ID 050 8435 9098

corex

34/10-7

Corex Laboratories Limited Wath-upon-Dearne Rotherham S63 7EW

05.02.84

KOMMENTAR TIL COREX RAPPORT
34/10-7

Tabell 1. Ingenting er sagt om at permeabiliteten er korrigert for "Klingenberg" effekt. Brevet fra Statoil sier tydelig at dette skulle gjøres. GK 8B har høyere porøsitet enn GK 8A, men viser mye lavere permeabilitet.

Tabell 2. Væskepermeabiliteter er målt ved forskjellige "Net Confining Pressures".
Pluggene 8B, 9B, 13B, 17B viser mye lavere permeabiliteter enn ved rutinemåliger (Tabell 1.)

Tabell 4. Porøsiteten og formasjonfaktorene viser normal reaksjon på trykk.
Brine resistivity er oppgitt til .19 ohm-meter uten at temperaturen er oppgitt. Antar vi 20°C tilsvarer det ca. 36.000 ppm. Det er langt fra "simulated formation brine" som er oppgitt brukt ca 43.000 - 44.000 ppm.
Formasjonsvann resistiviteten er ca. .19 ohm-meter ved 13 - 14°C. Dersom .19 er riktig ved ca. 20°C, har Corex ikke brukt formasjonsvann. Har Corex benyttet formasjonsvann og målingene er gjort omkring 20°C så er nevneren i Formasjons-faktor uttrykket gal.

Tabell 5. Metningseksponenten , n, er ikke beregnet av Corex.

Plugg	GK 6B	GK 8B	GK 9B	GK 13B	GK 17B
n-exp.	2.25	2.61	2.16	2.07	2.34
R^2	.862	.954	.996	.997	1.000

Tabell 8. Metningseksponenten er ikke oppgitt.

Plugg Nr.	GK 2	GK 4	GK 7	GK 11	GK 12	GK 14	GK 19
n-exp.	2.28	-	2.19	2.29	2.22	2.32	1.98
R^2	.982	-	.999	1.000	.999	.997	.996

Kapillær-trykks målinger, gas/vann og Hg-injeksjons kurvene stemmer bra overens.

corex

Corex Laboratories Limited
Golden Smithies Lane, Wath-upon-Dearne
Nr. Rotherham, South Yorkshire S63 7EW
Telephone: Rotherham 874226
Telex: 54241

Our ref: CL 396
Your ref:

12th March, 1981

Statoil,
Forus,
Postboks 300,
N-4001 Stavanger,
Norway

Gentlemen,

In a letter of 20th June, 1980, we were requested to perform a series of special core analysis tests on samples of core from well 34/10-7. We now have pleasure in presenting our final report on this work (Report No. CL 396).

The opportunity to be of service is appreciated and if you have any queries concerning this report please do not hesitate to contact us.

Yours sincerely,

J.R. Hook
Chief Scientist

05

JRH/sk

COREX LABORATORIES LIMITED

SPECIAL CORE STUDIES

COMPANY	STATOIL
WELL	34/10-7
LOCATION	NORTH SEA
COUNTRY	NORWAY
REPORT NO.	CL 396

CONTENTS

1. INTRODUCTION

Thirteen plug samples of diameter 1.5 inches and length 3 inches were received in the laboratory. These samples were divided into two sets as specified by Statoil and a separate programme of tests was performed on each set.

Each plug sample in set 1 was cut into 2 pieces and each piece was cleaned in Soxhlet extractors using firstly methanol, then toluene and finally methanol as the refluxing solvent. Helium porosity and gas permeabilities were determined and then one piece from each plug sample was used to investigate the variation of sample conductivity with saturating brine conductivity while the other piece was used to determine formation resistivity factor, porosity and liquid permeability and saturation exponent data at overburden pressures of 6.8, 13.6, 32.6 and 50 bars.

The samples in set 2 were trimmed and cleaned in Soxhlet extractors, again using firstly methanol, then toluene and finally methanol again as the refluxing solvent. Following the determination of helium porosity and gas permeability, gas-brine capillary pressure curves and formation resistivity factor and saturation exponent data were measured at room conditions. The samples were then re-extracted with methanol and mercury injection capillary pressure data were measured. Because of equipment limitations a one inch diameter by one inch long plug sample was cut from each 1.5 inch diameter sample and used for the mercury injection tests.

The results of the helium porcsity and gas permeability determinations are given in Table 1.

For all the tests described in this report simulated formation brine made to the analysis given in Table 2 was used.

It should be noted that many of the samples disintegrated during preparation or testing so that the full range of specified tests could not be performed.

TABLE 1 BASIC PROPERTIES OF SAMPLES

Company Statoil Well 34/10-7

COREX SAMPLE CODE	DEPTH (m)	GAS PERM. (mD)	POROSITY (%)	GRAIN DENSITY ($g\ cm^{-3}$)	LITHOLOGICAL DESCRIPTION
GK 2	1829.01	341	17.0	2.68	Set 2
GK 4	1832.23	371	38.8	2.66	Set 2
GK 6A	1836.43	53.1	32.2	2.66	Set 1
GK 6B		49.4	32.3	2.66	
GK 7	1837.19	253	33.6	2.66	Set 2
GK 8A	1838.74	150	31.0	2.64	Set 1
GK 8B		109	31.7	2.64	
GK 9A	1840.78				Sample disintegrated
GK 9B		245	35.0	2.62	Set 1
GK 10A	1841.95	164	33.2	2.64	Set 1
GK 10B					Sample split
GK 11	1846.11	671	38.9	2.66	Set 2
GK 12	1852.98	257	33.9	2.67	Set 2
GK 13A	1858.19				Sample split
GK 13B		108	31.9	2.64	Set 1

TABLE 2

BRINE ANALYSES

Company: Statoil Well: 34/10-7

Ion	Concentration (mgl^{-1})	
	Formation Brine	Sea Water
Sodium	14000	
Calcium	1275	
Magnesium	335	
Barium	50	
Lithium	7.6	
Potassium	209	
Chloride	26200	
Bicarbonate	415	
Sulphate	30.8	
Bromide	62	

TABLE 1 (CONT'D)

COREX SAMPLE CODE	DEPTH (m)	GAS PERM. (mD)	POROSITY (%)	GRAIN DENSITY ($g\ cm^{-3}$)	LITHOLOGICAL DESCRIPTION
GK 14 118.1	1861.91	44.3	31.0	2.66	Set 2
GK 17A	1943.01	82.4	22.6	2.63	Set 1
GK 17B		218	22.7	2.63	Sample contains filled fracture.
GK 19 160.1	1946.17	5.79	25.4	2.65	Set 2

2. TESTS ON SAMPLE SET 1

Following the determination of porosity and permeability as described in Section 1 one piece from each plug sample was saturated with simulated formation brine by evacuation followed by injection of brine at 1000 psig. An attempt was then made to investigate the variation of core conductivity with saturating brine conductivity but it was found that none of the samples survived all the stages of the test so no results are given.

The remaining piece from each plug sample was used for tests at net confining pressure. Each plug was placed between end pieces in a rubber sleeve, immersed in hydraulic oil in a pressure vessel and a hydrostatic net confining pressure of 6.8 bar applied. The samples were then saturated by evacuation followed by injection of a metered volume of simulated formation brine so that the sample porosity could be calculated. Several pore volumes of brine were pumped through each sample which was then allowed to attain electrical equilibrium with the brine. When equilibrium had been attained the electrical resistance of the sample was measured at five frequencies. The resistance at infinite frequency was then determined by extrapolation in order to correct for polarisation effects. This calculated resistance was converted to a specific resistivity for the sample and the formation resistivity factor of the sample determined by dividing by the resistivity of the saturating brine. The liquid permeability was then determined by measuring the flow rate of brine through the sample for an applied pressure and using Darcy's law to calculate the permeability.

The value of net confining pressure was then raised to the next required value and the change in pore volume during this change in pressure was measured by monitoring the volume of brine expelled from the sample. When the sample had stabilised the formation resistivity factor and liquid permeability were determined as described above.

This procedure was repeated for each required value of net confining pressure.

The results of the porosity and liquid permeability tests are given in Table 3 and the formation resistivity factor data are given in Table 4. The formation factor results are plotted against sample porosity for each value of net confining pressure on Figures 1-4. The line on each figure was drawn between the origin and the geometric mean values of porosity and formation factor.

On completion of the formation factor tests each sample was removed from the pressure vessel, a semi-permeable porous disc, saturated with formation brine, was placed in contact with the lower end, and the sample plus disc replaced in the pressure vessel and a net confining pressure of 50 bars applied. The brine saturation of the sample was then reduced by applying oil at low pressure to the upper end of the sample and the volume of brine expelled from the sample through the semi-permeable disc was monitored. When the brine saturation was stable the electrical resistivity of the sample was measured as described above and the brine saturation was calculated from the volume of brine expelled from the sample. The resistivity was expressed as a resistivity index by dividing by the value of resistivity at a brine saturation of 100%.

The pressure of oil applied to the sample was then increased so that another value of brine saturation could be obtained and the resistivity index determined. This procedure was repeated until data had been obtained at six values of brine saturation. The results are given in Table 5 and Figure 5. Due to the nature of sample GK 178 a very small range of values of brine saturation was attained and only one value has been reported.

A regression analysis of the data, including the point brine saturation = 1.00, resistivity index = 1.00 for each sample, gave a value of 2.13 for the saturation exponent, n.

On completion of the resistivity index measurements the oil and brine were removed from the samples by extraction with toluene and then methanol. The clean dry samples were saturated by evacuation followed by injection of simulated formation brine at 1000 psig. After stabilisation the formation resistivity factor at room conditions was determined by placing each sample between electrodes and measuring the electrical resistance as described above. The results are given in Table 6. Only three of the samples were in a condition to provide valid data so results are reported only for these samples.

TABLE 3 POROSITY AND LIQUID PERMEABILITY AT OVERBURDEN PRESSURES

Company: Statoil   Well: 34/10-7

Sample:	GK 6B		GK 8B		GK 9B		GK 13B	
Depth (m)	1836.43		1838.74		1840.78		1858.19	
Net confining pressure: (bar)	Porosity (%)	Perm. (mD)	Porosity (%)	Perm. (mD)	Porosity (%)	Perm. (mD)	Porosity (%)	Perm. (mD)
6.8	32.1	18.7	31.4	10.7	33.5	27.4	31.2	14.7
13.6	31.6	18.1	31.2	9.98	32.6	25.8	30.8	13.7
32.6	31.1	16.7	30.7	9.36	30.9	22.7	30.2	12.3
50.0	30.6	16.1	30.3	9.15	29.4	20.8	29.8	11.5

TABLE 3 (CONT'D)

Company: Statoil **Well:** 34/10-7

Sample:	GK 178 150 3							
Depth (m)	1943.01							
Net confining pressure: (bar)	Porosity (%)	Perm. (mD)						
6.8	22.3	1.80						
13.6	22.1	0.97						
32.6	21.5	0.09						
50.0	21.4	0.05						

TABLE 4

FORMATION RESISTIVITY FACTOR

OVERBURDEN PRESSURE CONDITIONS

Company: Statoil   Well: 34/10-7   Brine Resistivity: 0.190 ohm.m

Net confining pressure (bar)		6.8		13.6		32.6		50.0	
Sample	Depth (m)	Porosity	Formation Factor	Porosity	Formation Factor	Porosity	Formation Factor	Porosity	Formation Factor
GK 6B	1834.73	32.1	11.7	31.6	11.8	31.1	12.4	30.6	12.8
GK 8B	1838.74	31.4	12.3	31.2	12.6	30.7	13.0	30.3	13.4
GK 9B	1840.78	33.5	11.7	32.6	12.2	30.9	12.5	29.4	14.4
GK 13B	1858.19	31.2	10.6	30.8	11.0	30.2	11.4	29.8	11.8
GK 17B	1943.01	22.3	12.6	22.1	13.5	21.5	14.2	21.4	15.0

Figure 1.

FORMATION RESISTIVITY FACTOR-POROSITY CORRELATION

COMPANY STATOIL FIELD

WELL 34/10 - 7 FORMATION

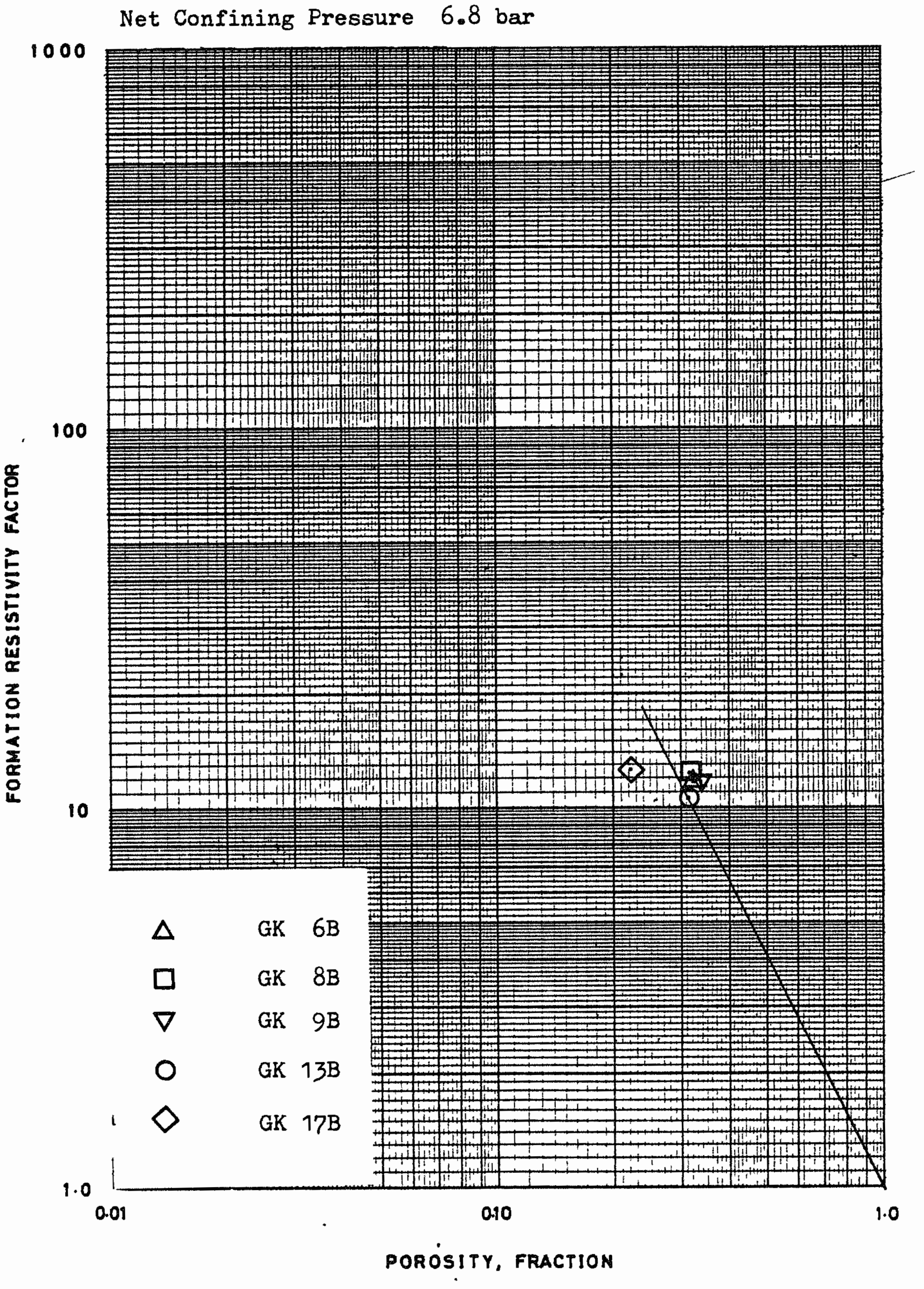

Figure 2.

