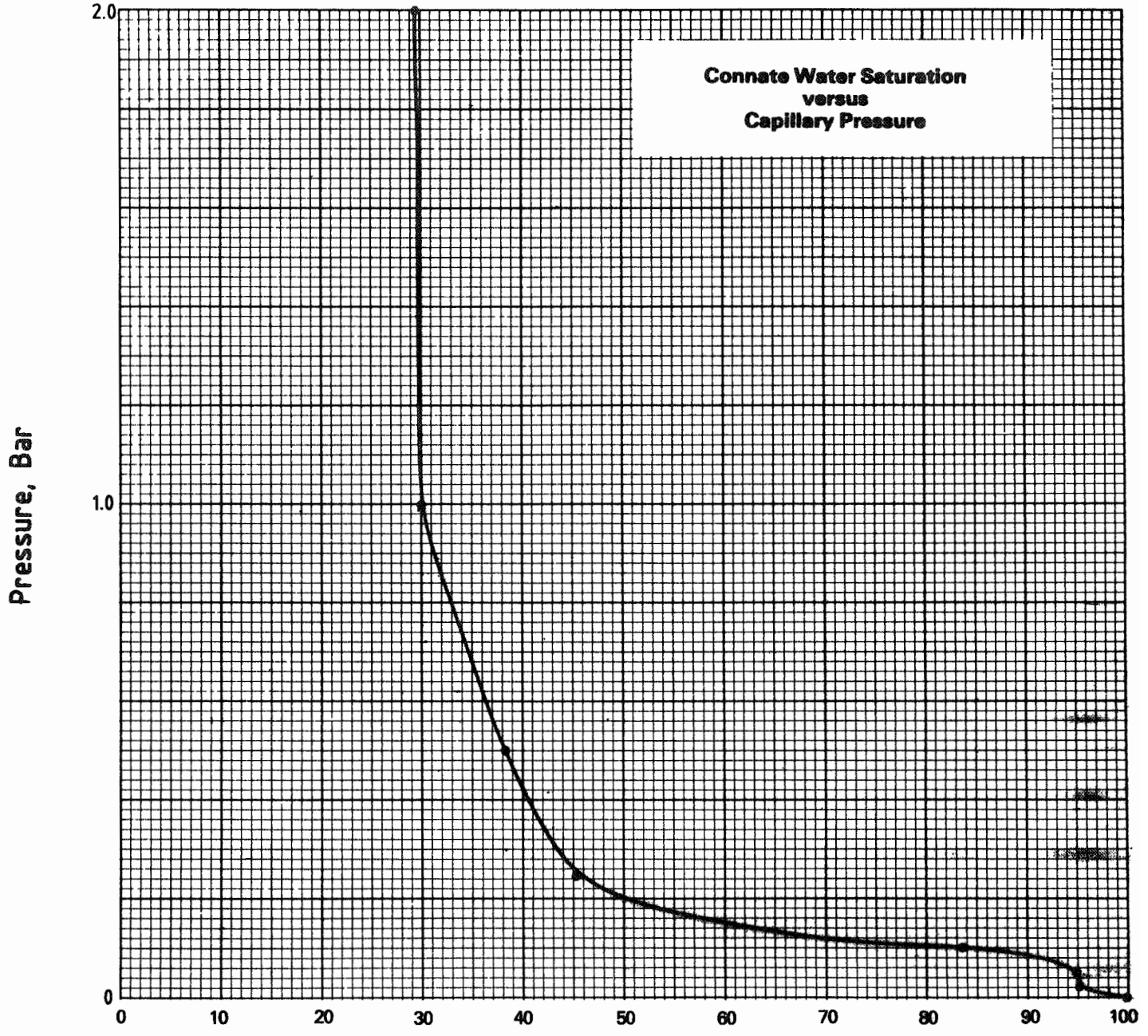
Well ..... 34/10-11 .....

Sample No. ..... 2A ..... Kair ..... 417 md .....

Depth ..... Ø ..... 32.4% .....



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Capillary Pressure Curve

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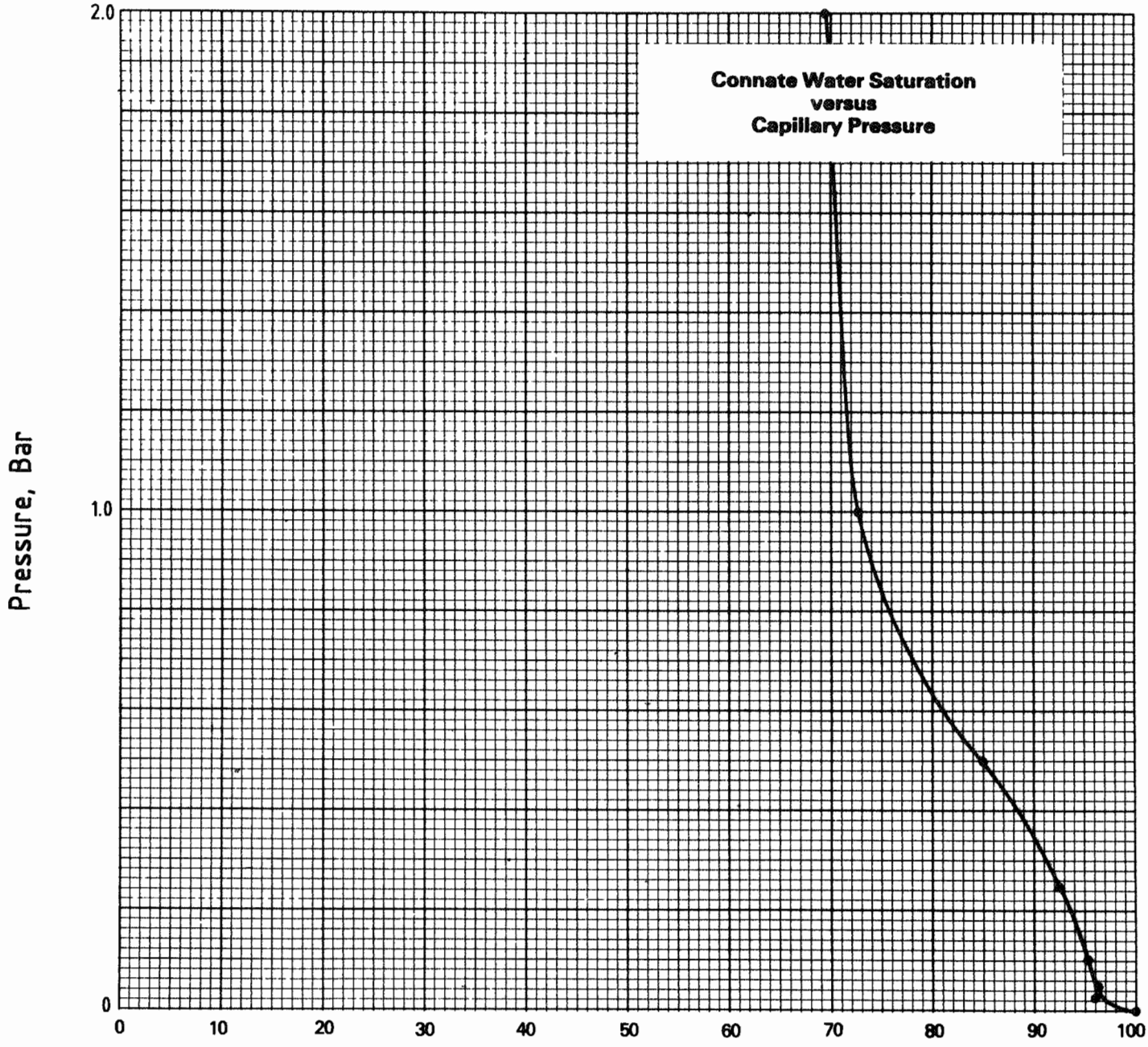
Well ..... 34/10-11 .....

Sample No. ..... 40 ..... Kair ..... 11.4 md .....

Depth ..... Ø ..... 25,4% .....



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Capillary Pressure Curve

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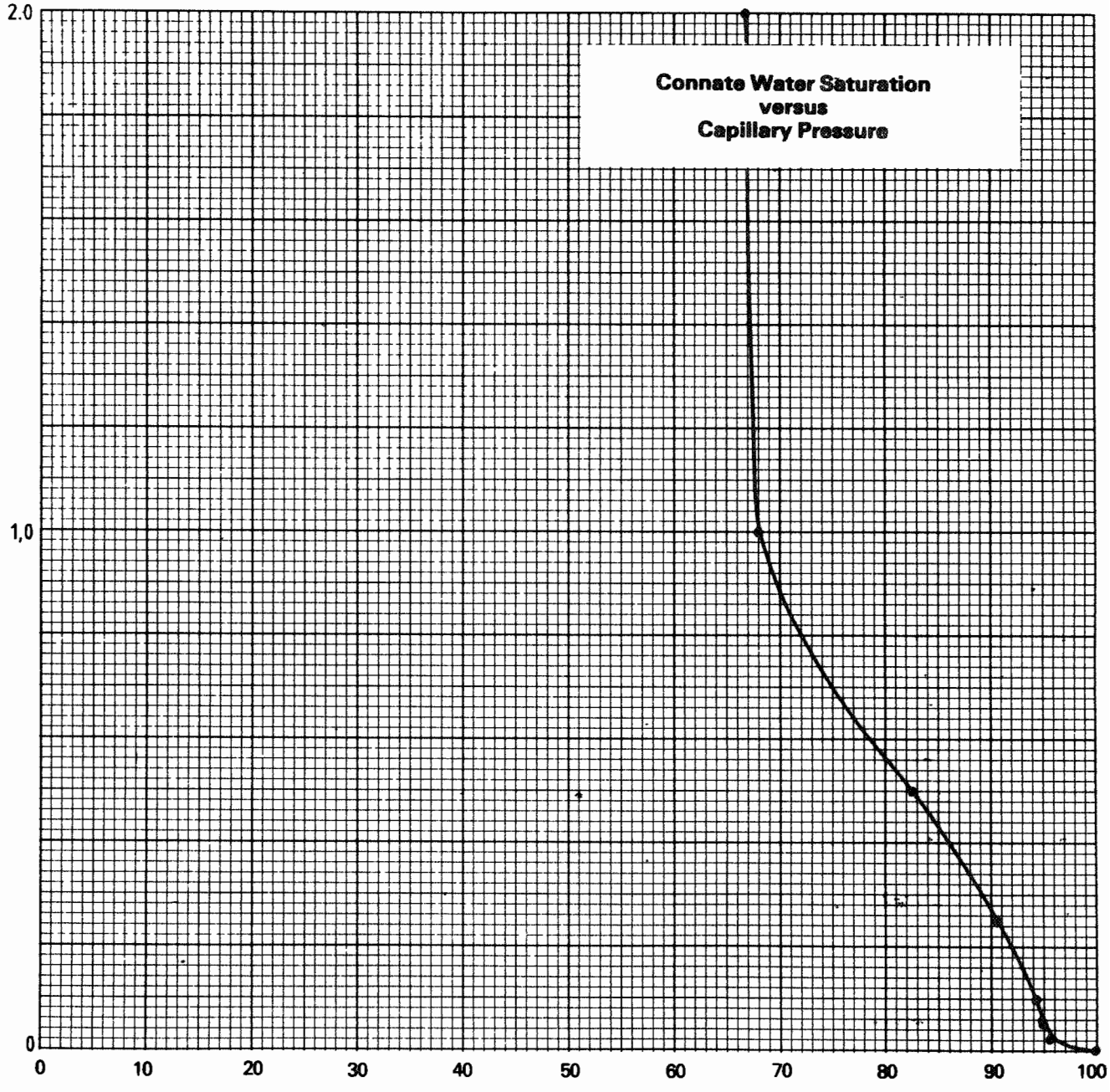
Well ..... 34/10-11 .....