FORMATION RESISTIVITY FACTOR-POROSITY CORRELATION

COMPANY STATOIL FIELD

WELL 34/10 - 7 FORMATION

Net Confining Pressure 13.6 bar

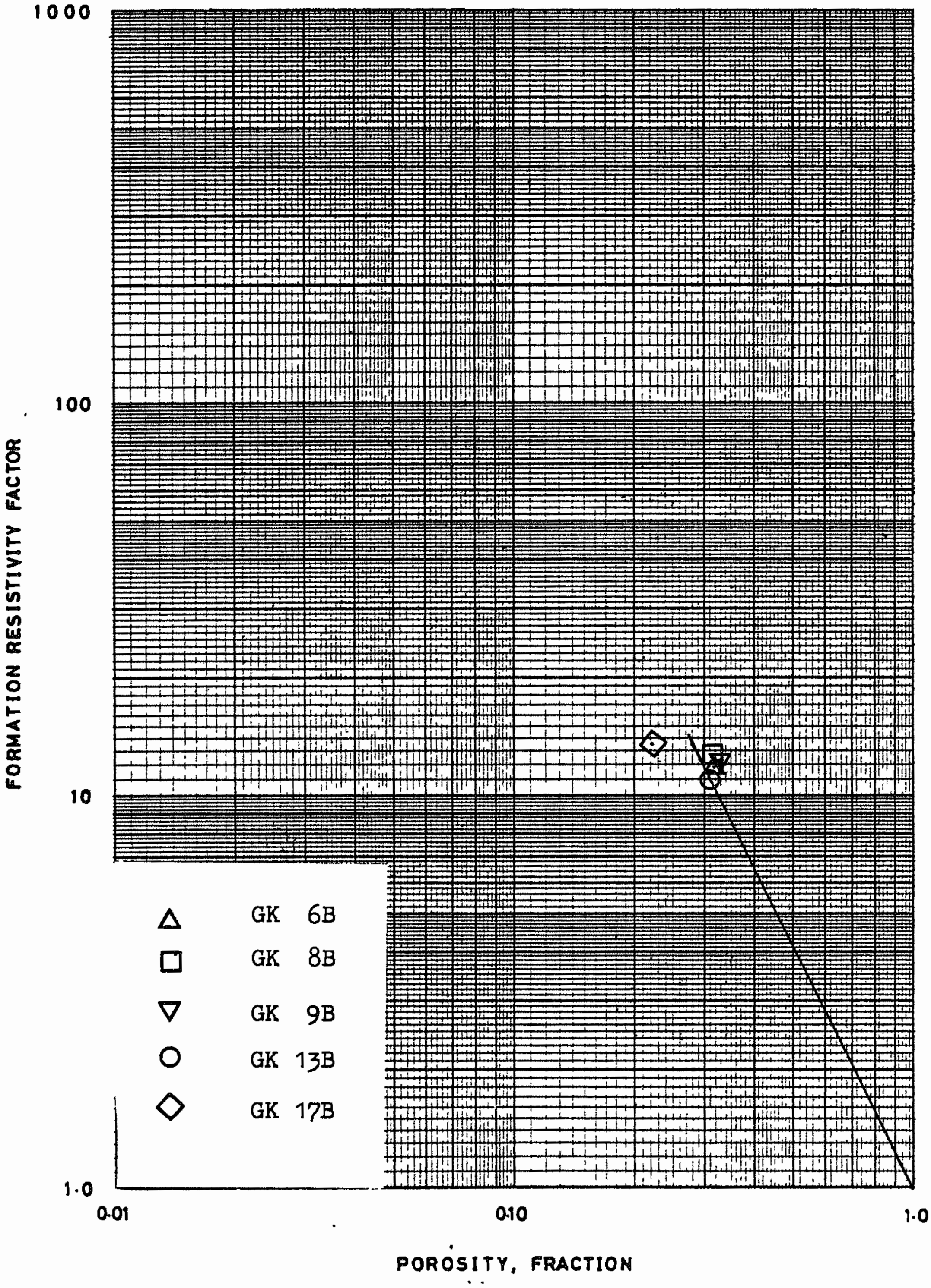

Figure 3.

FORMATION RESISTIVITY FACTOR-POROSITY CORRELATION

COMPANY STATOIL FIELD

WELL 34/10 - 7 FORMATION

Net Confining Pressure 32.6 bar

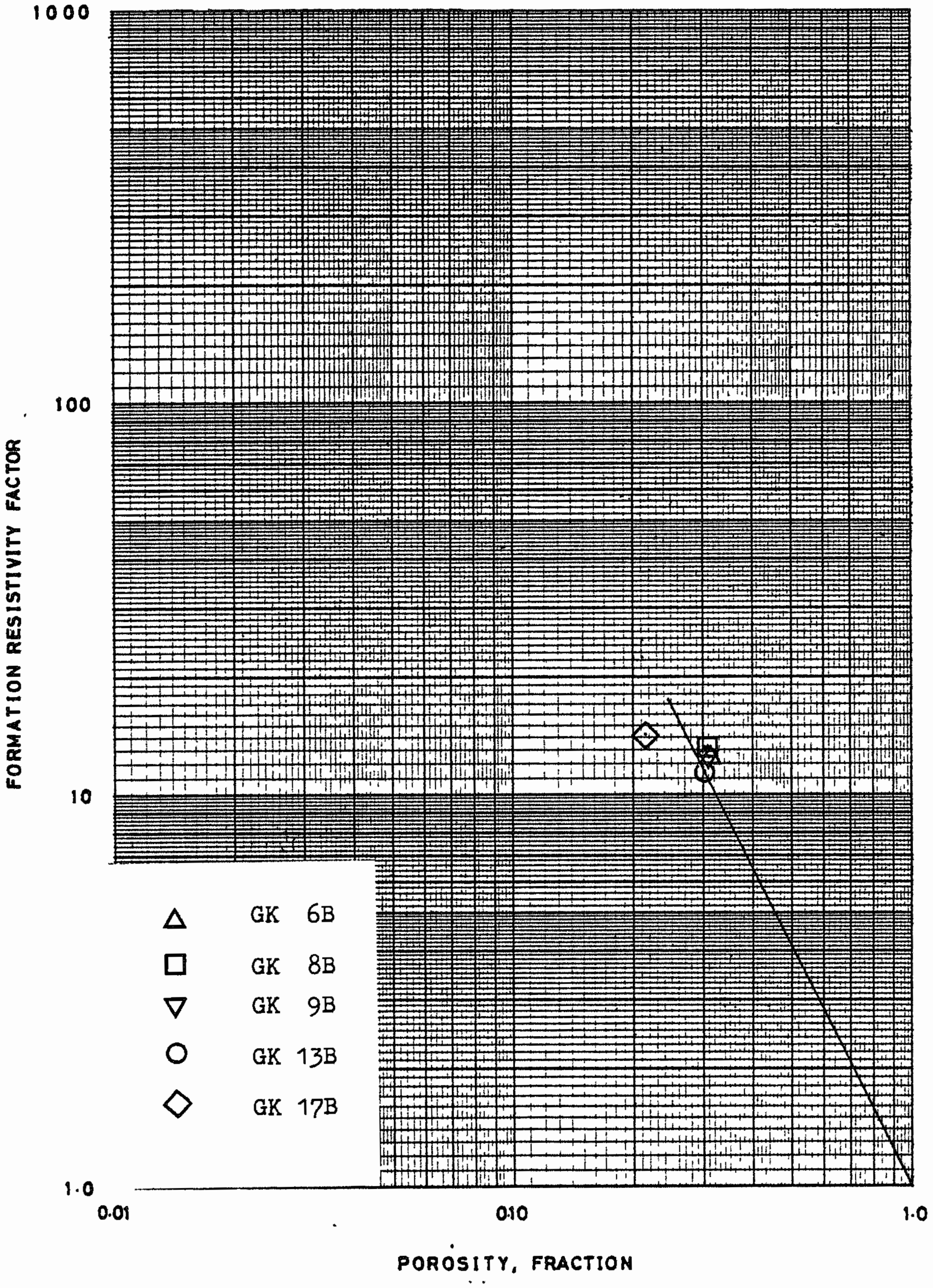

Figure 4.

FORMATION RESISTIVITY FACTOR-POROSITY CORRELATION

COMPANY STATOIL FIELD

WELL 34/10 - 7 FORMATION

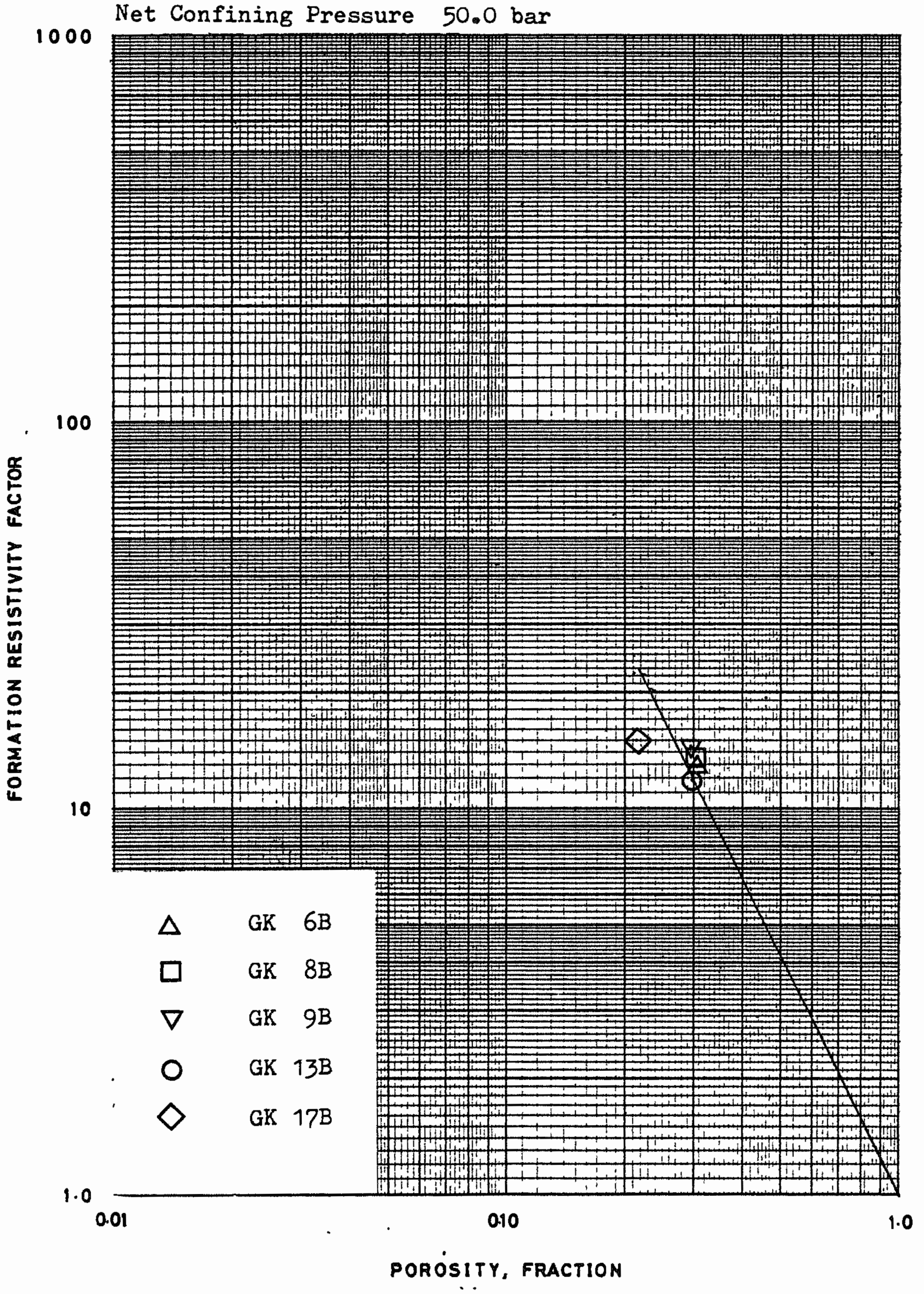

TABLE 5

RESISTIVITY INDEX   OB

Company Statoil   Well 34/10-7   Net confining pressure 50 bar

SW-P-50   RI-P50

SAMPLE	DEPTH (m)	BRINE SATN. (%)	RESISTIVITY INDEX
GK 6B	1834.73	87.1	1.38
		84.1	1.51
		78.7	1.85
		71.7	2.26
		63.0	3.04
		52.1	3.84
GK 8B	1838.74	91.4	1.35
		90.5	1.42
		87.4	1.51
		81.2	1.76
		74.1	2.11
		72.6	2.19
GK 9B	1840.78	95.4	1.09
		92.1	1.20
		87.1	1.34
		80.5	1.66
		71.8	2.05
		69.7	2.14
GK 13B	1858.19	92.3	1.18
		89.2	1.27
		81.9	1.50
		74.0	1.96
		64.9	2.42
		59.8	2.86
GK 17B	1943.01	96.0	1.10

Figure 5.