Sample No. ..... 42 ..... Kair ..... 5,87 md .....

Depth ..... Ø ..... 22.0% .....



Capillary Pressure Curve

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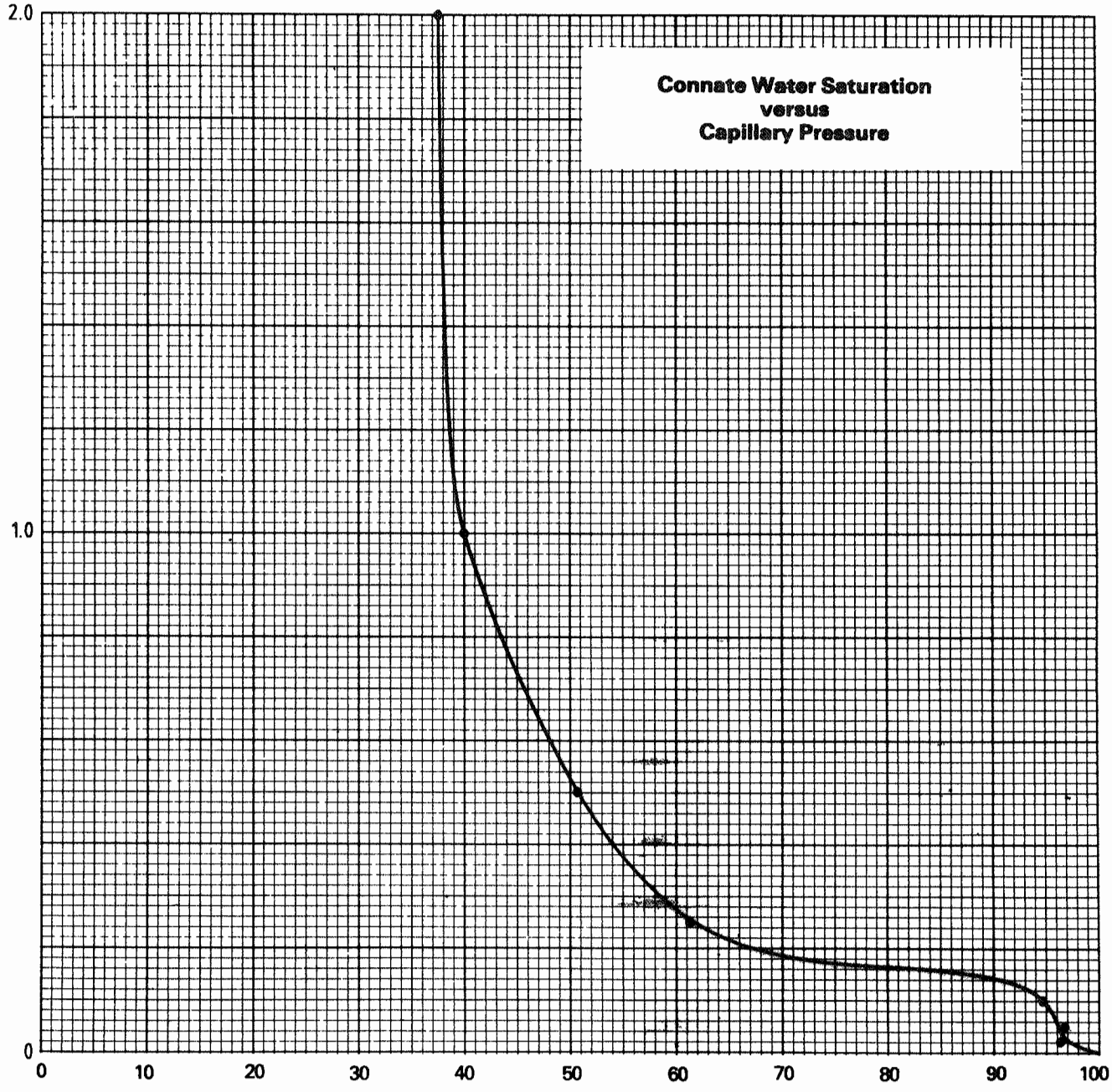
Well ..... 34/10-11 .....

Sample No. ..... 50 ..... Kair ..... 205 md .....

Depth ..... Ø ..... 32.6% .....



Capillary Pressure Curve

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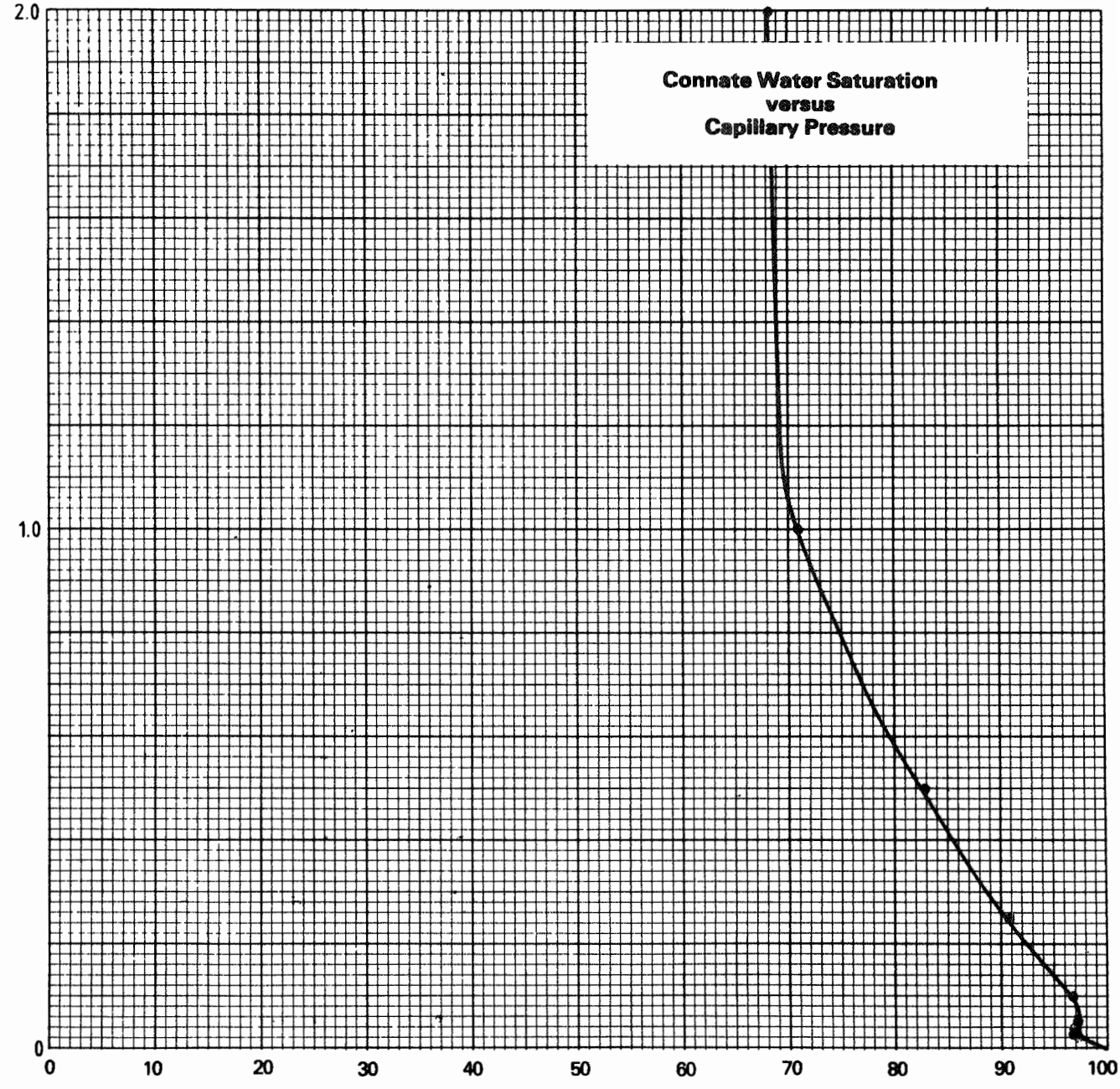
Well ..... 34/10-11 .....

Sample No. ..... 53 ..... Kair ..... 10.4 md .....

Depth ..... Ø ..... 24.5% .....



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Resitivity index versus water Saturation

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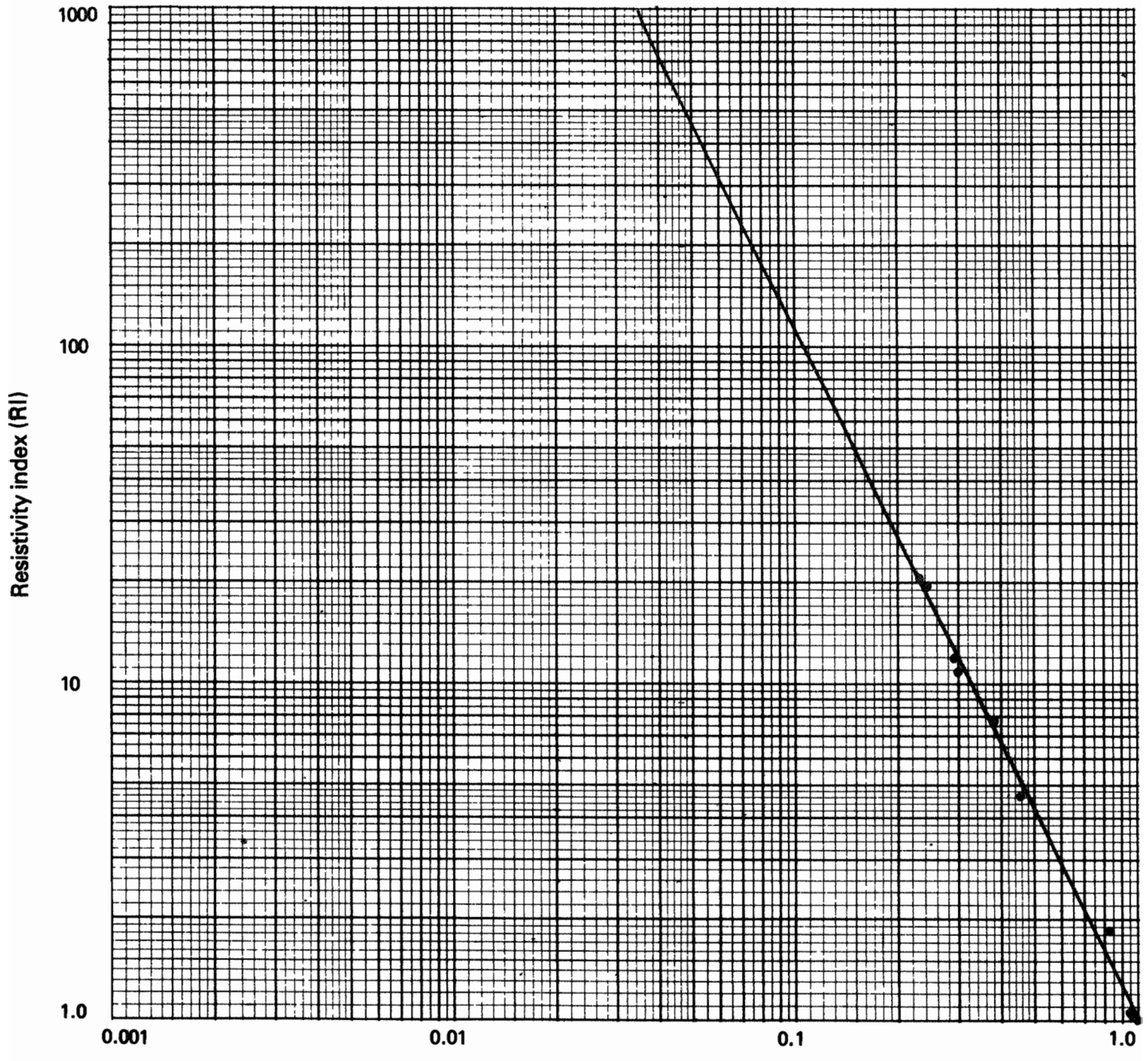
Company Statoil

Well 34/10-11 Sample : 2A

$RI = 1.01\ Sw^{-2,08}$



Water Saturation, Fraction of Pore Space.

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Resitivity index versus water Saturation

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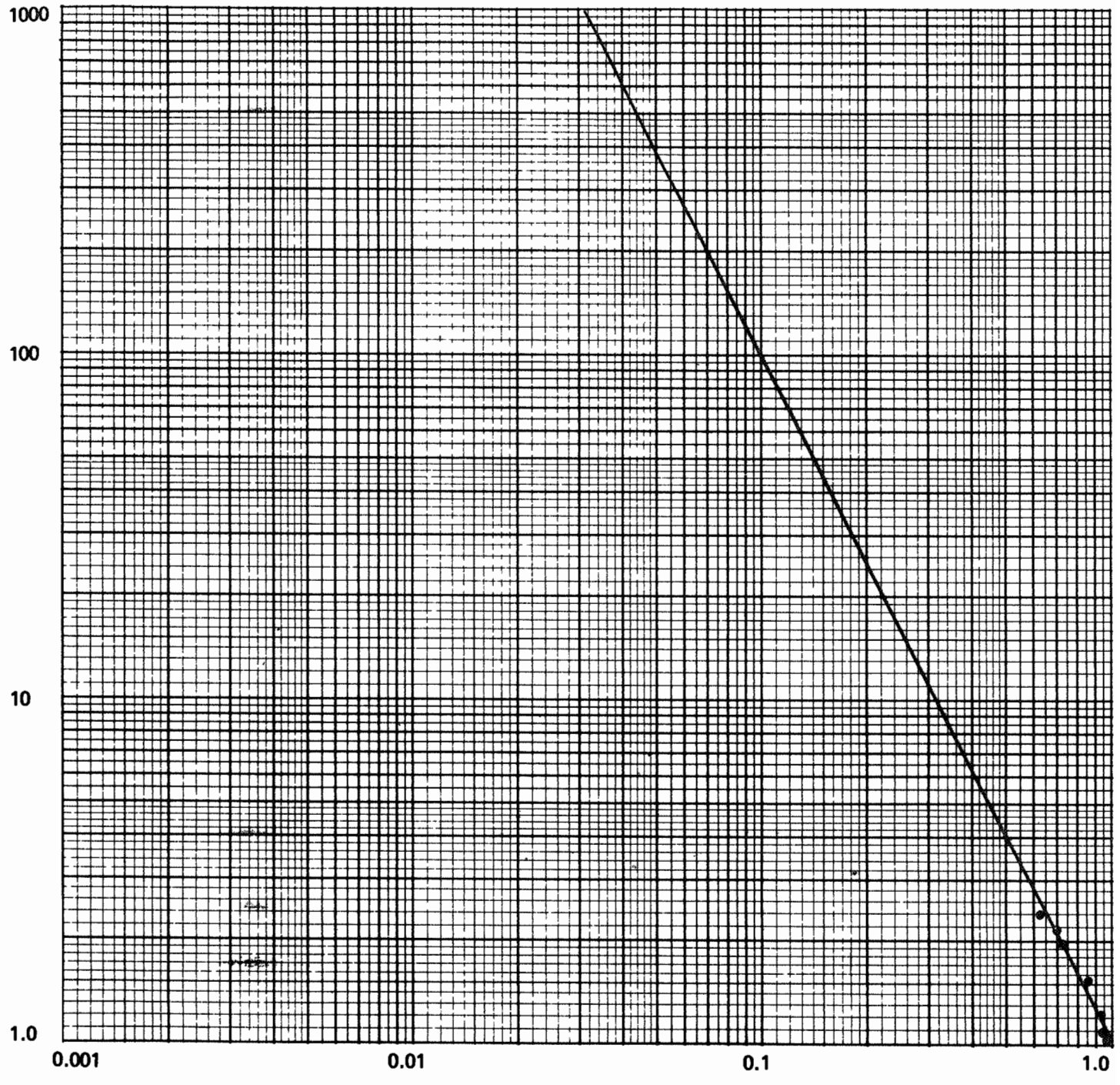
Company Statoil

Well 34/10-11 Sample : 40

$RI = 1.01\ Sw^{-1.99}$



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Resitivity index versus water Saturation

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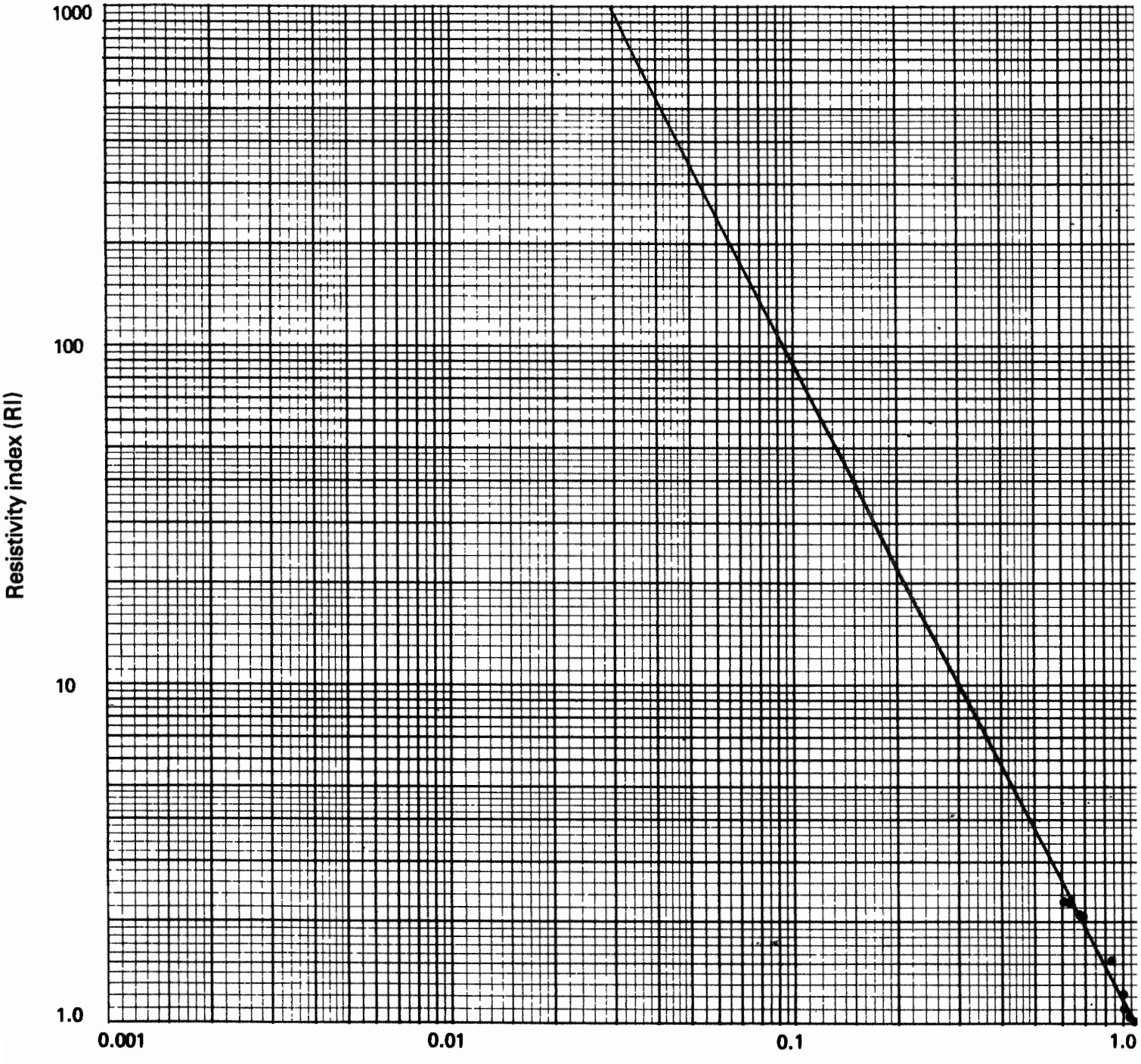
Company Statoil