RESISTIVITY INDEX versus WATER SATURATION

COMPANY STATOIL FIELD

WELL 34/10 - 7 FORMATION

Net Confining Pressure 50 bar

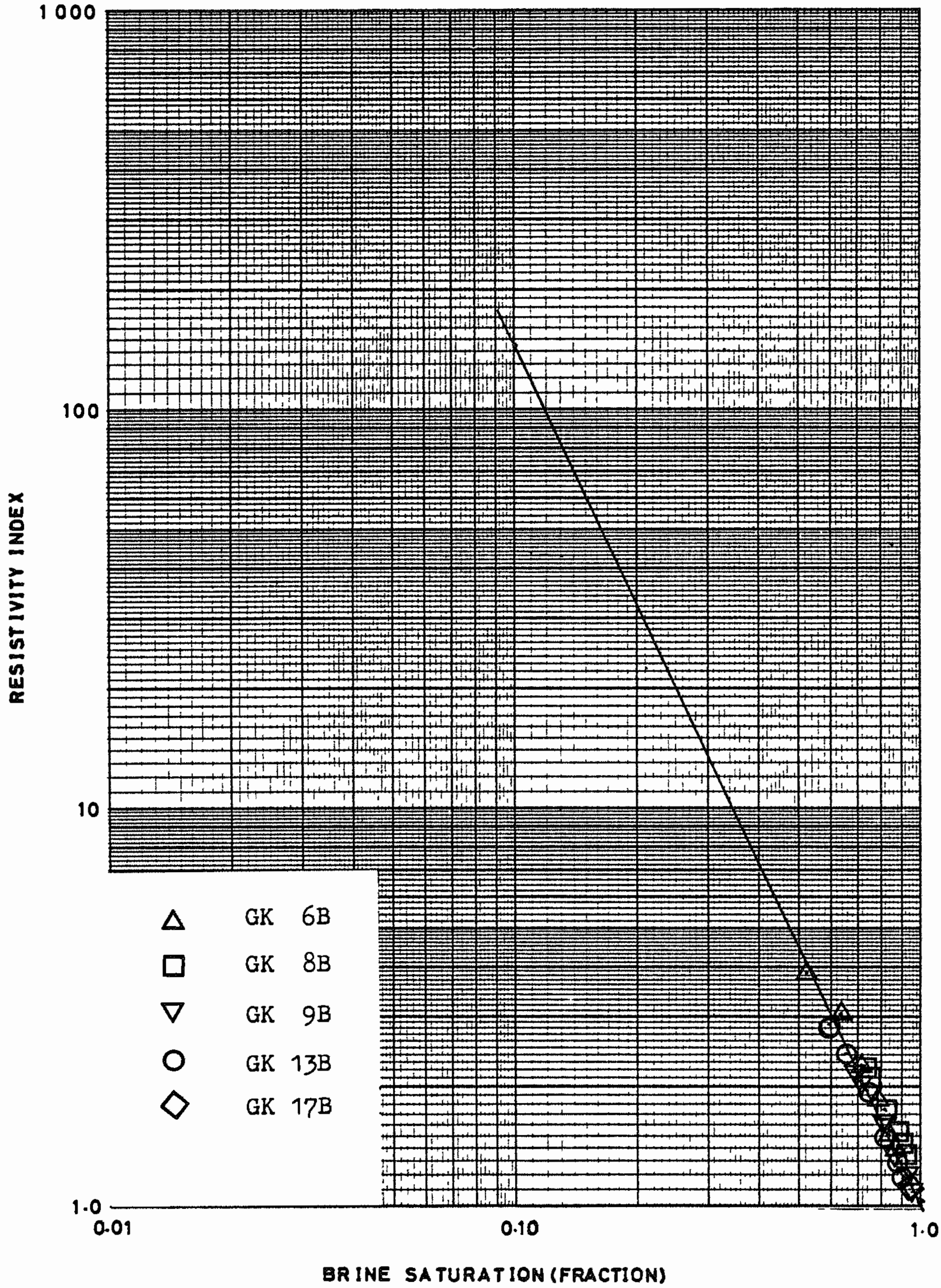

TABLE 6

FORMATION RESISTIVITY FACTOR

ROOM CONDITIONS

Company Statoil   Well 34/10-7   Brine Resistivity 0.190 ohm.m.

Sample	Depth (m)	Porosity (%)	Formation Factor
GK 6B	1836.43	32.3	7.43
GK 8B	1838.74	31.7	6.90
GK 13B	1858.19	31.9	5.87

3. TESTS ON SAMPLE SET 2

This set of samples was used to determine formation resistivity factor, resistivity index, capillary pressure and pore throat size distribution data.

The plug samples were saturated by evacuation followed by injection of simulated formation brine at a pressure of 1000 psig. The samples were left immersed in brine until electrical equilibrium had been attained before the formation resistivity factors were measured. Each sample was placed, in turn, between electrodes and the electrical resistance determined at five frequencies. The resistance of each sample at infinite frequency was calculated to correct for polarisation effects and this value was converted to a specific resistivity. The formation resistivity factor was then determined by dividing by the resistivity of the saturating brine. The results are given in Table 7 and Figure 6. A linear regression analysis of these data gave values of 1.66 for the cementation exponent, m, and 1.14 for the intercept, a.

Following the formation factor measurement each sample was placed on a semi-permeable diaphragm in a capillary pressure apparatus. Nitrogen, saturated with water vapour, was admitted at controlled pressure to the apparatus and the volume of brine expelled from the samples through the semi-permeable diaphragm was monitored with a pipette. When the volume of brine expelled was constant each sample was removed from the capillary pressure cell and weighed to determine the brine saturation. At the same time each sample was placed between electrodes and the electrical resistivity determined as described above. The samples were then replaced in the capillary pressure apparatus and the nitrogen pressure increased so that another value of brine saturation could be attained. This procedure was repeated until six values of brine saturation and resistivity had been determined. The resistivity values were expressed as a resistivity index by dividing the sample resistivity at the measured brine saturation by the resistivity of the sample at a brine saturation of 100%.

The results of the resistivity index measurements are given in Table 8 and Figure 7. A regression analysis of the data, together with the point brine saturation = 1.00, resistivity index = 1.00, gave a value of 2.26 for the saturation exponent, n.

The results of the capillary pressure tests are given in Table 9 and Figures 8-13.

On completion of the above tests the samples were cleaned of brine by extraction with methanol so that mercury injection capillary pressure data could be determined. Because of equipment limitations one inch diameter by one inch long plug samples were cut from the 1.5 inch diameter samples dried and the pore volume determined. Each sample was placed in turn in the mercury injection apparatus and evacuated. While maintaining the vacuum, mercury was pumped into the sample chamber up to a reference mark completely immersing the sample. Gas was then admitted to the surface of the mercury thus injecting mercury into the sample. The volume of mercury injected was monitored by pumping additional mercury into the sample chamber to maintain the mercury level at the reference mark. The volume injected was corrected to allow for the expansion of the sample chamber and compressibility of the mercury and the mercury saturation calculated. The applied pressure was also corrected for the head of mercury above the sample so that the mercury saturation could be related to injection pressure.

Each value of injection pressure was converted to an equivalent pore throat radius assuming a value of 460 dynes cm^{-1} for the surface tension of mercury and a contact angle of 140^{o}. The pore throat size distribution was then evaluated by dividing the incremental volume of mercury injected, expressed in pore volumes, by the change in pore throat size corresponding to the change in injection pressure.

The results are given in Tables 10-15 and the capillary pressure curves and pore throat size distributions are shown on Figures 14-25.

TABLE 7

FORMATION RESISTIVITY FACTOR

ROOM CONDITIONS

Company Statoil | Well 34/10-7 | Brine Resistivity 0.190 ohm.m

Sample	Depth (m)	Porosity (%)	Formation Factor
GK 2	1829.01-.21	17.0	18.9
GK 4	1832.23-.47	38.8	Split plug
GK 7	1837.19-.26	33.6	5.26
GK 11	1846.11-.47	38.9	6.11
GK 12	1852.98-.02	33.9	6.95
GK 14	1861.91-.14	31.0	6.85
GK 19	1946.17-.27	25.4	16.7

Figure 6.

FORMATION RESISTIVITY FACTOR-POROSITY CORRELATION

COMPANY STATOIL FIELD

WELL 34/10 - 7 FORMATION

Room Conditions

Brine Resistivity 0.190 ohm m

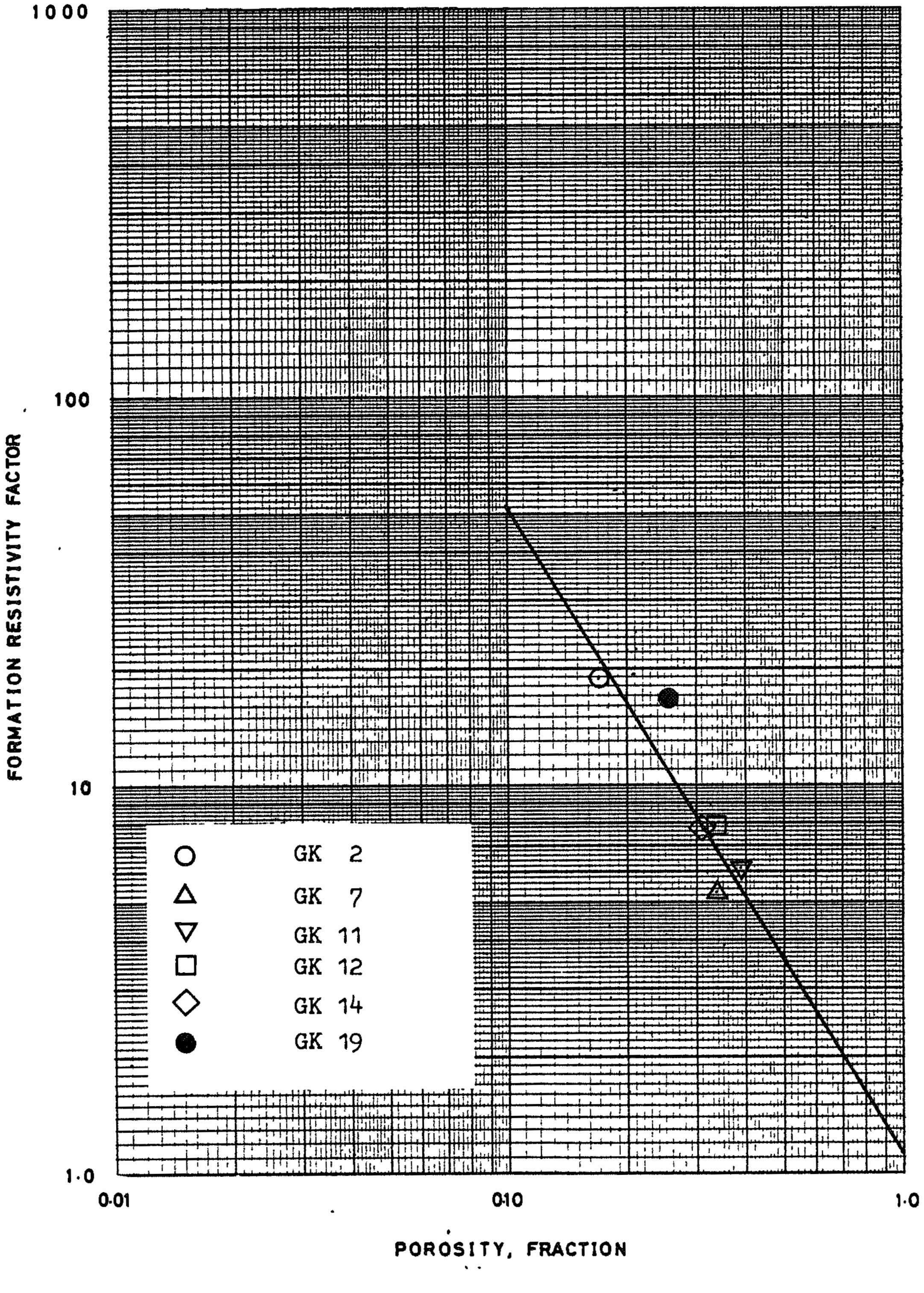

TABLE 8

RESISTIVITY INDEX

ROOM CONDITIONS

Company Statoil Well 34/10-7

SAMPLE	DEPTH (m)	BRINE SATN. (%)	RESISTIVITY INDEX
GK 2 36.1	1829.01	100.0	1.08
		95.4	1.16
		81.3	1.65
		73.8	2.08
		67.4	2.49
		63.7	2.65
GK 4 46.1	1832.23	SPLIT PLUG	
GK 7 57 2	1837.19	98.0	1.02
		87.2	1.33
		73.4	2.01
		60.7	3.01
		51.7	4.30
		46.3	5.24
GK 11 83.1	1846.11	95.0	1.14
		84.2	1.49
		40.2	8.17
		32.1	13.55
		23.2	28.34
		20.0	39.50
GK 12 101 1	1852.98	91.6	1.22
		84.5	1.43
		69.5	2.21
		59.1	3.20
		51.4	4.35
		47.7	5.24

TABLE 8 (CONT'D)

SAMPLE	DEPTH (m)	BRINE SATN. (%)	RESISTIVITY INDEX
GK 14 1181	1861.91	96.9	1.12
		94.8	1.18
		81.7	1.67
		67.8	2.52
		56.2	3.74
		50.0	4.90
GK 19 1601	1946.17	99.0	1.02
		97.9	1.08
		92.3	1.14
		78.3	1.57
		66.7	2.23
		61.7	2.65

Figure 7.

RESISTIVITY INDEX versus WATER SATURATION

COMPANY STATOIL FIELD

WELL 34/10 - 7 FORMATION

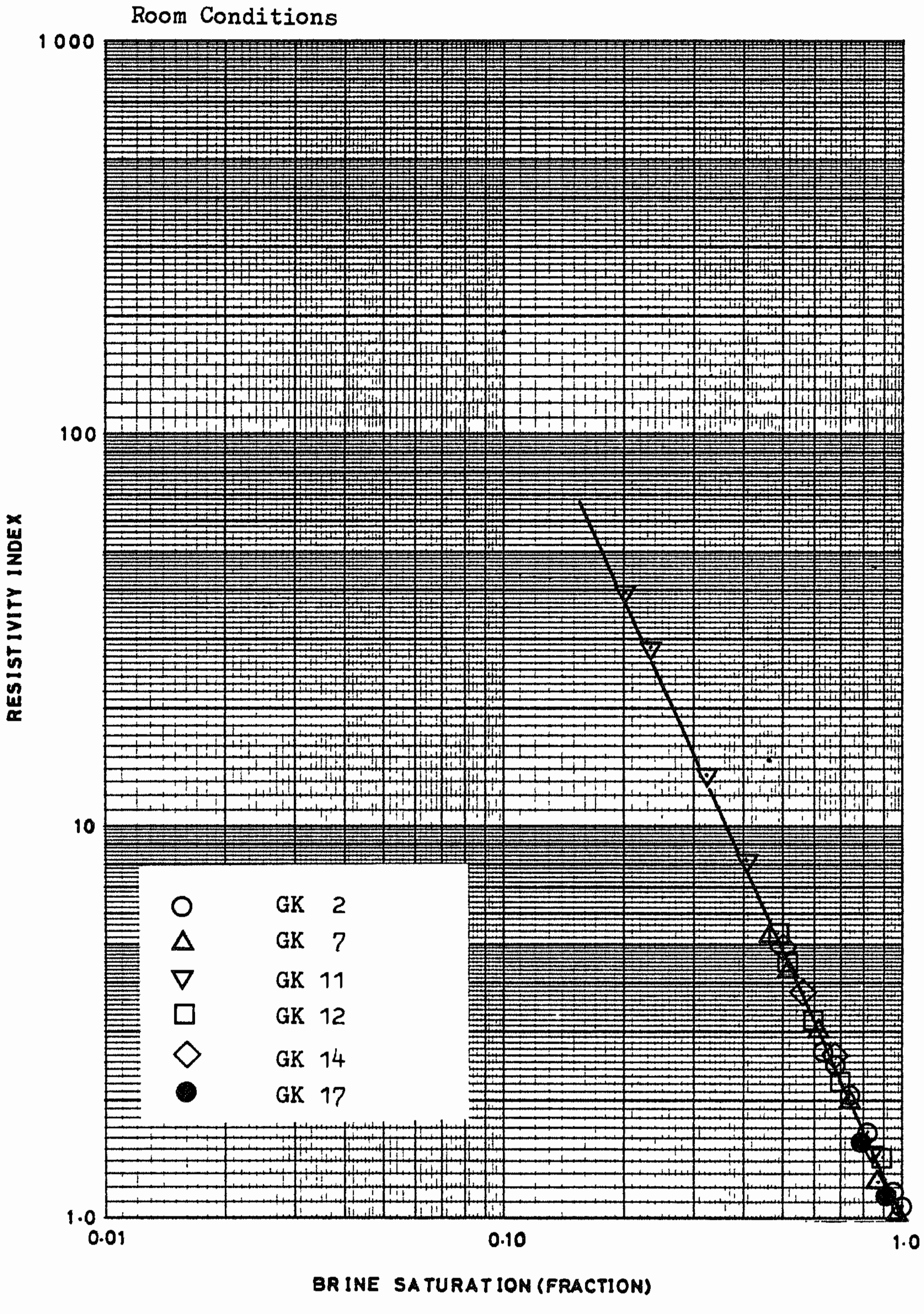

TABLE 9

GAS-BRINE CAPILLARY PRESSURE

Company: Statoil   Well: 34/10-7

Sample	Depth (m)	Porosity (%)	Gas Perm. (mD)	Brine Saturation (% pore space)					
				0.1b	0.2b	0.4b	0.8b	1.6b	2.8b
GK 2	1829.01	17.0	341	100.0	95.4	81.3	73.8	67.4	63.7
GK 4	1832.23	38.8	371		SPLIT	PLUG			
GK 7	1837.19	33.6	253	98.0	87.2	73.4	60.7	51.7	46.3
GK 11	1846.11	38.9	671	95.0	84.2	40.2	32.1	23.2	20.0
GK 12	1852.98	33.9	257	91.6	84.5	69.5	59.1	51.4	47.7
GK 14	1861.91	31.0	44.3	96.9	94.8	81.7	67.8	56.2	50.0
GK 19	1946.17	25.4	5.79	99.0	97.9	92.3	78.3	66.7	61.7

Figure 8.

AIR-BRINE CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 2 DEPTH 1829.01

GAS PERMEABILITY 341mD POROSITY 17.0%

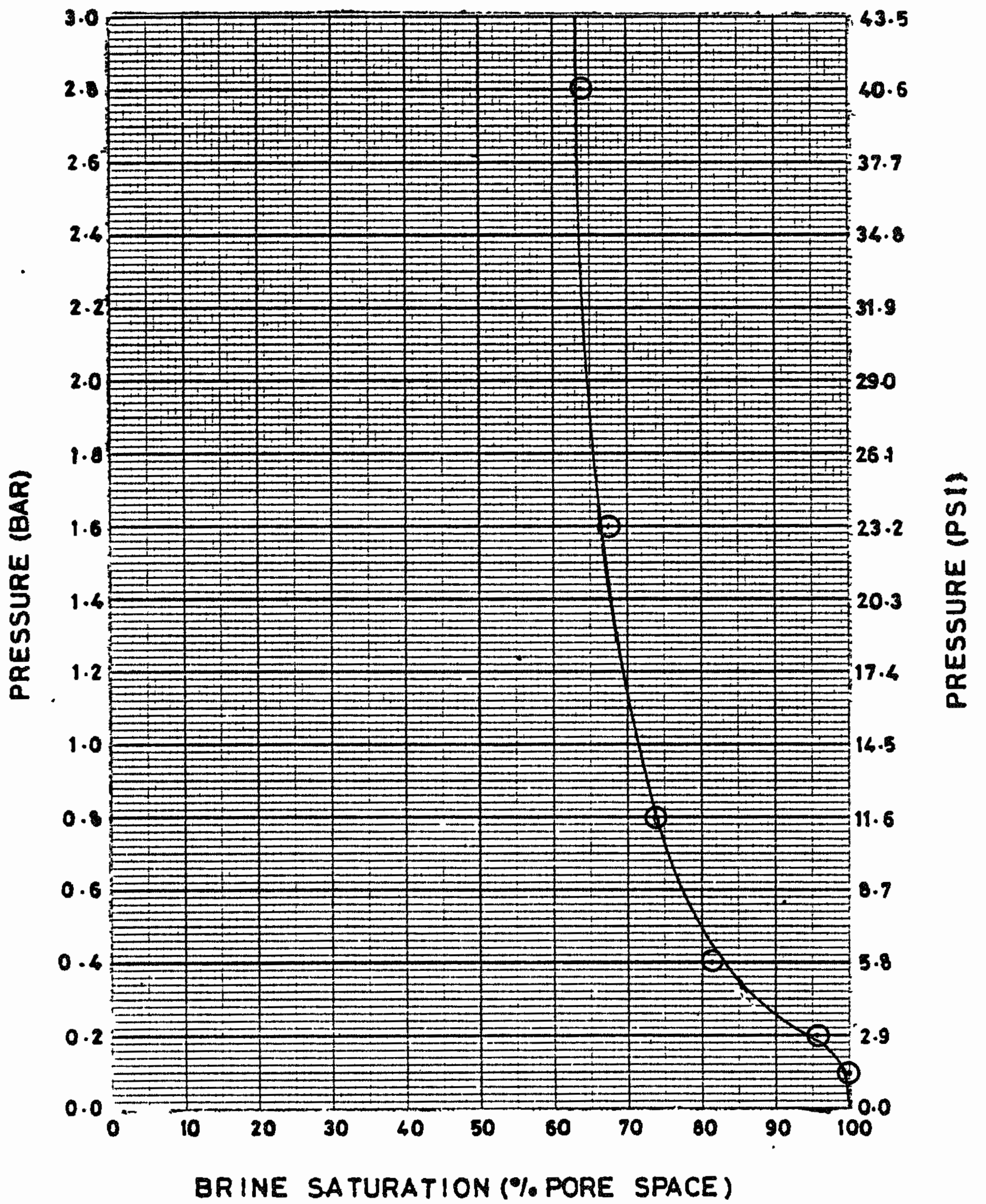

Figure 9.

AIR-BRINE CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 7 DEPTH 1837.19

GAS PERMEABILITY 253mD POROSITY 33.6%

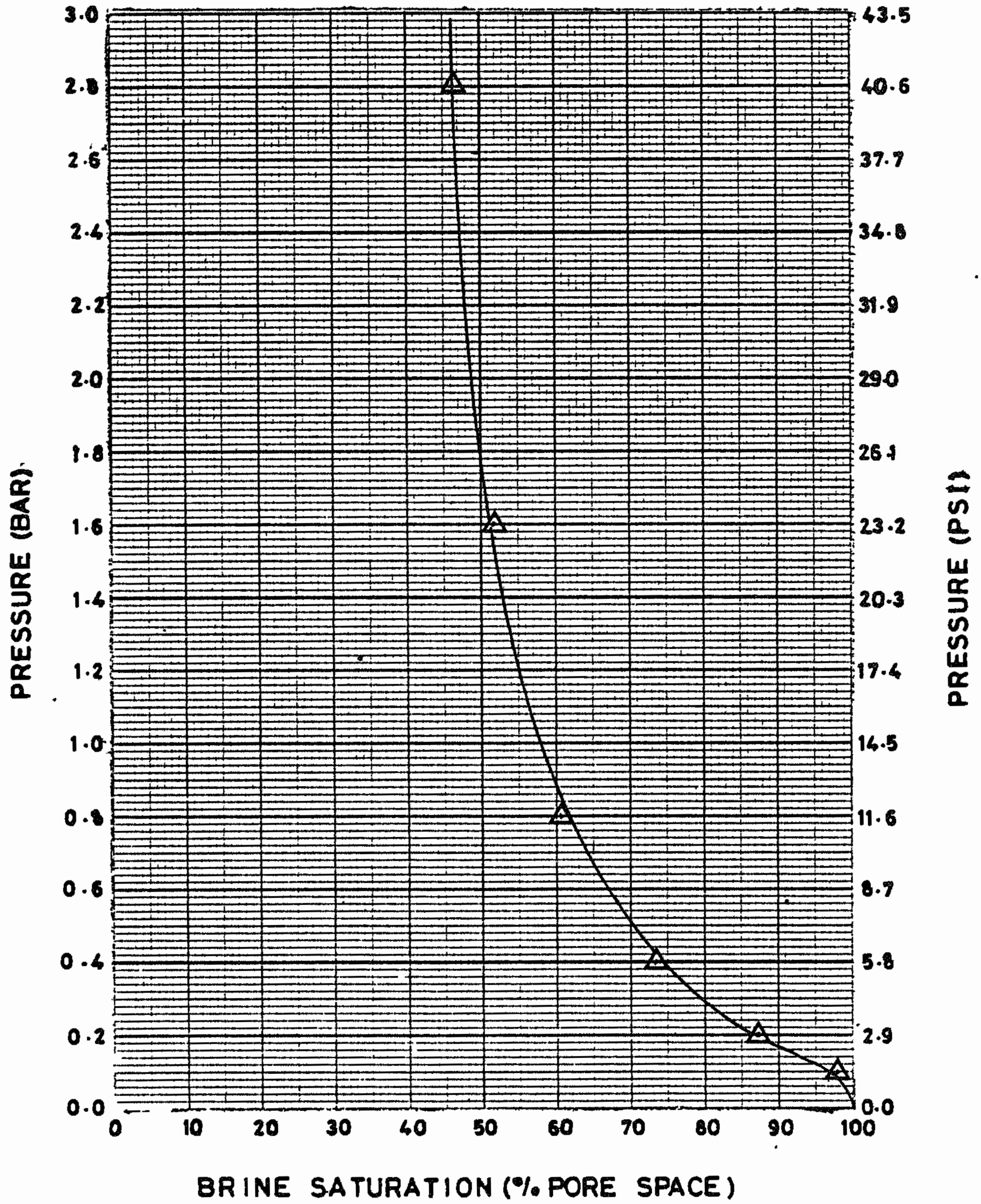

Figure 10.

AIR-BRINE CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 11 DEPTH 1846.11

GAS PERMEABILITY 671mD POROSITY 38.9%

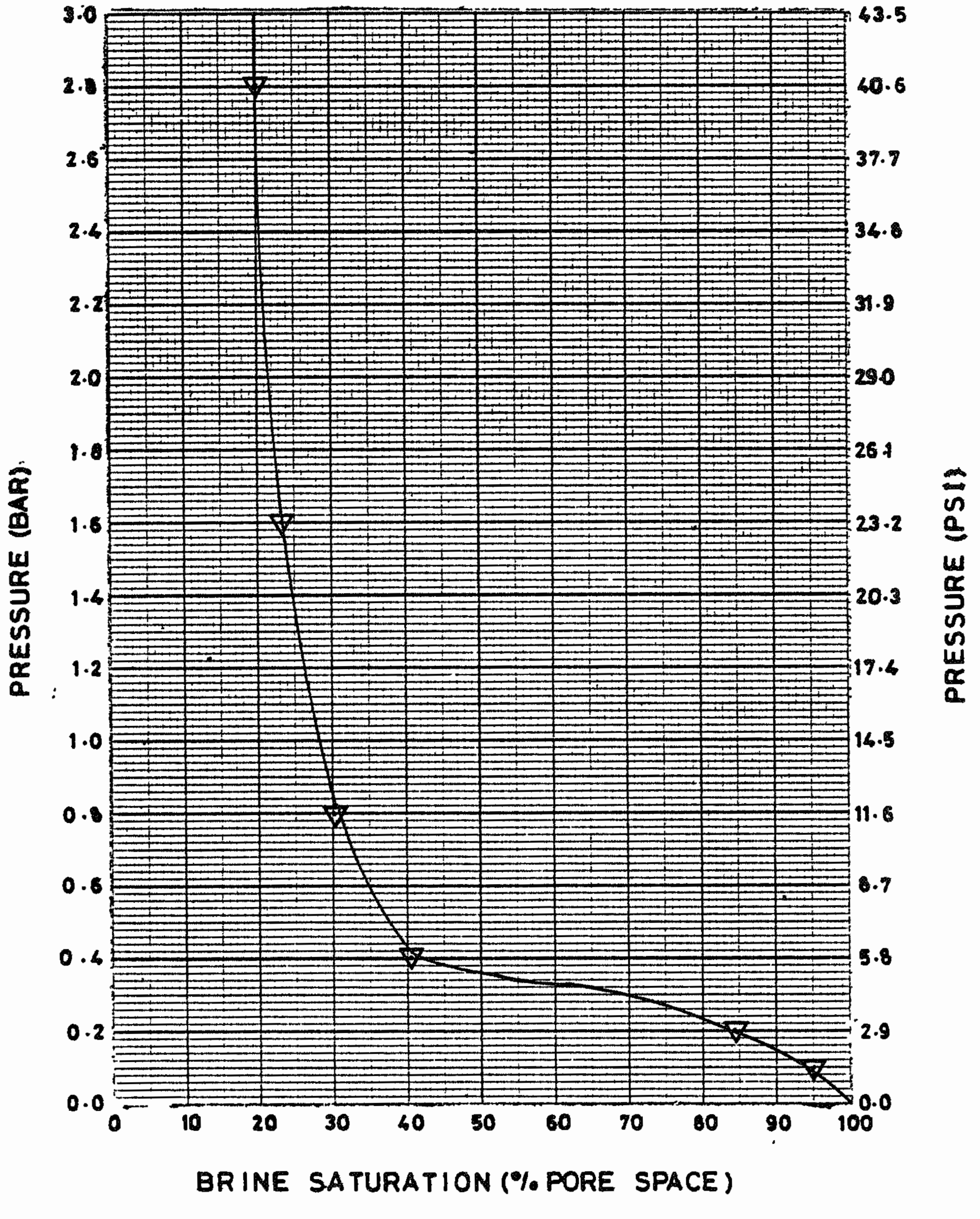

Figure 11.