Well 34/10-11 Sample : 42

$RI = 0.97\ Sw^{-1.94}$



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Resitivity index versus water Saturation

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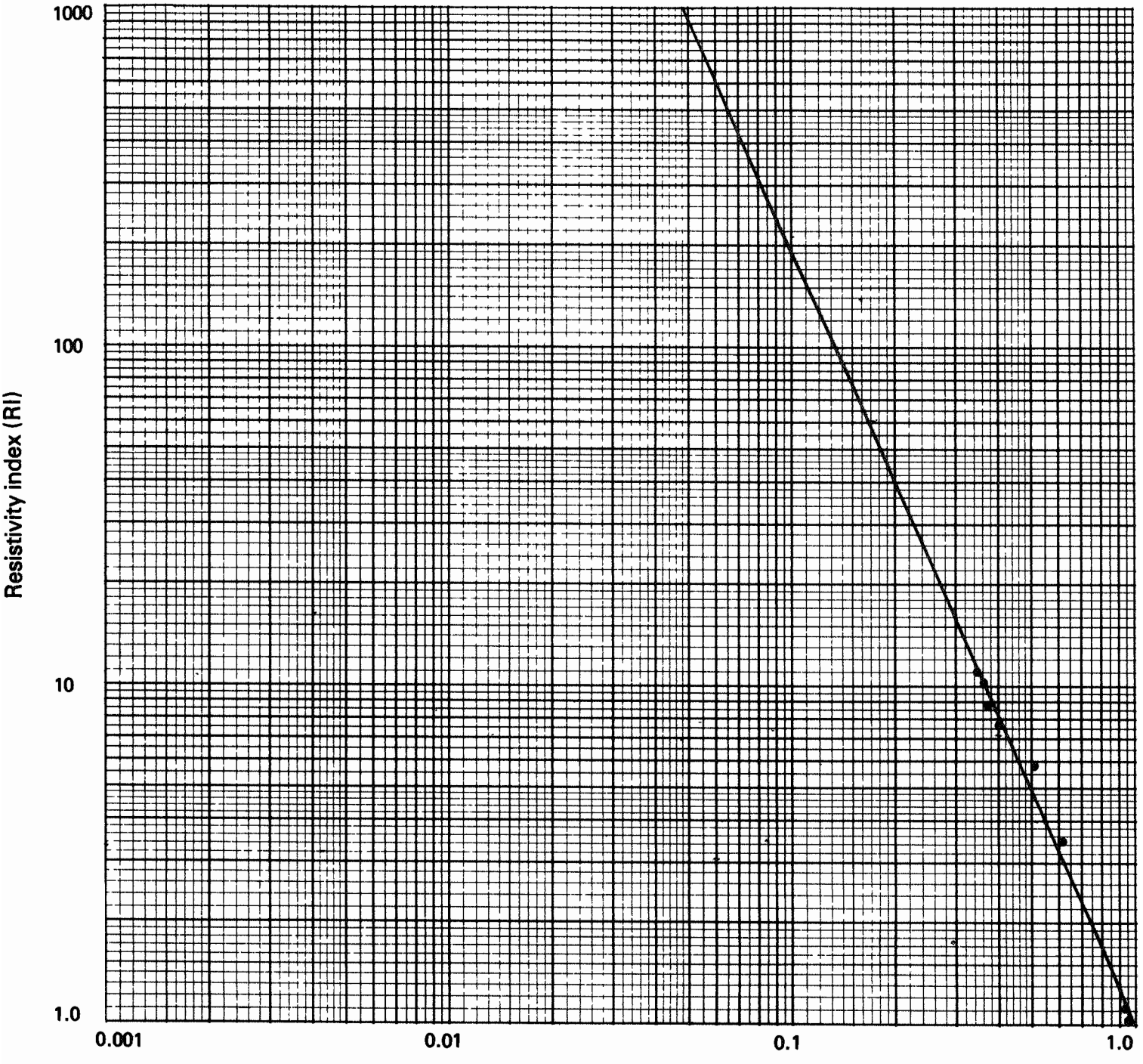
Company Statoil

Well 34/10-11 Sample : 50

$RI = 0.01\ Sw^{-2.29}$



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Resitivity index versus water Saturation

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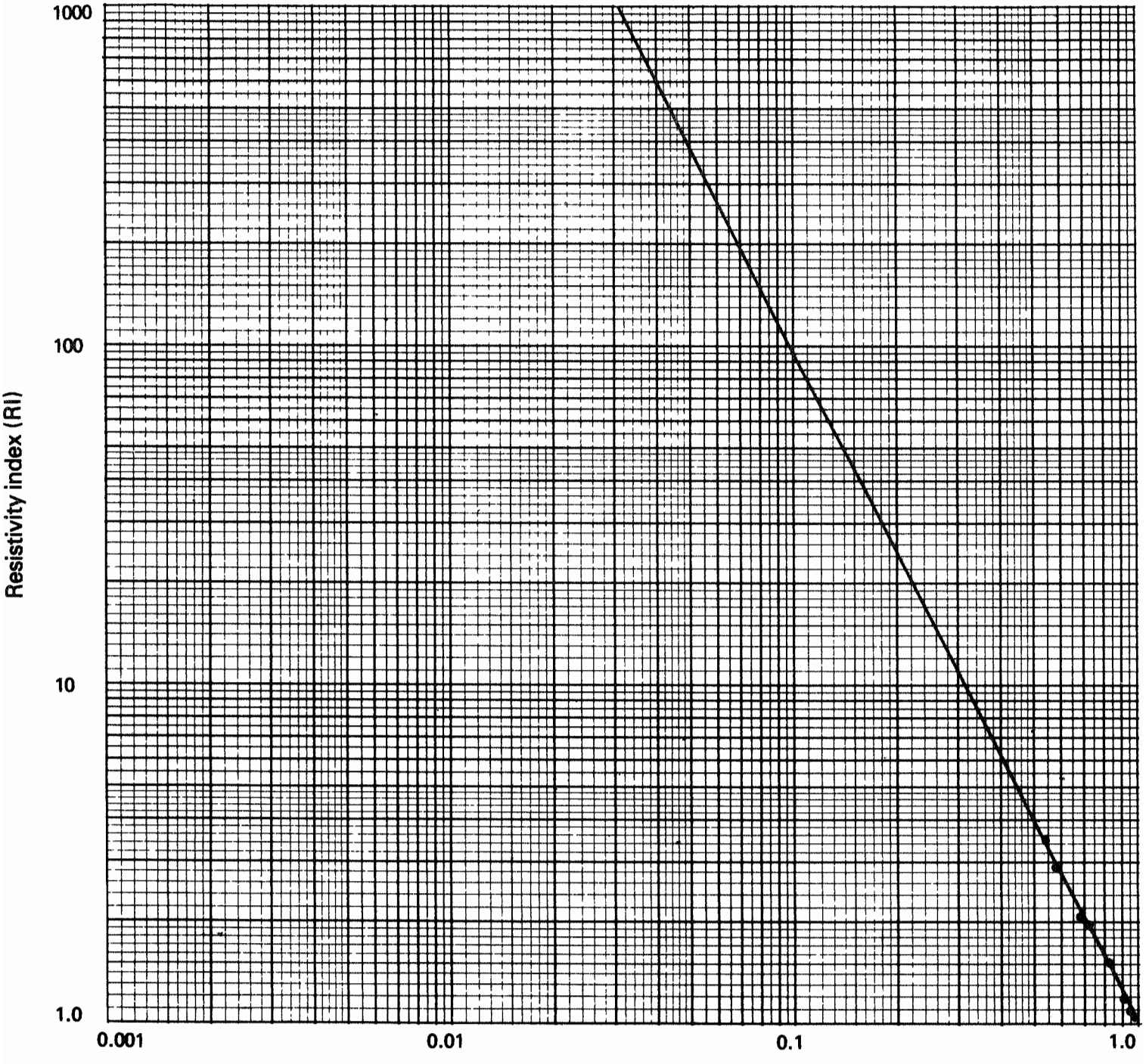
Company Statoil

Well 34/10-11 Sample : 53

$RI = 1.00\ Sw^{-1.98}$



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KLINKENBERG CORRECTED AIR PERMEABILITY

Sample no.	Sett: (Mean pressure)$^{-1}$ (atm. abs.)$^{-1}$	Air permeability md	Klinkeberg corrected permeability md
2 A	0.938	441	
	0.765	436	
	0.645	433	
	0.492	430	417
40	0.747	15.0	
	0.633	14.4	
	0.549	14.0	
	0.434	13.5	11.4
42	0.703	7.17	
	0.600	6.99	
	0.524	6.88	
	0.418	6.63	5.87
50	0.912	216	
	0.747	213	
	0.633	212	
	0.484	211	205
53	0.767	13.6	
	0.647	13.0	
	0.560	12.8	
	0.440	12.2	10.4