AIR-BRINE CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 12 DEPTH 1852.98

GAS PERMEABILITY 257mD POROSITY 33.9%

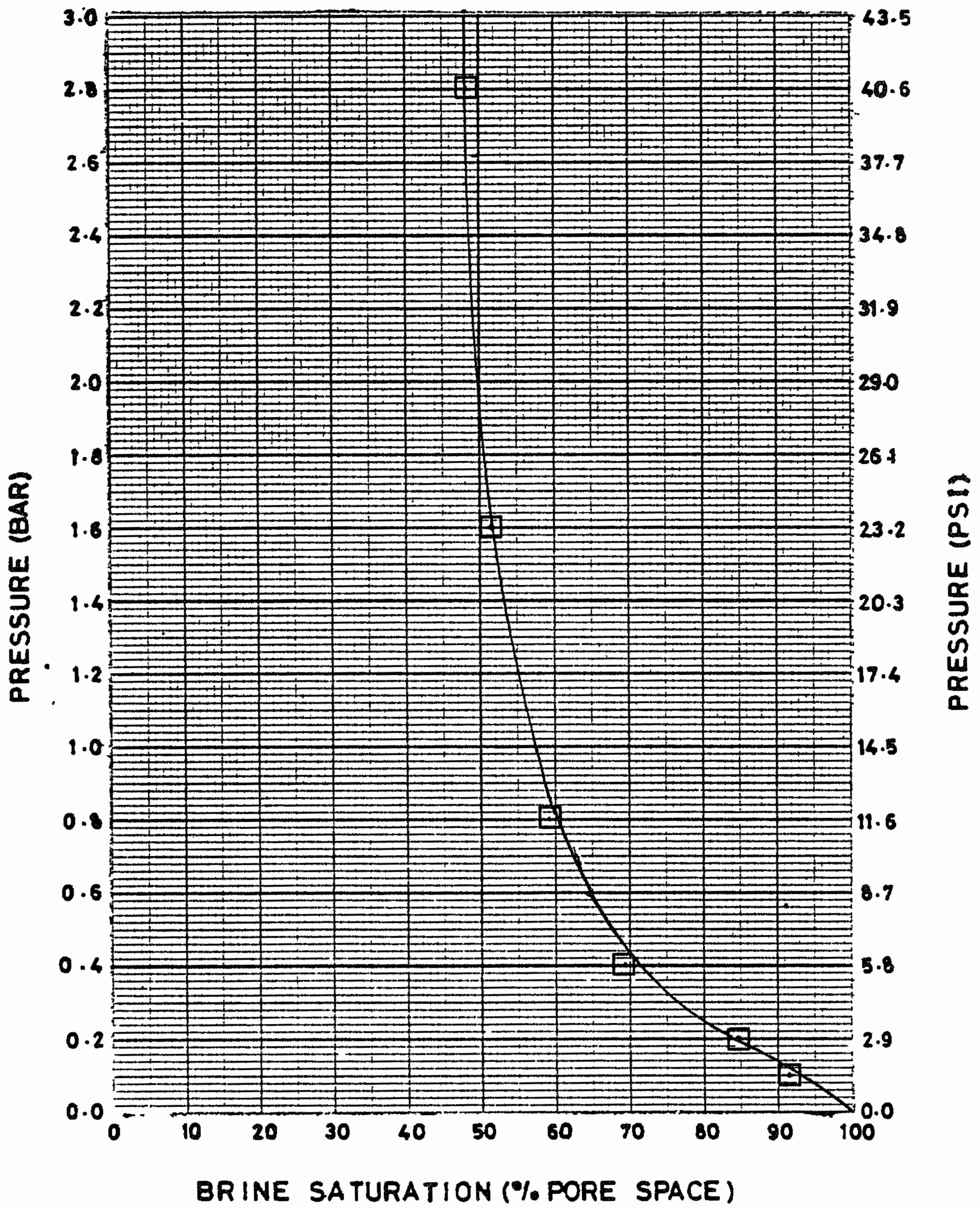

Figure 12.

AIR-BRINE CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 14 DEPTH 1861.91

GAS PERMEABILITY 44.3mD POROSITY 31.0%

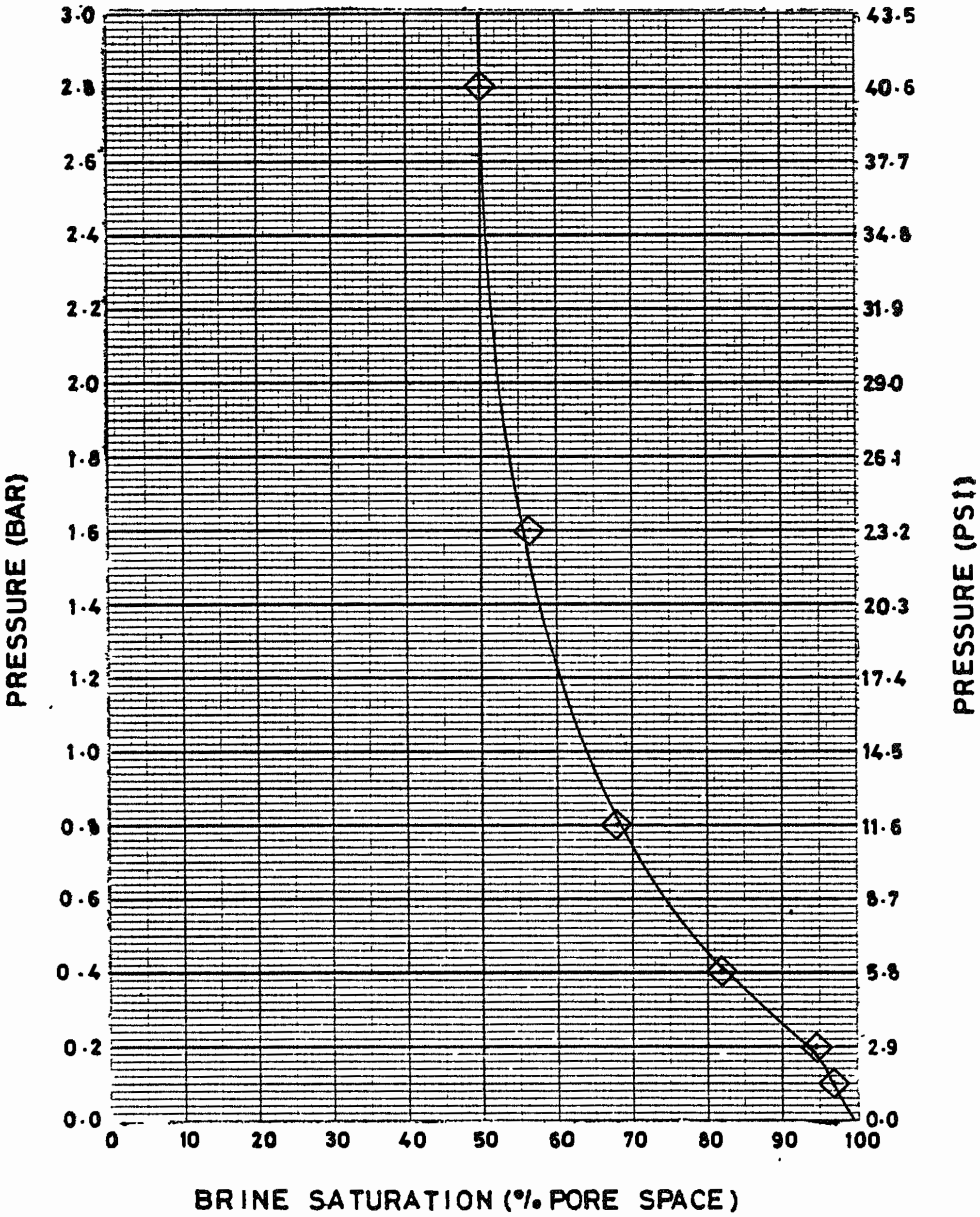

Figure 13.

AIR-BRINE CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 19 DEPTH 1946.17

GAS PERMEABILITY 5.79mD POROSITY 25.4%

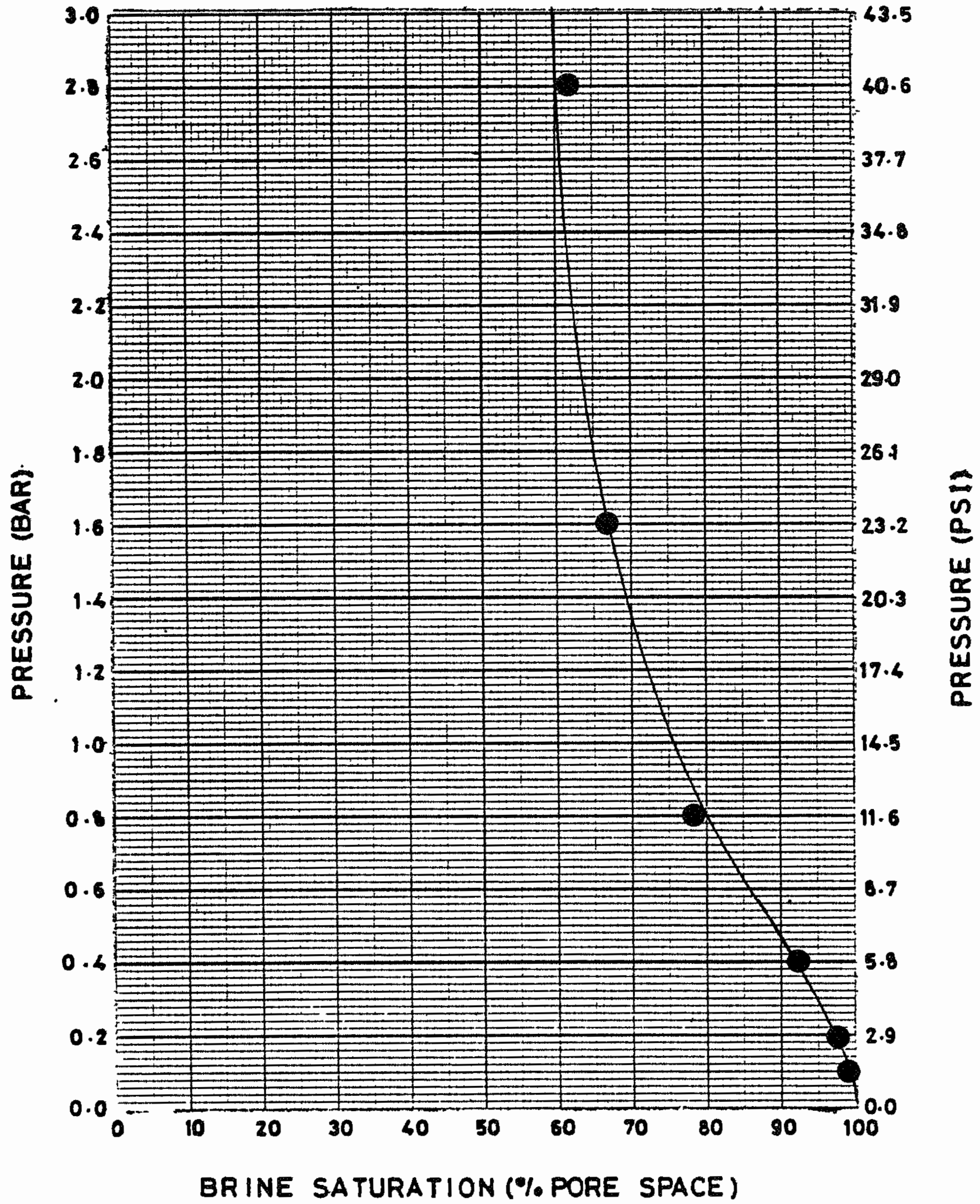

TABLE 10

MERCURY INJECTION CAPILLARY PRESSURE & PORE SIZE DISTRIBUTION

Company: Statoil **Well:** 34/10-7

Sample: GK 2 **Depth:** 1829.01m

Porosity: 17.0% **Gas Permeability:** 341mD

CAPILLARY PRESSURE DATA		PORE SIZE DISTRIBUTION	
Mercury saturation (%)	Pressure (kg/cm^2)	Pore radius (μm)	Dist. function
1.4	0.11	44.3	6.4
4.1	0.31	18.0	23.2
6.5	0.56	10.6	92.6
10.6	0.86	6.16	157.
17.6	1.81	3.16	362.
23.4	3.06	1.90	630.
29.1	4.96	1.16	1020.
35.0	8.26	0.74	1450.
38.9	12.0	0.54	1990.
41.3	15.1	0.42	1700.
43.4	20.1	0.32	3840.
46.4	26.1	0.24	3300.
48.8	33.7	0.19	6380.
51.4	41.6	0.16	7830.
53.7	51.6	0.125	7070.
55.8	63.1	0.102	14200.
58.1	76.6	0.085	13300.
60.5	95.1	0.070	15400.
62.3	112.	0.060	20500.
64.0	128.	0.053	25600
65.2	140.		

Figure 14.