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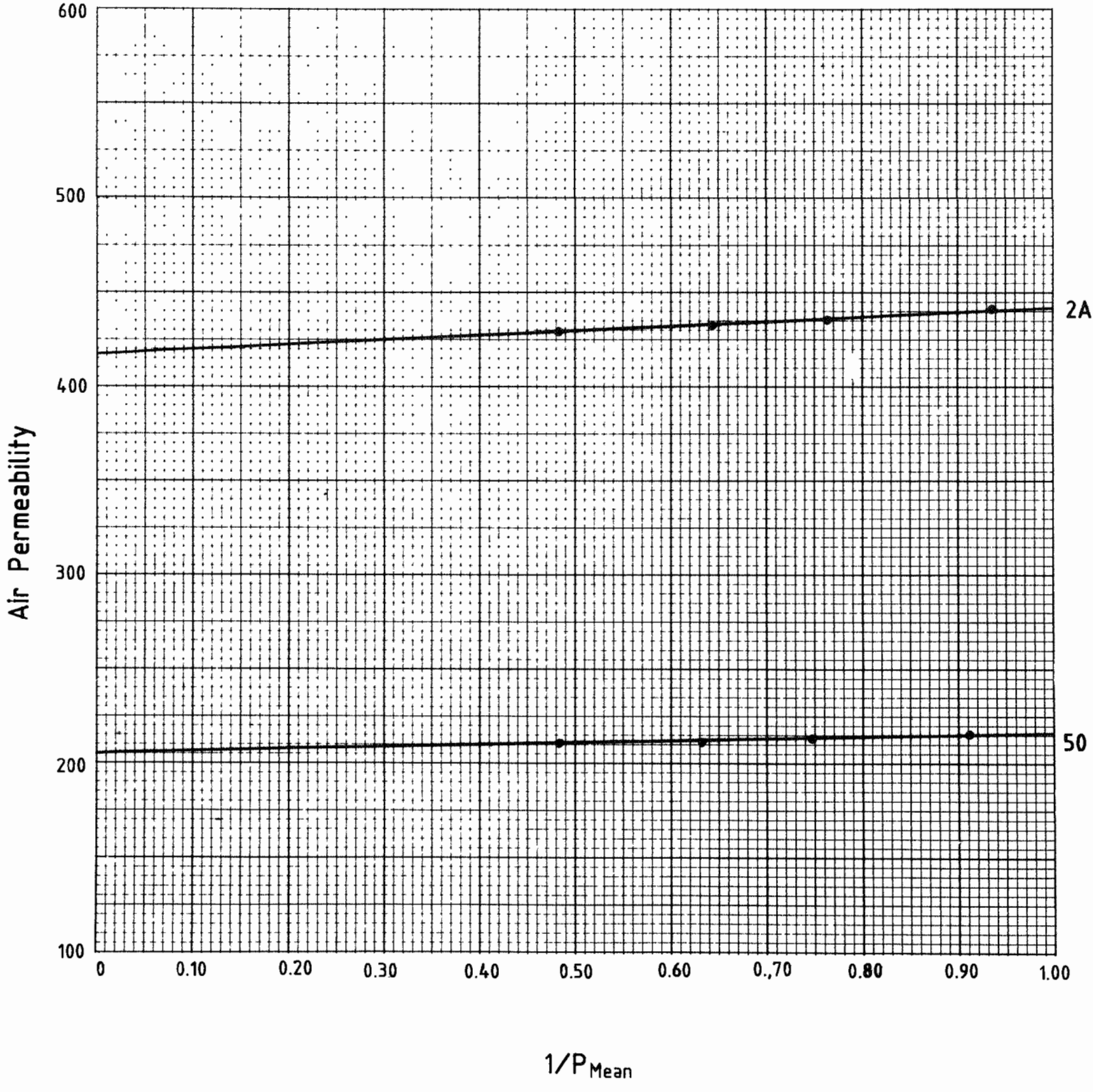
Klinkenberg Correction



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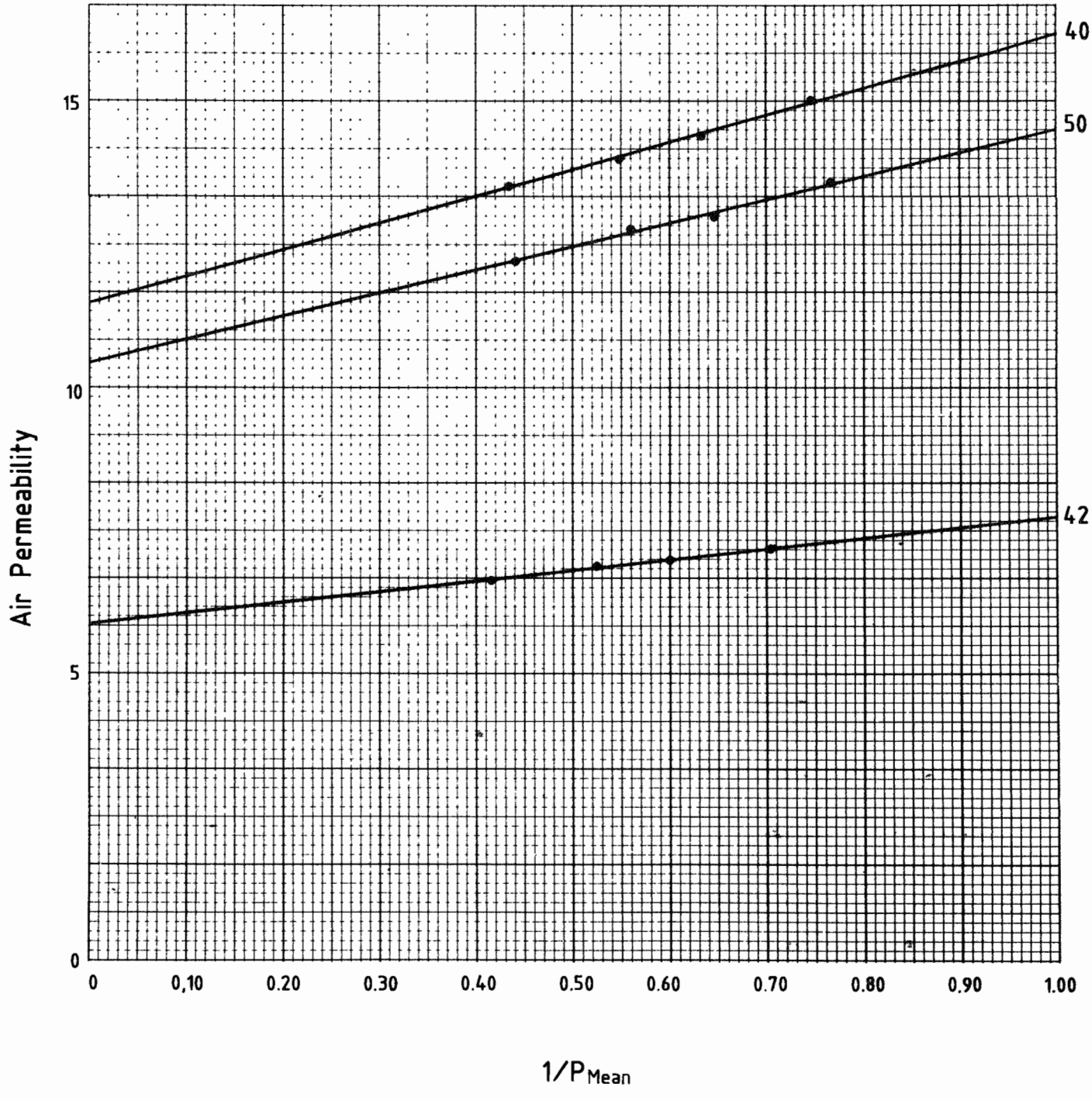
Petroleum
Laboratory

Klinkenberg Correction



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BRINE PERMEABILITY REDUCTION AT FOUR DIFFERENT CONFINING PRESSURES.

Sample	Room	20 Bar		50 Bar		100 Bar		150 Bar	
no.	KBrine original,md	KBrine md	Fraction of orig.	KBrine md	Fraction of orig.	KBrine md	Fraction of orig.	KBrine md	Fraction of orig.
42	4.64	3.05	0.657	2.19	0.472	1.76	0.379	1.54	0.332
50	178	142	0.798	94.6	0.531	61.3	0.344	44.0	0.247
53	8.28	5.84	0.705	4.67	0.564	3.91	0.472	3.57	0.431

BRINE POROSITY REDUCTION AT FOUR DIFFERENT CONFINING PRESSURES.

Sample	Room	20 Bar		50 Bar		100 Bar		150 Bar	
no.	Ø % orig.	Ø %	Fraction of orig.	Ø %	Fraction of orig.	Ø %	Fraction of orig.	Ø %	Fraction of orig.
42	22.0	21.2	0.964	20.5	0.932	19.7	0.895	19.3	0.877
50	32.6	27.3	0.837	26.2	0.807	25.4	0.779	24.8	0.761
53	24.5	23.4	0.955	22.5	0.918	21.7	0.886	21.4	0.871