MERCURY INJECTION CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 2 DEPTH 1829.01

GAS PERMEABILITY 341 POROSITY 17.0

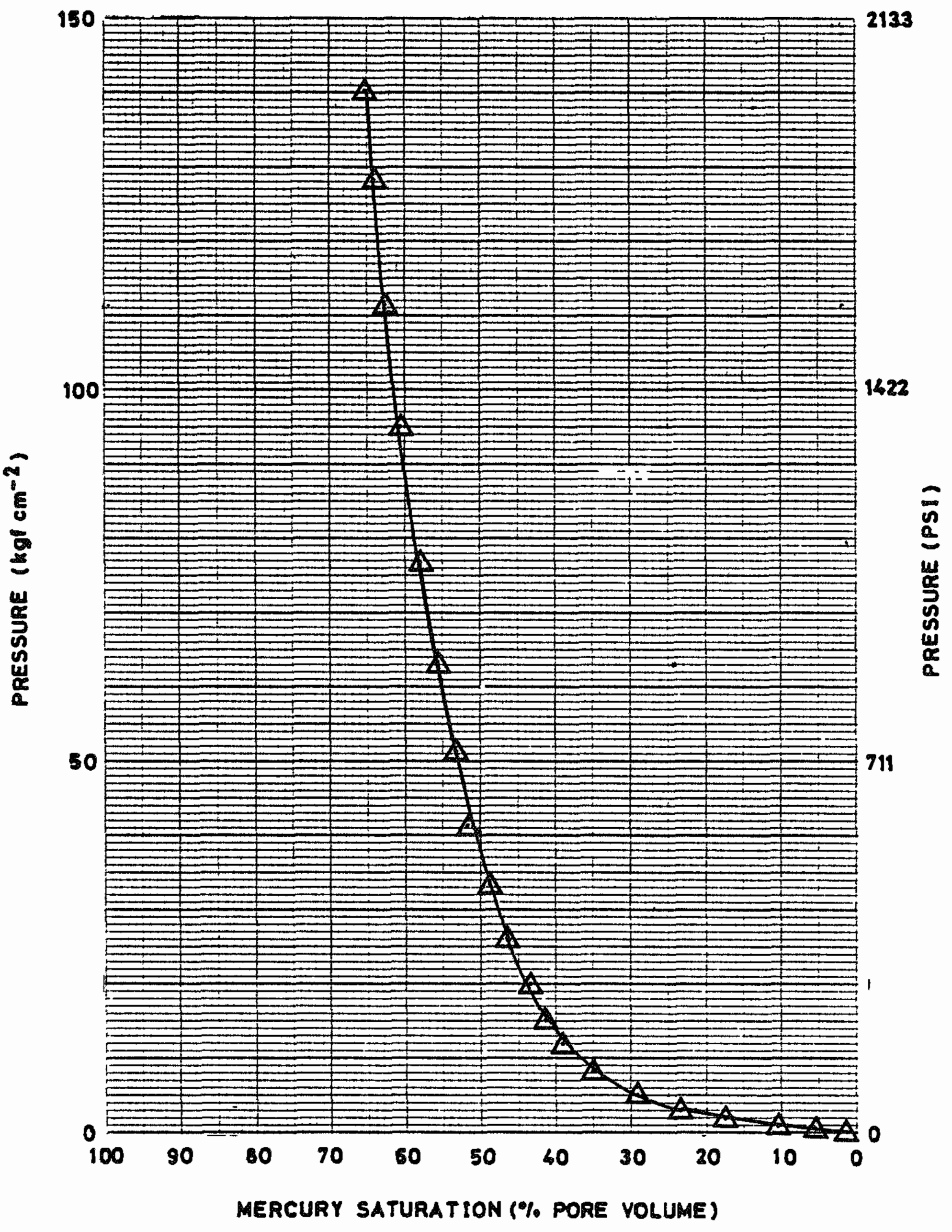

FIGURE 15

PORE THROAT SIZE DISTRIBUTION

COMPANY Statoil WELL 34/10-7

SAMPLE GK 2 DEPTH 1829.01m

POROSITY 17.0% GAS PERMEABILITY 341mD

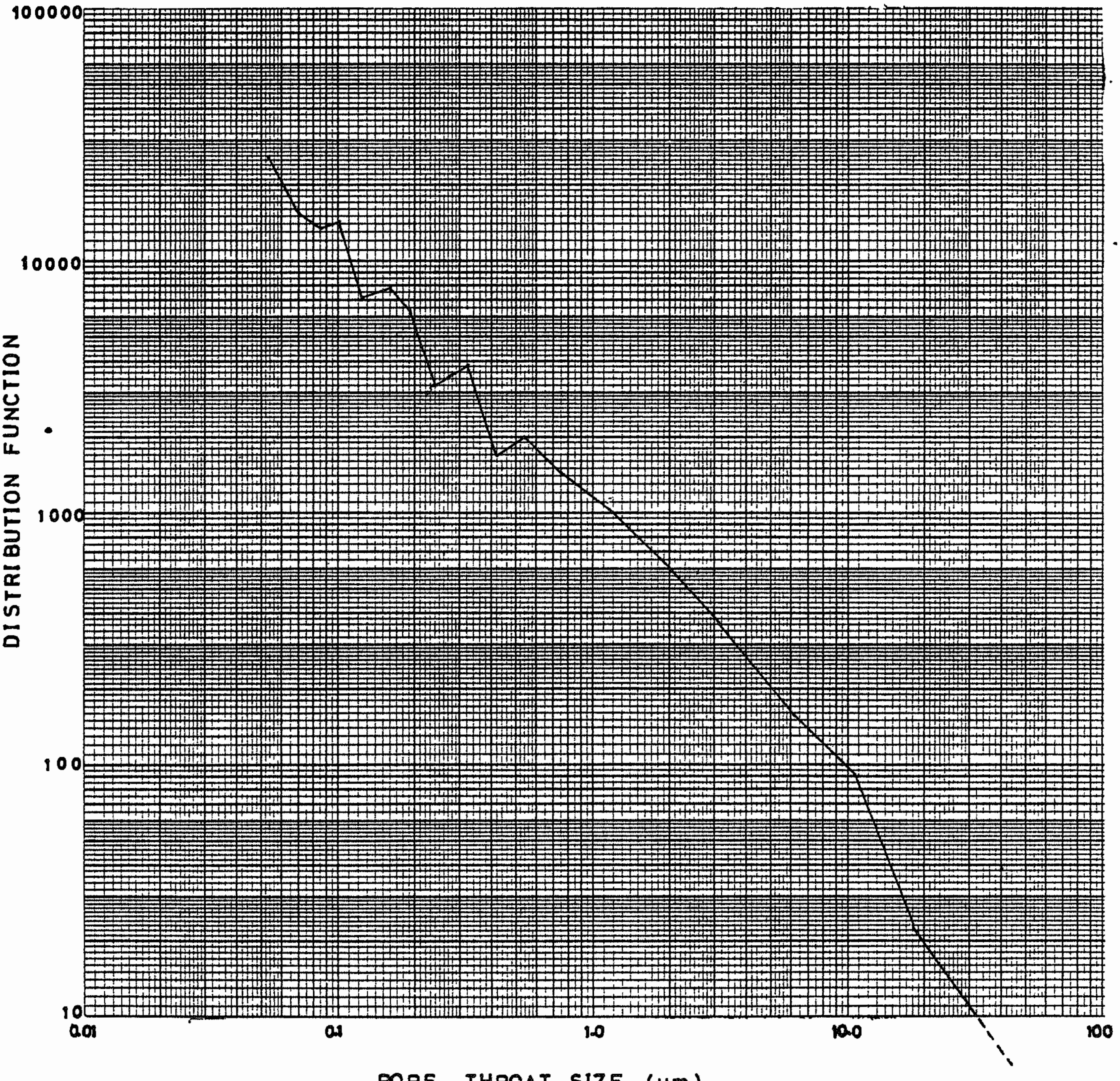

TABLE 11

MERCURY INJECTION CAPILLARY PRESSURE & PORE SIZE DISTRIBUTION

Company: Statoil Well: 34/10-7

Sample: GK 7 Depth: 1837.19m

Porosity: 33.6% Gas Permeability: 253mD

CAPILLARY PRESSURE DATA		PORE SIZE DISTRIBUTION	
Mercury saturation (%)	Pressure (kg/cm²)	Pore radius (μm)	Dist. function
1.3	0.11	44.3	4.03
3.0	0.31	19.4	27.8
5.1	0.46	13.3	35.9
6.8	0.66	9.62	71.2
8.6	0.86	7.74	129.
10.2	1.01	4.49	57.8
40.6	3.86	1.58	1230.
47.6	5.56	1.14	1060.
50.7	7.16	0.94	1720.
52.8	8.21	0.81	1640.
55.1	9.66	0.64	2000.
58.9	13.1	0.52	2780.
60.8	15.1	0.44	2660.
63.0	18.1	0.34	3030.
66.6	25.6	0.24	3940.
69.7	35.6	0.18	4700.
71.2	42.6	0.16	4570.
72.5	50.6	0.125	5170.
74.1	62.6	0.105	12300.
75.3	75.1	0.090	6250.
76.6	88.6	0.075	12800.
77.8	104.	0.065	12700.
79.1	121.	0.055	12800.
80.4	140.		

Figure 16.

MERCURY INJECTION CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 7 DEPTH 1837.19

GAS PERMEABILITY 253 POROSITY 33.6

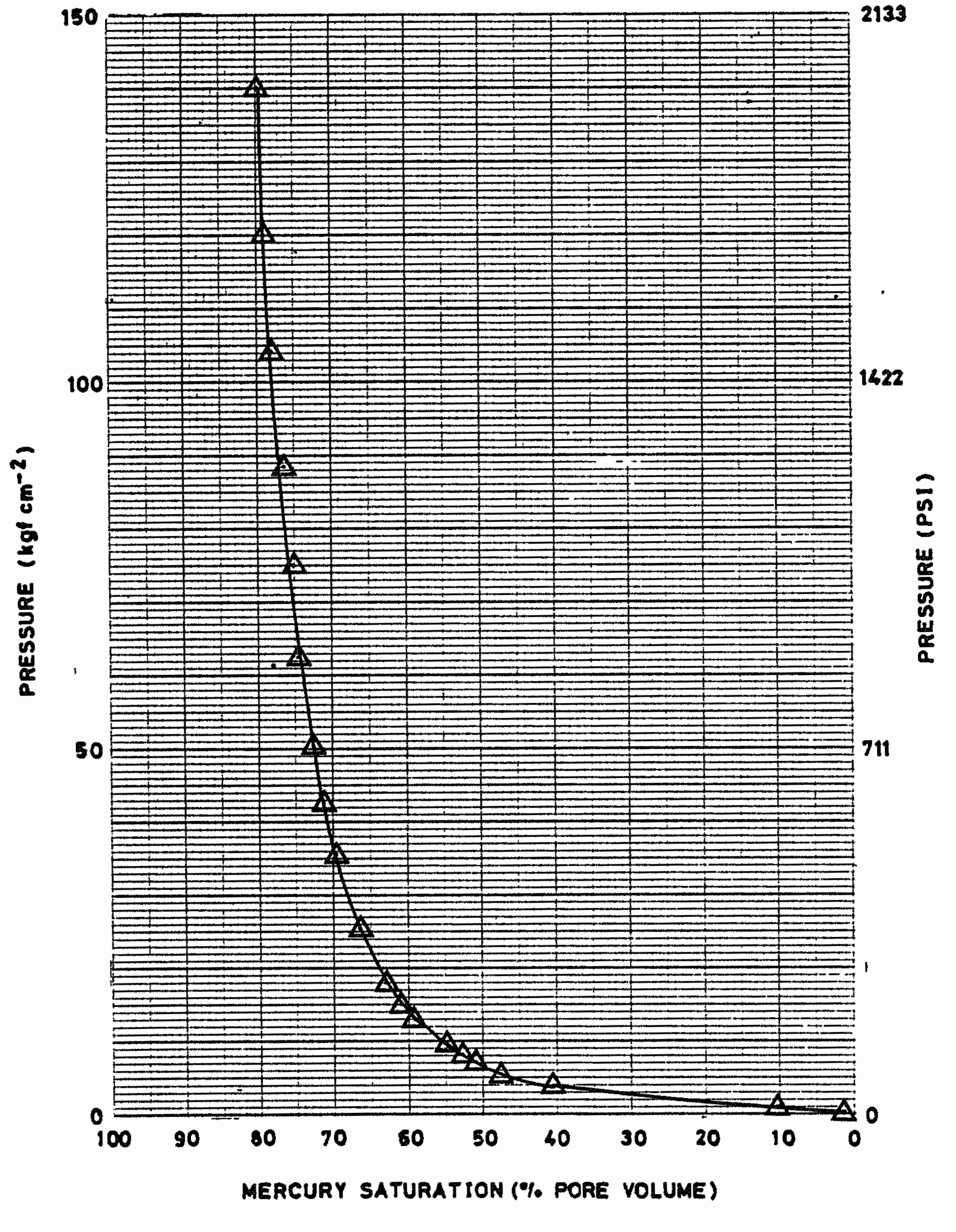

FIGURE 17

PORE THROAT SIZE DISTRIBUTION

COMPANY Statoil WELL 34/10-7

SAMPLE GK 7 DEPTH 1837.19m

POROSITY 33.6% GAS PERMEABILITY 253mD

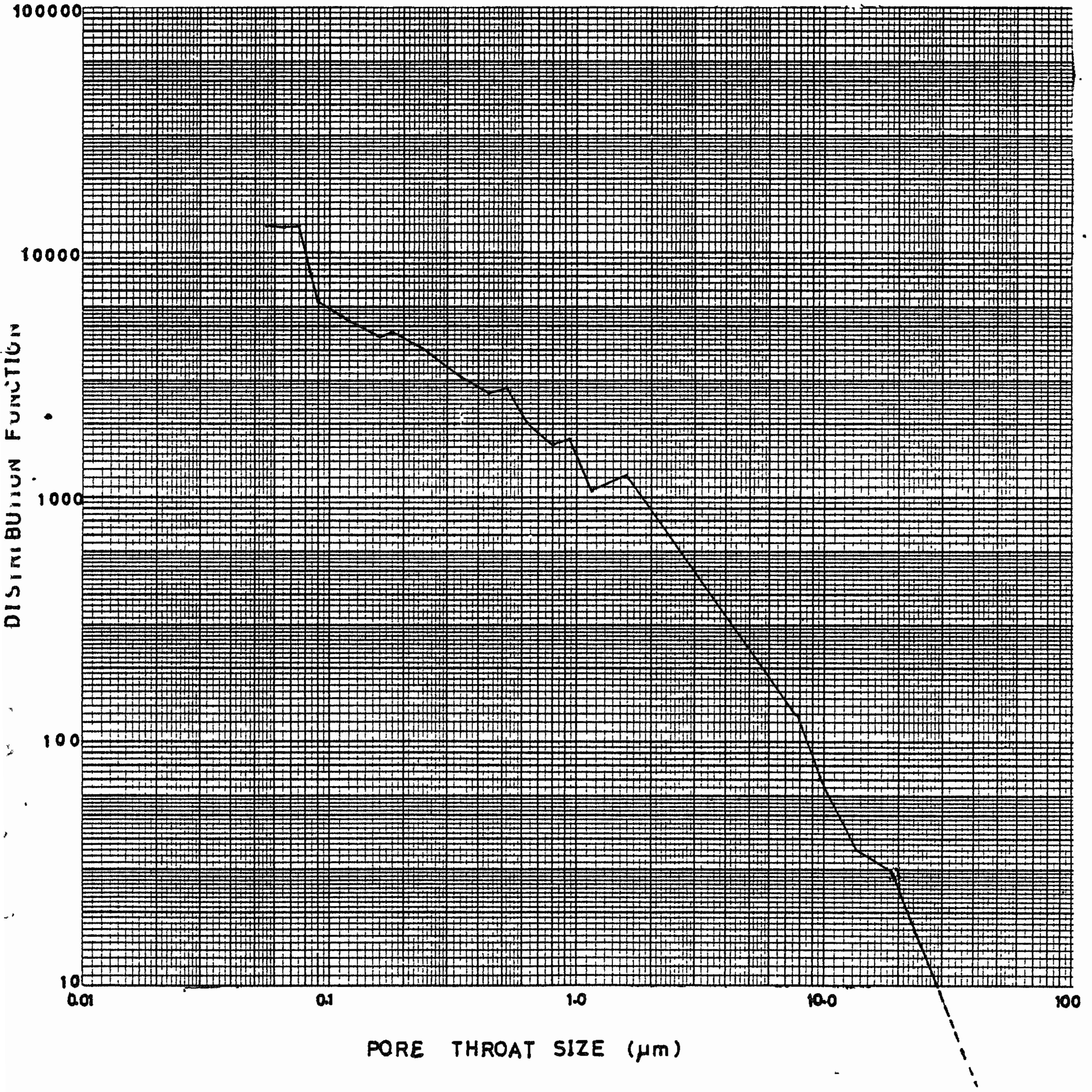

TABLE 12

MERCURY INJECTION CAPILLARY PRESSURE & PORE SIZE DISTRIBUTION

Company: Statoil **Well:** 34/10-7

Sample: GK 11 **Depth:** 1846.11m

Porosity: 38.9% **Gas Permeability:** 671mD

CAPILLARY PRESSURE DATA		PORE SIZE DISTRIBUTION	
Mercury saturation (%)	Pressure (kg/cm^2)	Pore radius (μm)	Dist. function
2.0	0.085	70.0	41.7
14.2	0.13	53.4	416.
30.6	0.14	48.2	99.0
37.0	0.16	25.8	12.1
41.6	1.06	4.20	551.
70.0	4.41	1.39	510.
72.5	6.26	1.02	819.
74.7	8.21	0.79	878.
76.2	10.2	0.61	1070.
78.2	13.8	0.46	1420.
79.7	17.6	0.36	1680.
81.4	23.1	0.24	2080.
84.3	43.6	0.14	2270.
85.7	63.6	0.10	2900.
86.2	84.6	0.078	5480.
87.6	111.	0.059	5330.
88.3	134.	0.052	12000.
88.5	140.		

Figure 18.

MERCURY INJECTION CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 11 DEPTH 1846.11

GAS PERMEABILITY 671. POROSITY 38.9

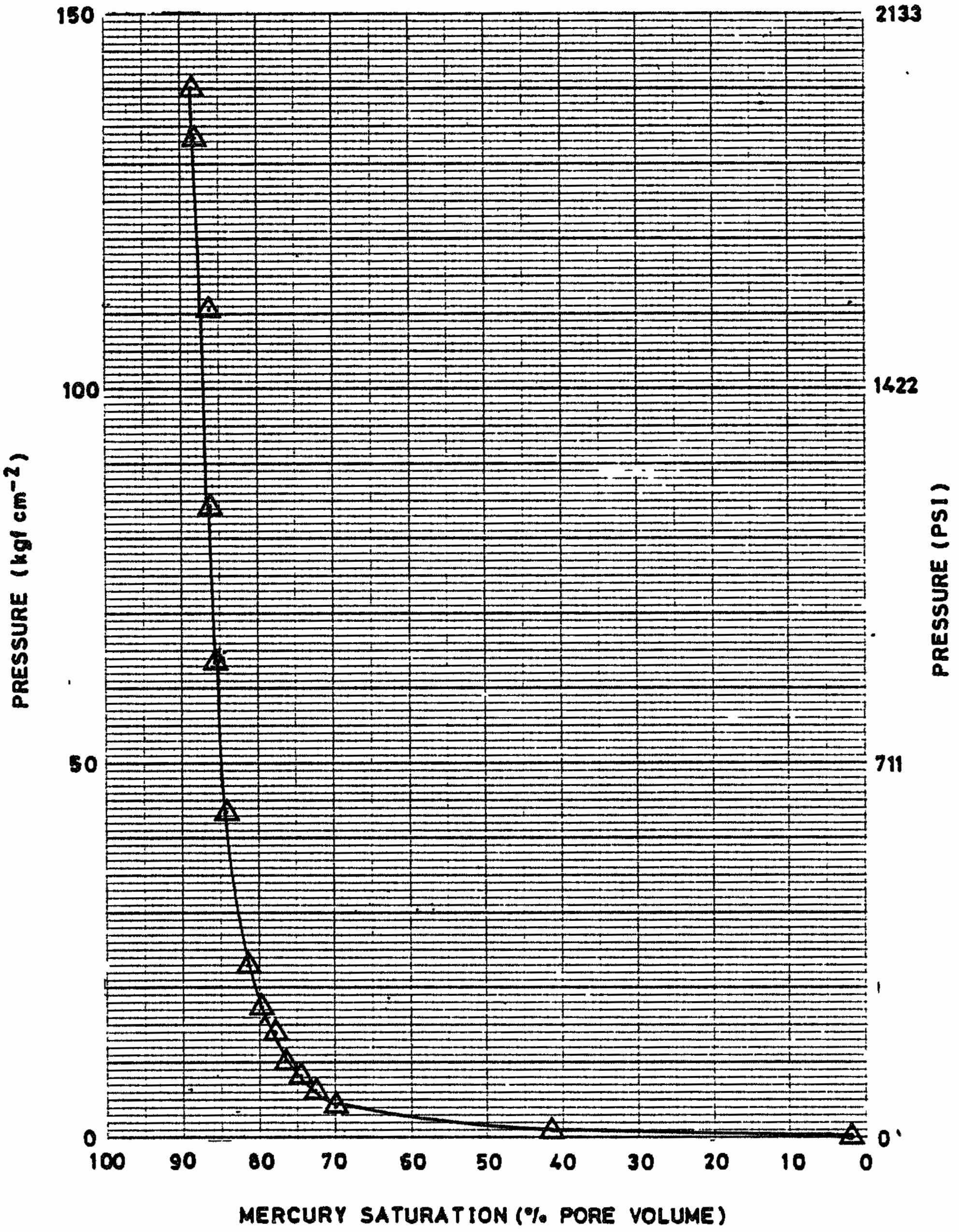

FIGURE 19

PORE THROAT SIZE DISTRIBUTION

COMPANY Statoil WELL 34/10-7

SAMPLE GK 11 DEPTH 1846.11m

POROSITY 38.9% GAS PERMEABILITY 671mD

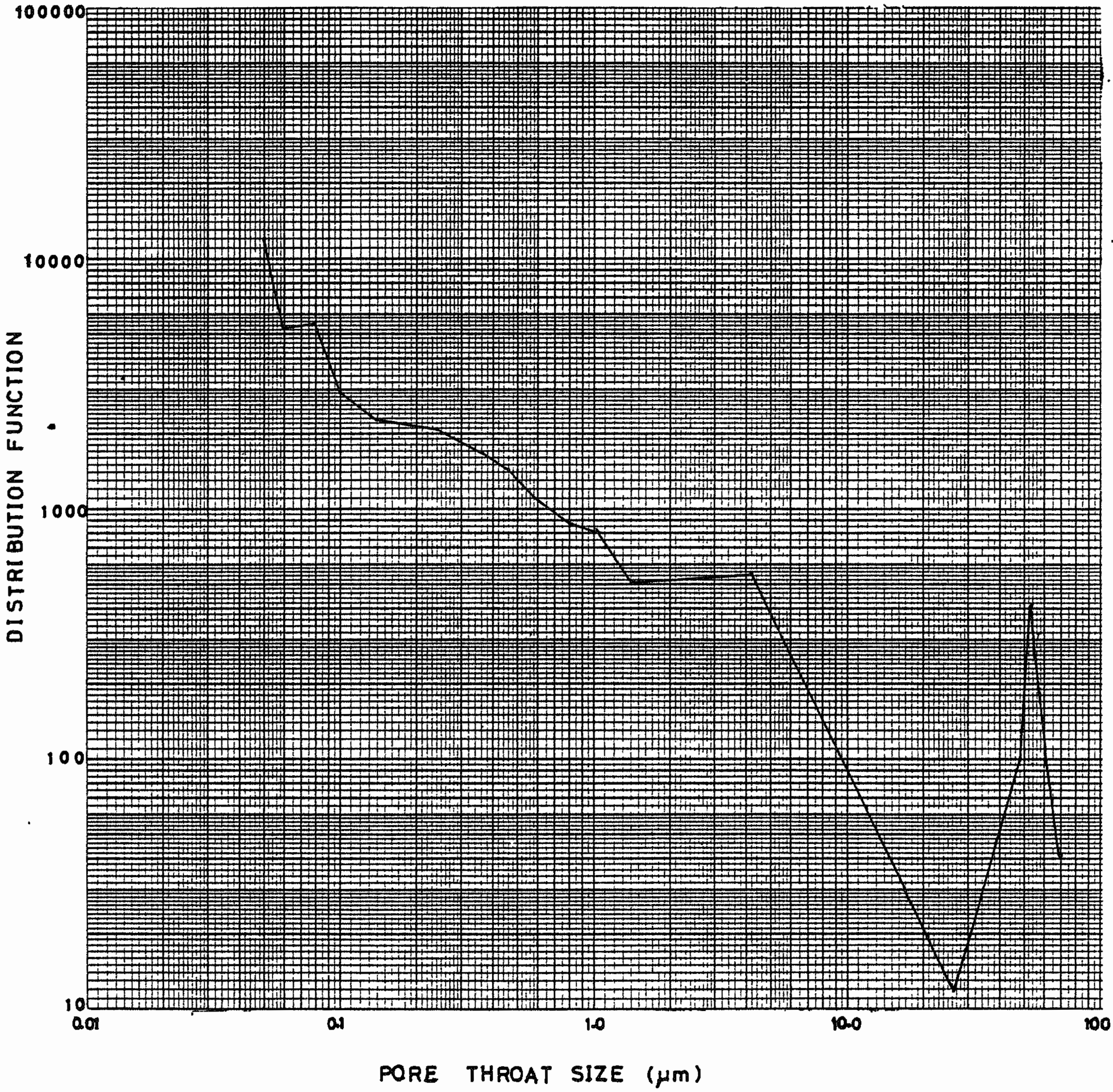

TABLE 13

MERCURY INJECTION CAPILLARY PRESSURE & PORE SIZE DISTRIBUTION

Company: Statoil

Well: 34/10-7

Sample: GK 12

Depth: 1852.98m

Porosity: 33.9%

Gas Permeability: 257mD

CAPILLARY PRESSURE DATA		PORE SIZE DISTRIBUTION	
Mercury saturation (%)	Pressure (kg/cm^2)	Pore radius (µm)	Dist. function
1.2	0.41	12.5	60.7
7.3	0.96	5.15	763.
43.0	2.56	2.24	416.
47.8	4.31	1.48	826.
50.9	5.56	1.09	1160.
55.6	8.06	0.78	1370.
58.4	10.6	0.56	2370.
64.4	16.6	0.40	2750.
66.0	19.3	0.34	4100.
68.5	23.6	0.28	4340.
70.6	28.1	0.24	3920.
72.6	33.6	0.20	6530.
74.6	40.6	0.16	5670.
76.2	49.1	0.14	4970.
77.7	60.1	0.11	6350.
79.0	72.1	0.09	7000.
80.4	88.6	0.075	16000.
81.5	104.	0.065	11600.
82.6	121.	0.055	10600
83.7	140.		

Figure 20.

MERCURY INJECTION CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 12 DEPTH 1852.98