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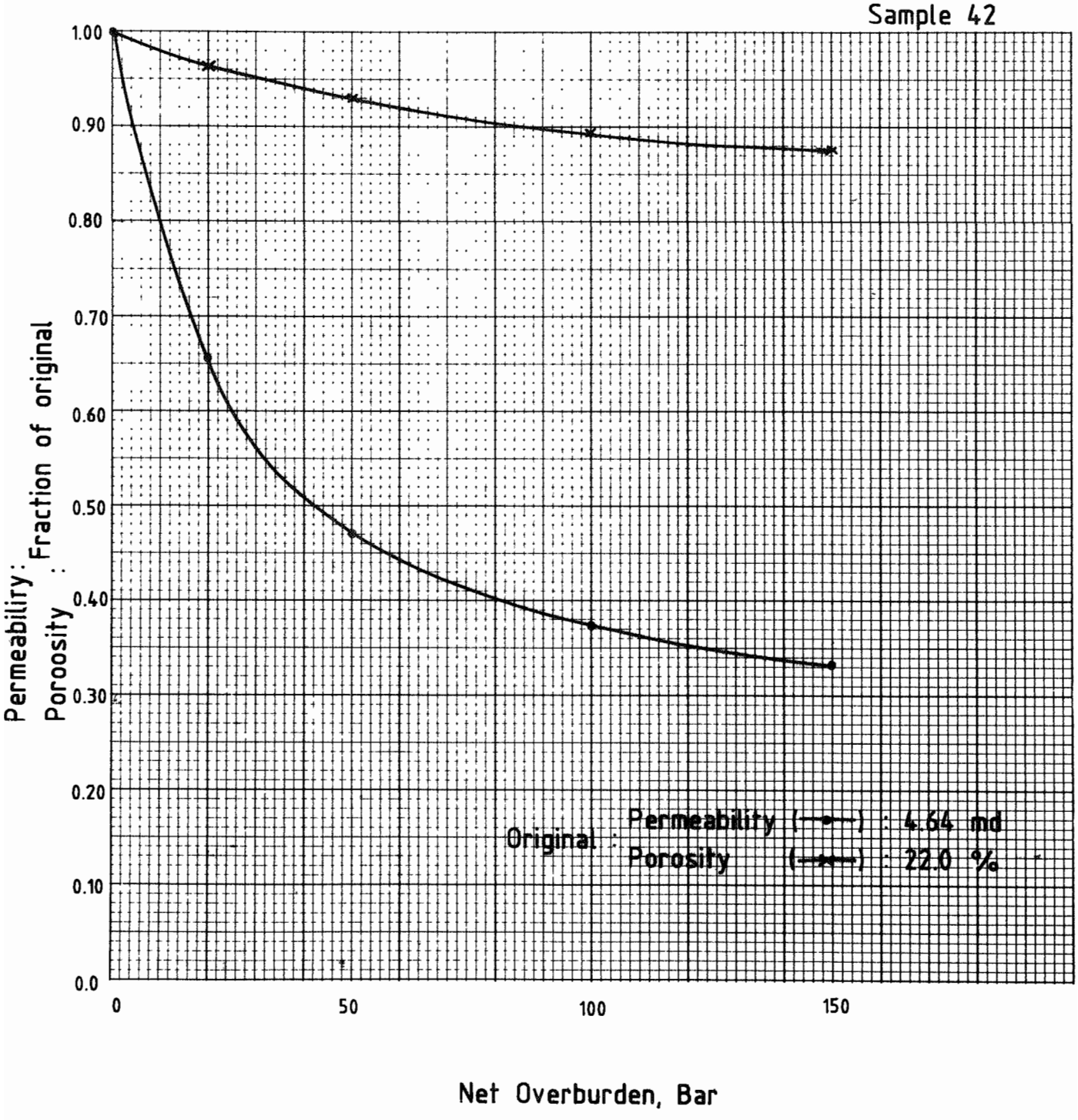
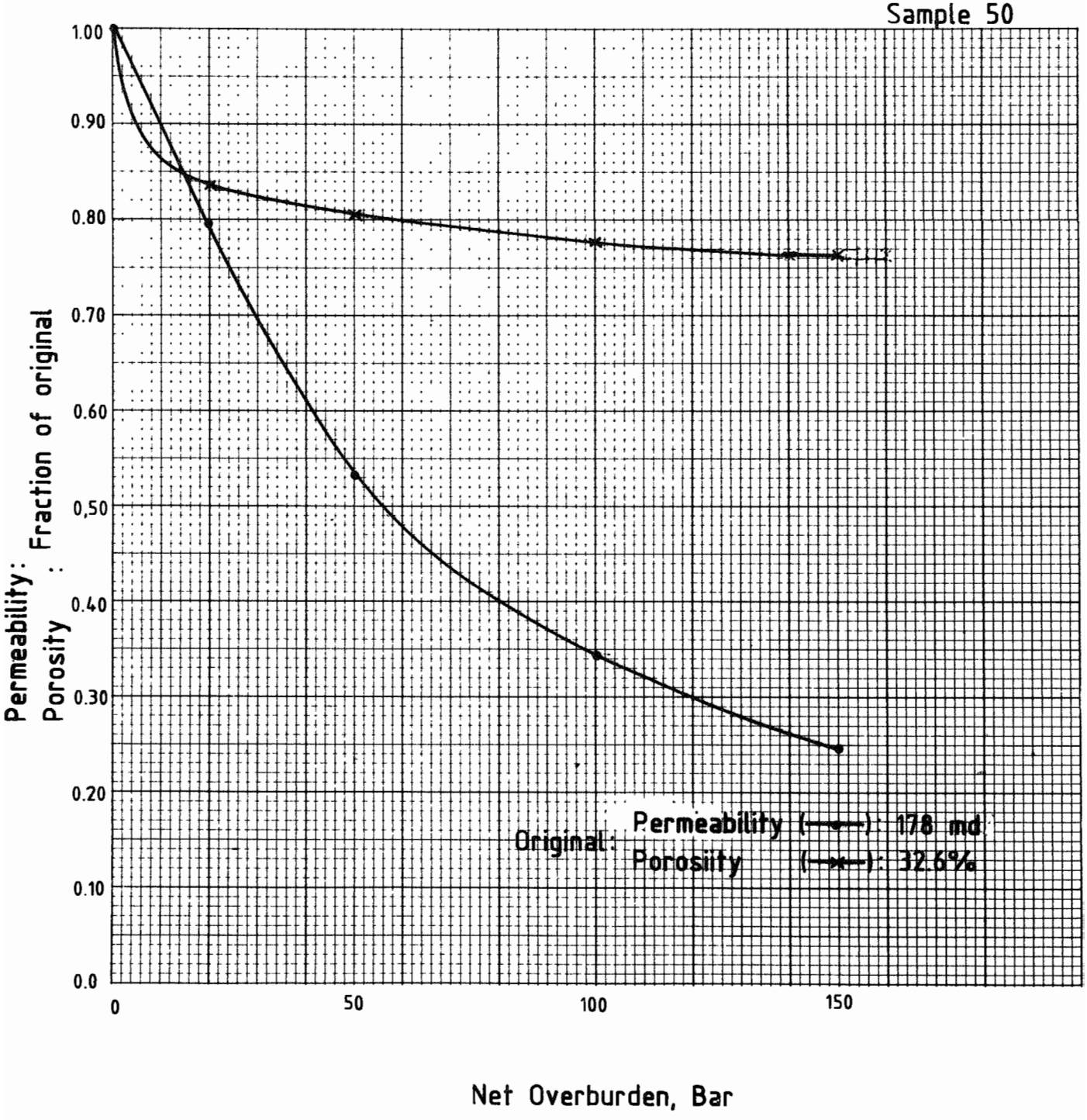
Laboratory

Permeability, Porosity versus Net Overburden



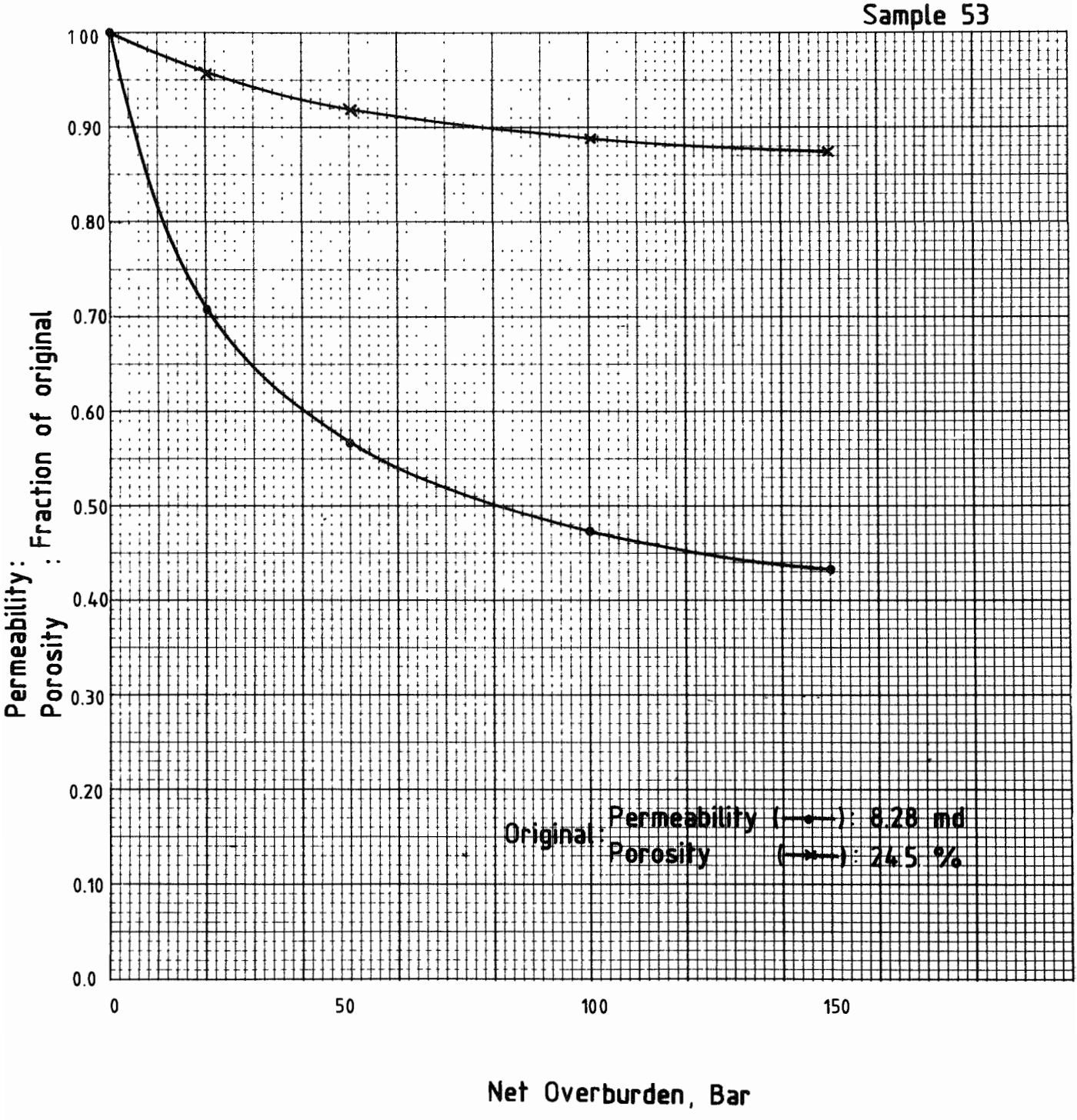
GECO
Petroleum
Laboratory

Permeability, Porosity versus Net Overburden



GECO
Petroleum
Laboratory

Permeability, Porosity versus Net Overburden



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POROSITY AND FORMATION RESISTIVITY FACTOR
MEASURED AT 4 DIFFERENT NET CONFINING PRESSURES.

$$FF = a\ \phi^{-m}$$

Brine Resistivity at 20°C: 0.176 Ωm

	No confining		20 Bar		50 Bar		100 Bar		150 Bar	
Sample no.	Ø%	FF	Ø%	FF	Ø%	FF	Ø%	FF	Ø%	FF
42	22.0	14.78	21.2	15.29	20.5	16.62	19.7	18.09	19.3	20.82
50	32.6	9.41	27.3	10.00	26.2	10.40	25.4	10.69	24.8	11.12
53	24.5	13.73	23.4	15.28	22.5	16.63	21.7	17.70	21.4	18.26

By wighted least squares method, forced through FF = 1.0, Ø = 1.0

a	1.02	1.00	1.00	1.00	0.99
m	1.84	1.80	1.81	1.80	1.83

Formation Factor versus Porosity

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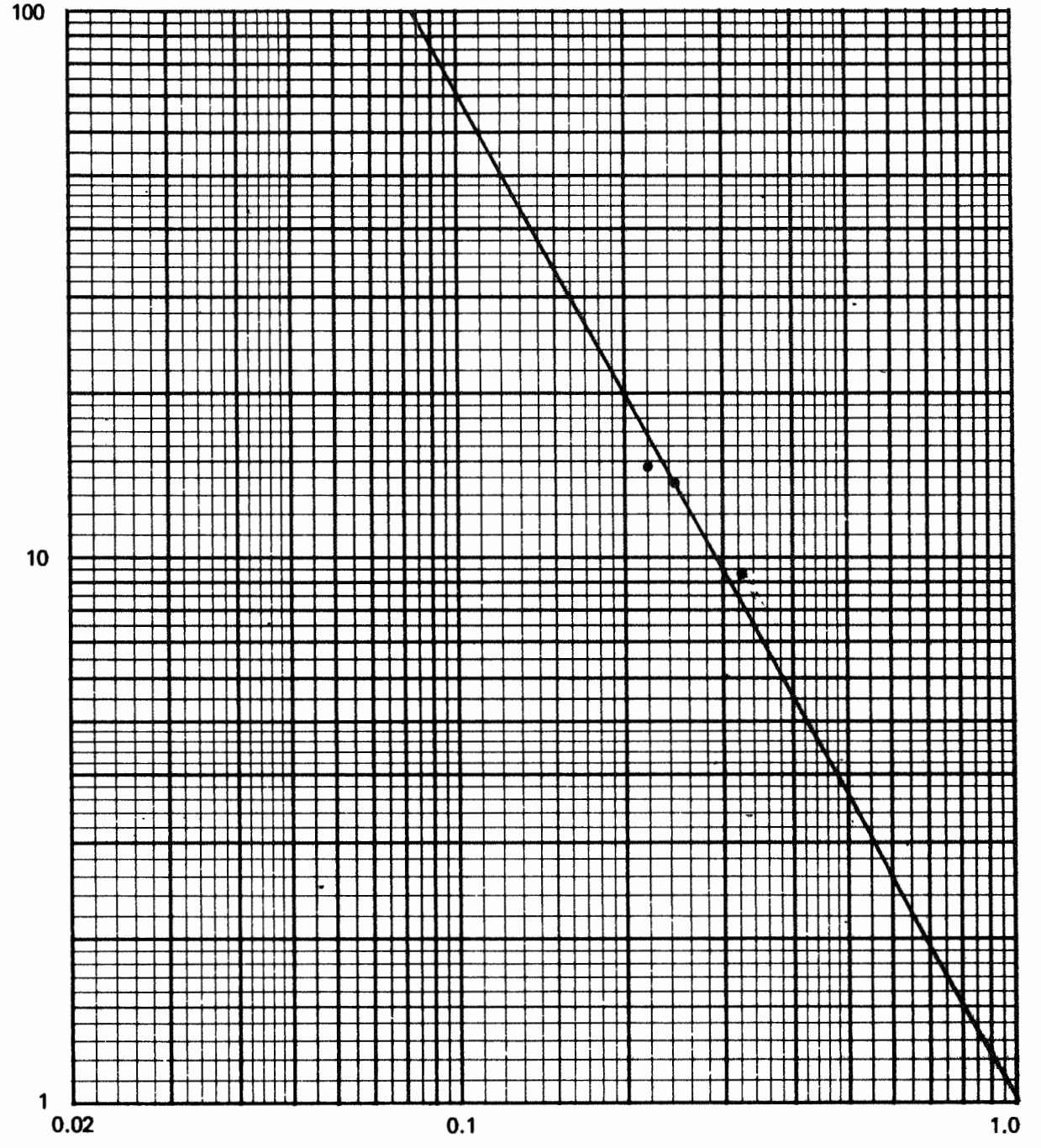
Company Statoil

Well 34/10-11

Room Condition

FF = $1{,}02\phi^{-1.84}$



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Formation Factor versus Porosity

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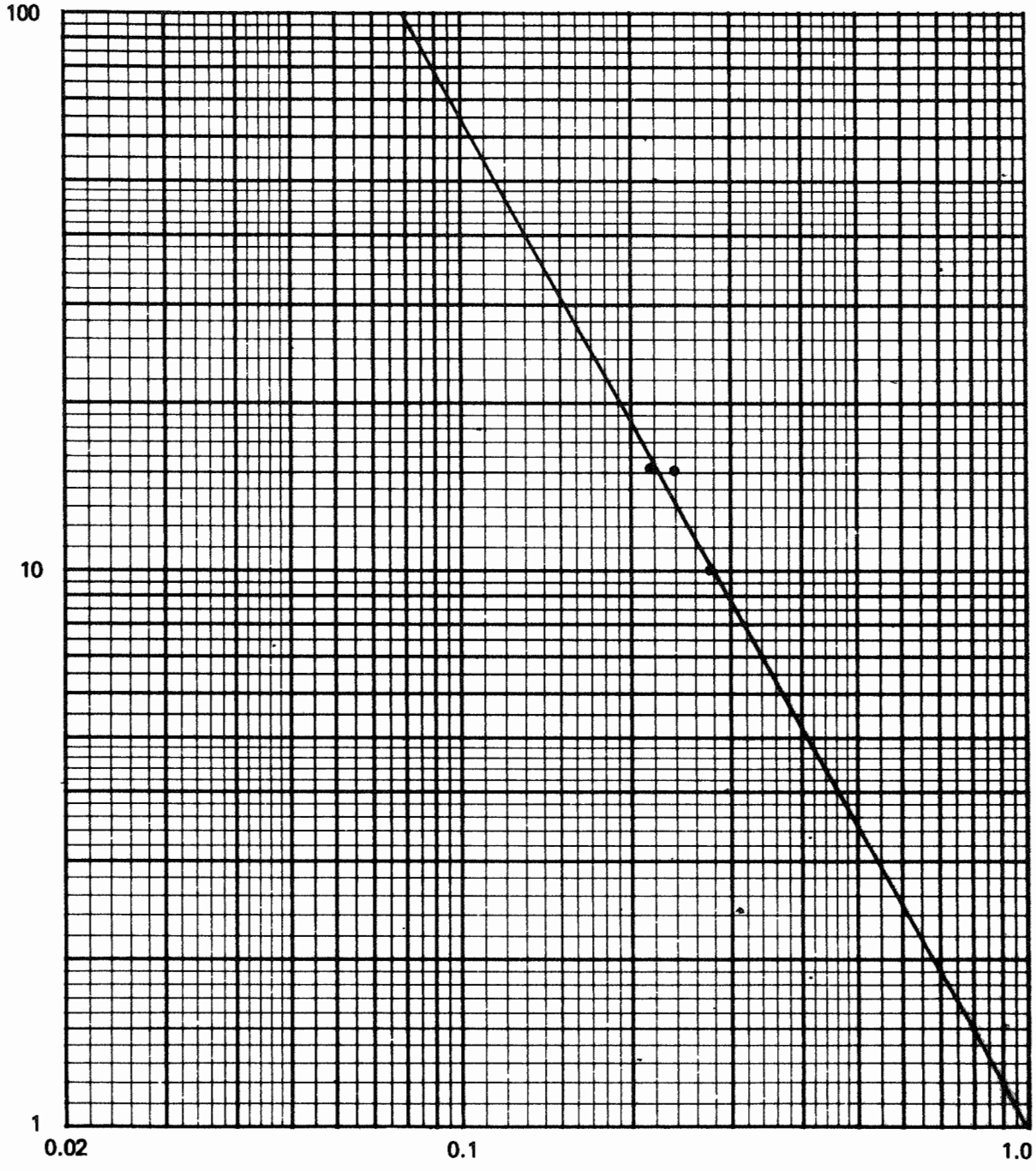
Company Statoil

Well 34/10-11

Net Overburden Pressure : 20 Bar

$FF = 1{,}00\phi^{-1.80}$



Formation Resistivity Factor.

Fractional Porosity.

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Formation Factor versus Porosity

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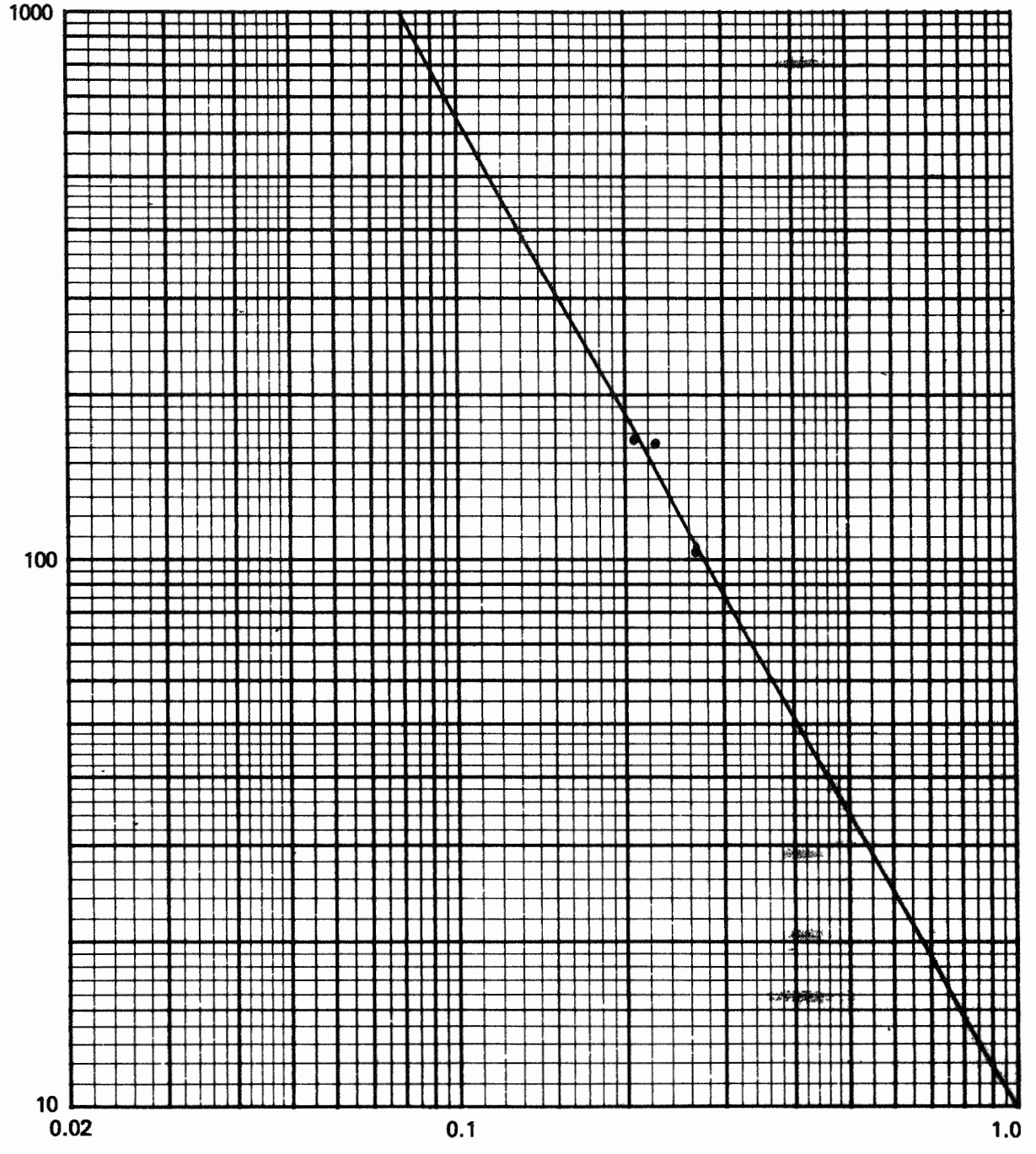
OF NORWAY A/S

Company Statoil

Well 34/10-11

Net Overburden : 50 Bar

FF = $1{,}00\phi^{-1.81}$



Formation Resistivity Factor.

Fractional Porosity.

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Formation Factor versus Porosity

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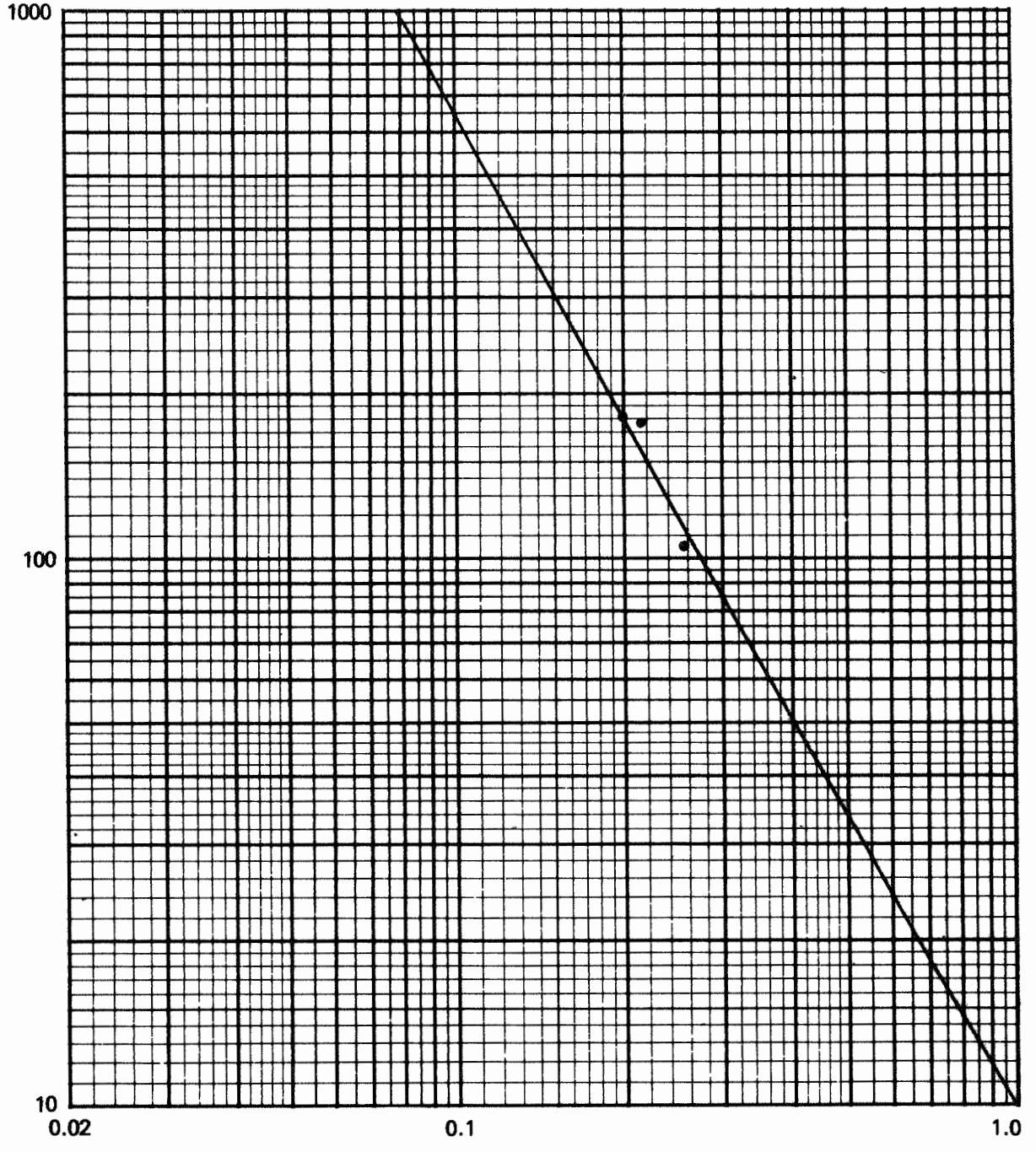
Company Statoil

Well 34/10-11

Net Overburden Pressure : 100 Bar

FF = $1{,}00\phi^{-1.80}$



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Formation Factor versus Porosity

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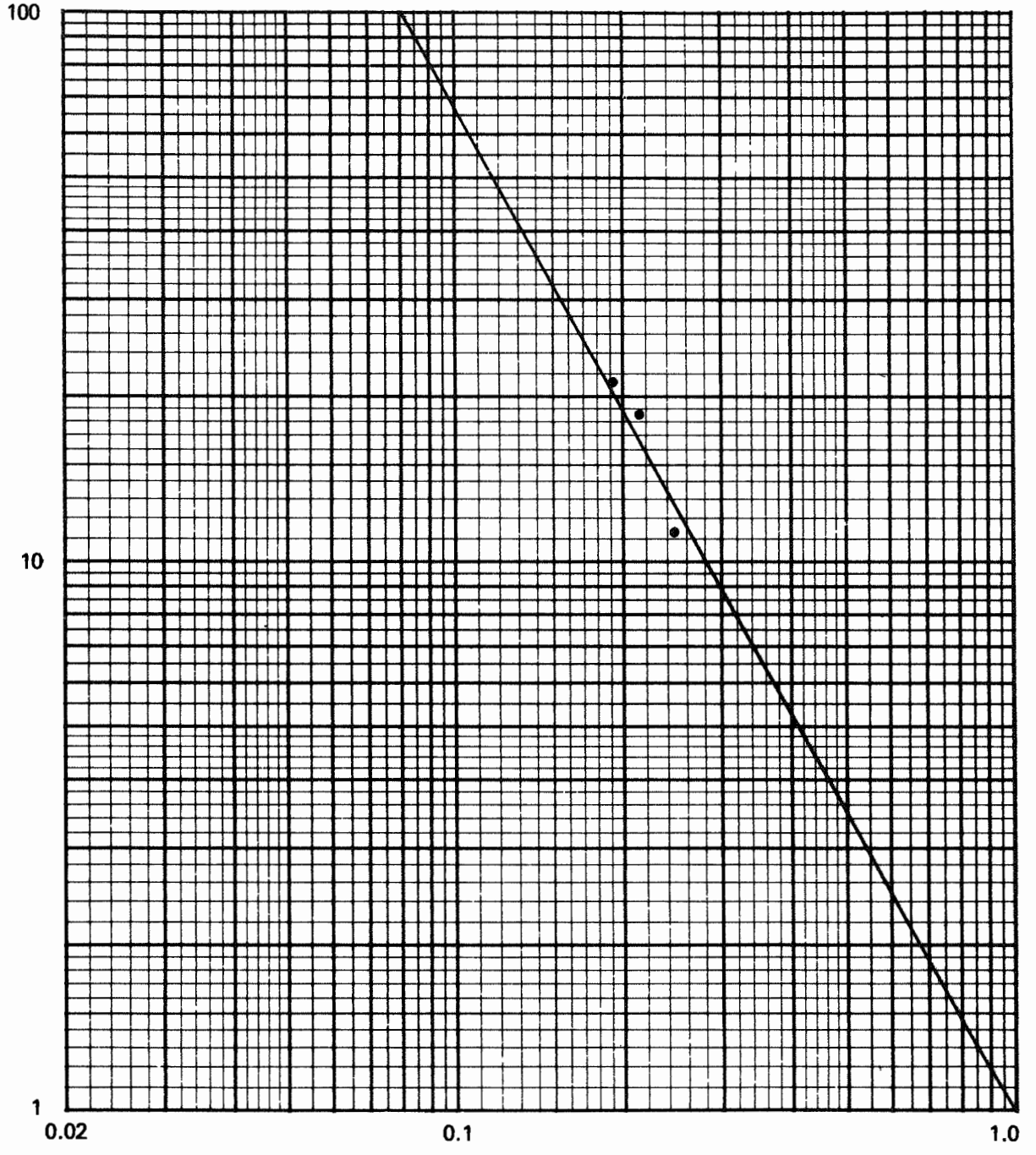
OF NORWAY A-S

Company Statoil

Well 34/10-11

Net Overburden Pressure : 150 Bar

FF = $0{,}99\phi^{-1.83}$



Formation Resistivity Factor.

Fractional Porosity.

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