GAS PERMEABILITY 257 POROSITY 33.9

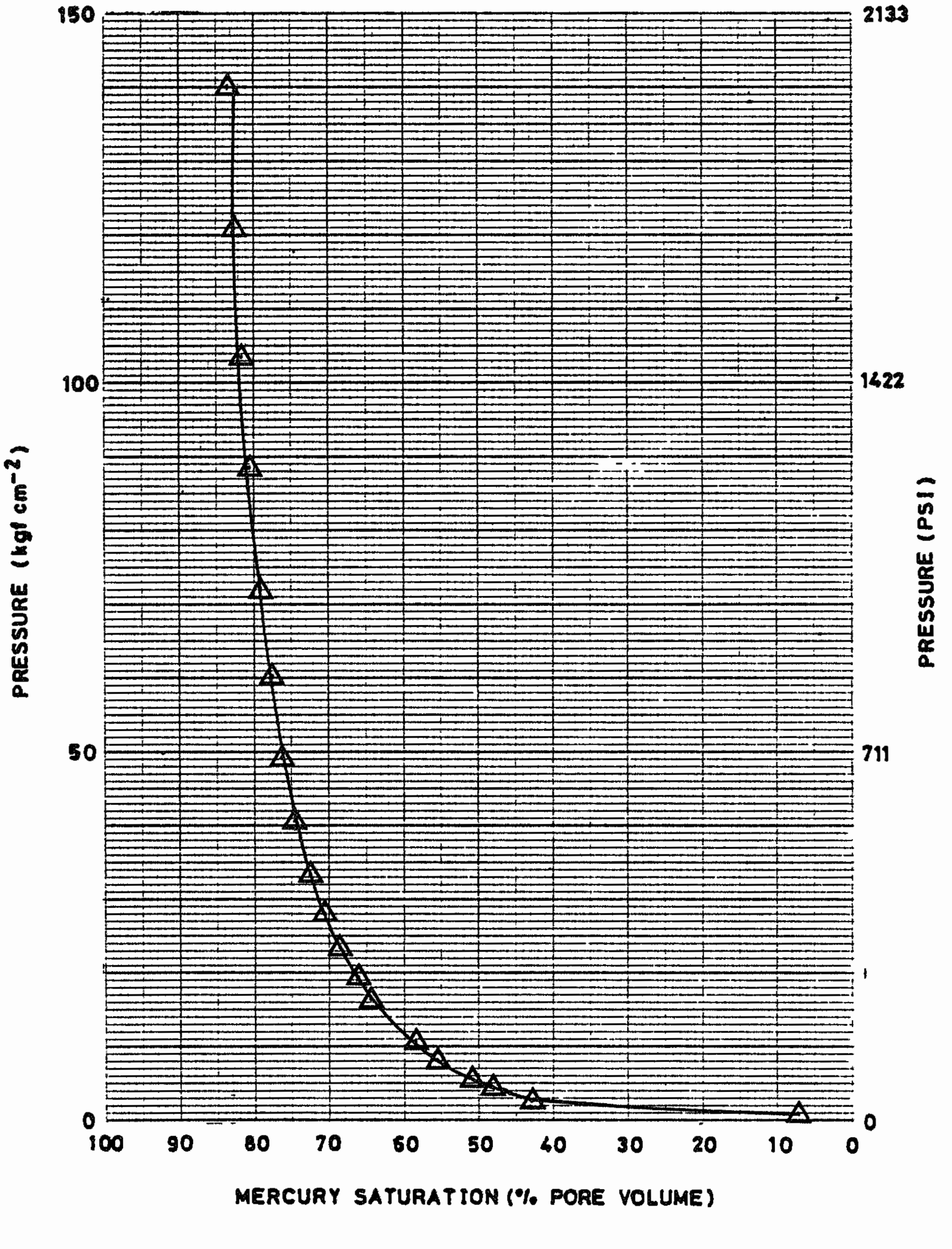

FIGURE 21

PORE THROAT SIZE DISTRIBUTION

COMPANY Statoil WELL 34/10-7

SAMPLE GK 12 DEPTH 1852.98m

POROSITY 33.9% GAS PERMEABILITY 257mD

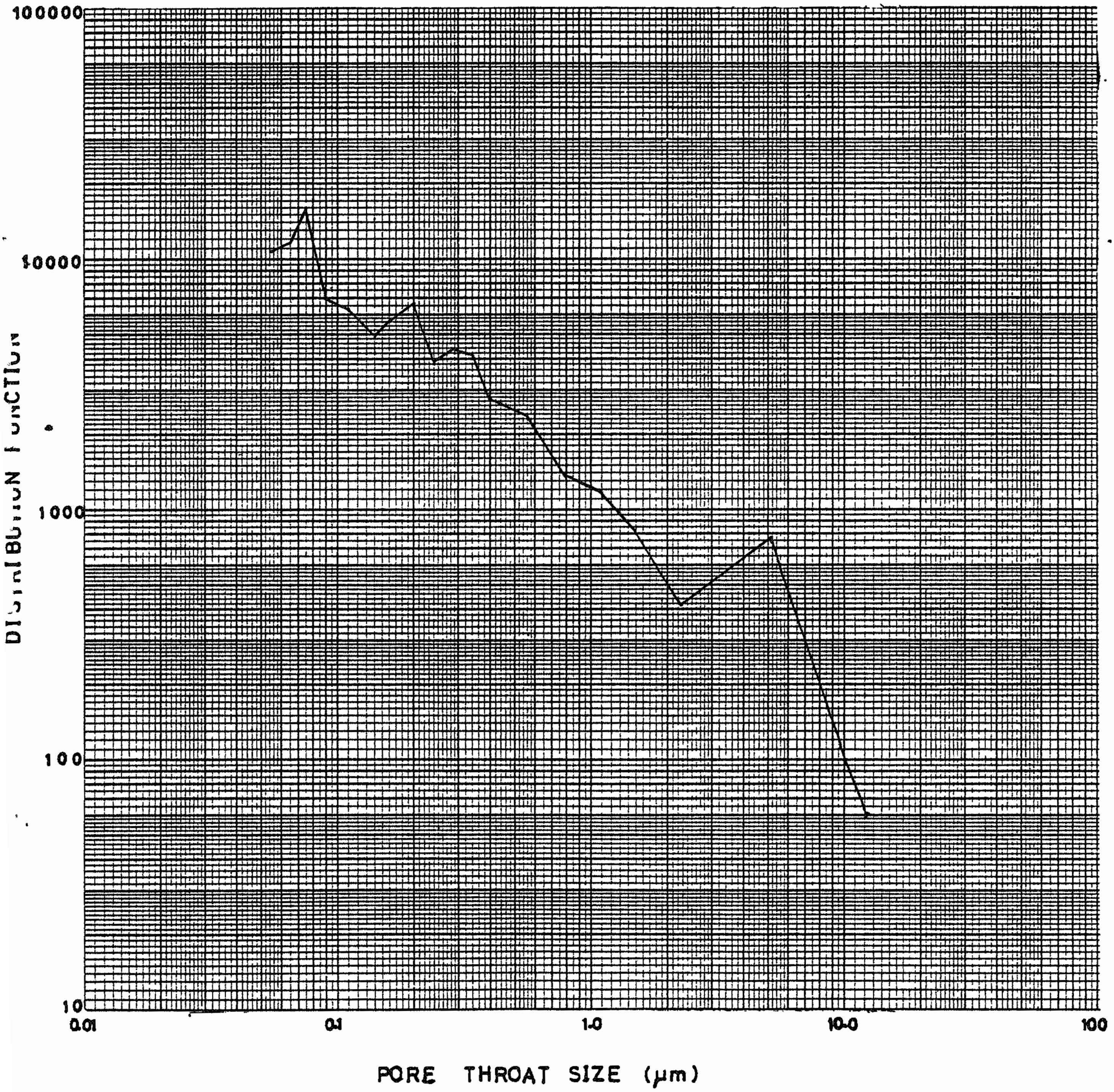

TABLE 14

MERCURY INJECTION CAPILLARY PRESSURE & PORE SIZE DISTRIBUTION

Company: Statoil Well: 34/10-7

Sample: GK 14 Depth: 1861.91m

Porosity: 31.0 Gas Permeability: 44.3

CAPILLARY PRESSURE DATA		PORE SIZE DISTRIBUTION	
Mercury saturation (%)	Pressure (kg/cm^2)	Pore radius ρ (µm)	Dist. function
2.17	0.31	15.8	14.2
4.27	0.86	4.97	283.
23.4	4.56	1.30	1430.
31.4	7.06	0.87	2050.
37.8	10.1	0.62	2780.
42.8	13.6	0.48	3440.
46.3	16.6	0.39	4790.
50.1	20.6	0.32	5470.
53.9	25.6	0.26	7000.
56.7	29.6	0.22	5760.
59.6	37.1	0.18	8720.
61.8	43.6	0.15	8430.
64.7	56.6	0.12	7470.
67.0	69.1	0.09	11500.
69.3	85.6	0.08	15700.
70.8	99.6	0.07	24300.
72.3	113.	0.06	18000.
73.7	127.	0.05	25800
75.3	140.		

Figure 22.

MERCURY INJECTION CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 14 DEPTH 1861.91

GAS PERMEABILITY 44.3 POROSITY 31.0

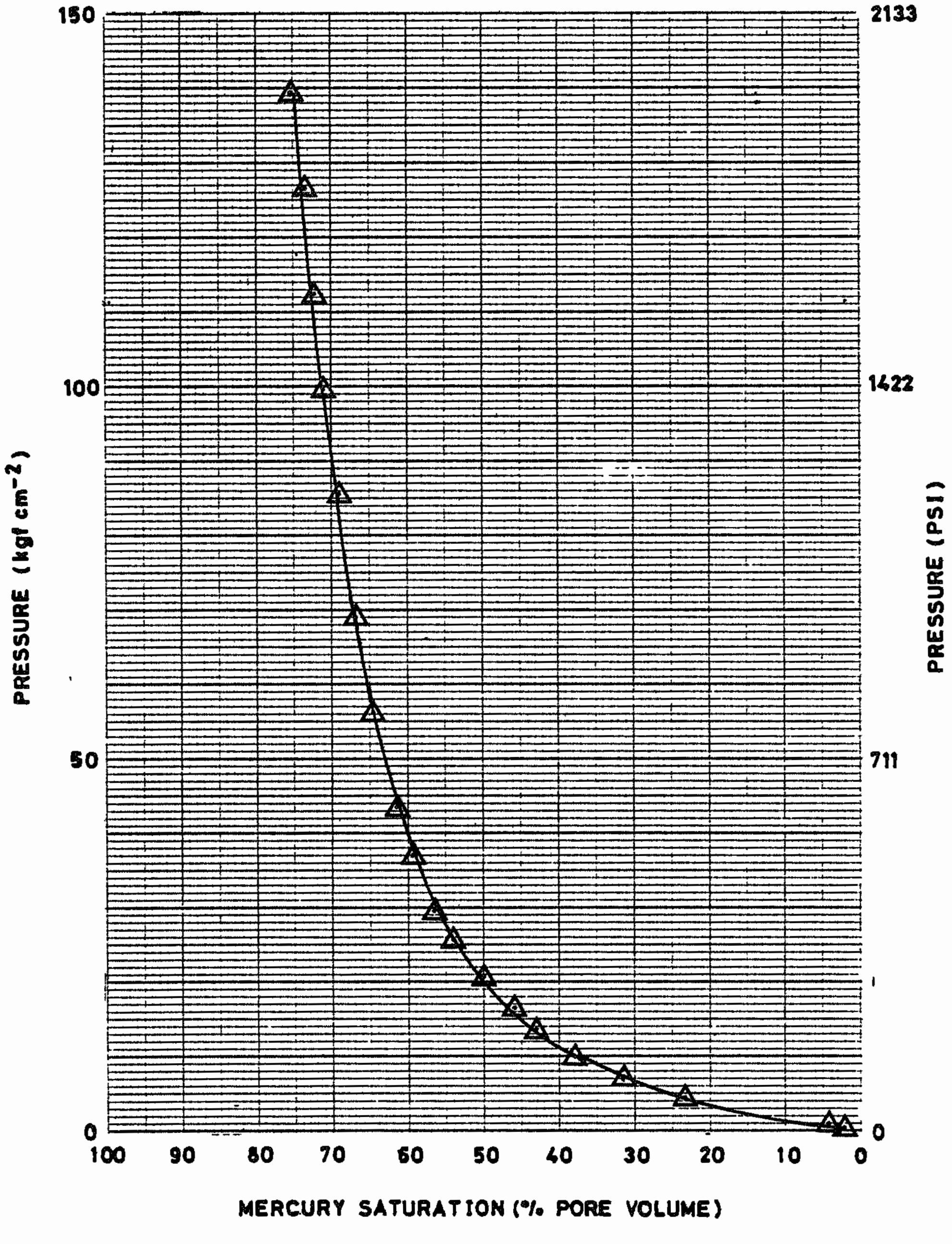

FIGURE 23

PORE THROAT SIZE DISTRIBUTION

COMPANY Statoil WELL 34/10-7

SAMPLE GK 14 DEPTH 1861.91m

POROSITY 31.0% GAS PERMEABILITY 44.3mD

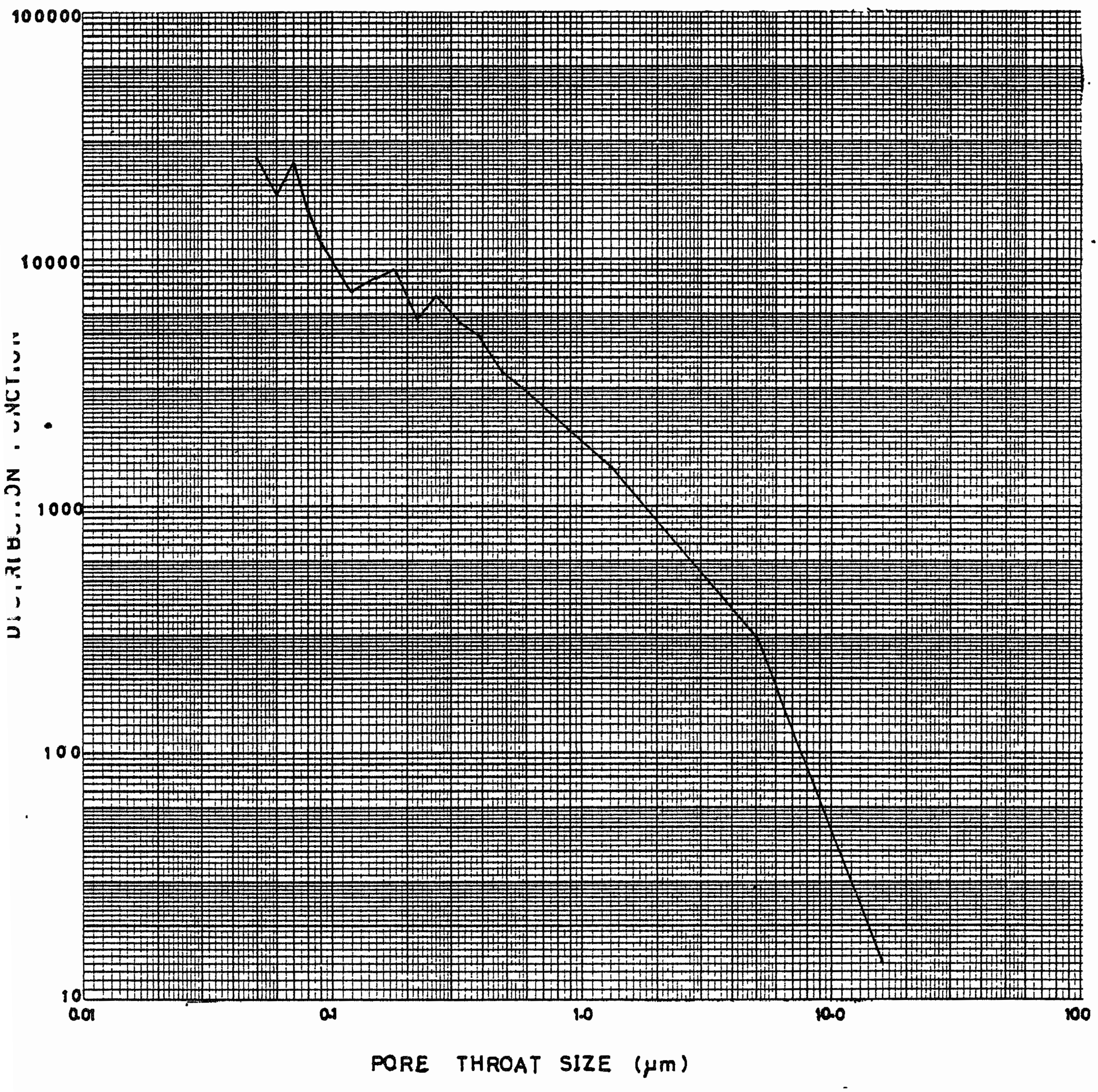

TABLE 15

MERCURY INJECTION CAPILLARY PRESSURE & PORE SIZE DISTRIBUTION

Company: Statoil **Well:** 34/10-7

Sample: GK 19 **Depth:** 1946.17m

Porosity: 25.4% **Gas Permeability:** 5.79mD

CAPILLARY PRESSURE DATA		PORE SIZE DISTRIBUTION	
Mercury saturation (%)	Pressure (kg/cm²)	Pore radius (µm)	Dist. function
1.44	0.46	8.68	53.5
8.87	4.16	1.35	978.
16.2	7.41	0.78	1630.
22.6	12.4	0.43	352.
33.5	26.6	0.24	6130.
37.8	36.1	0.18	9140.
42.3	47.6	0.14	11300
45.7	59.3	0.11	17100
49.1	71.6	0.09	13600
51.9	84.6	0.08	43800
54.5	97.6	0.07	23800
56.6	111.	0.063	41600
58.7	126.	0.055	18500
60.6	140.		

Figure 24.

MERCURY INJECTION CAPILLARY PRESSURE CURVE

COMPANY STATOIL FIELD

WELL 34/10 - 7 SAMPLE GK 19 DEPTH 1946.17

GAS PERMEABILITY 5.79 POROSITY 25.4

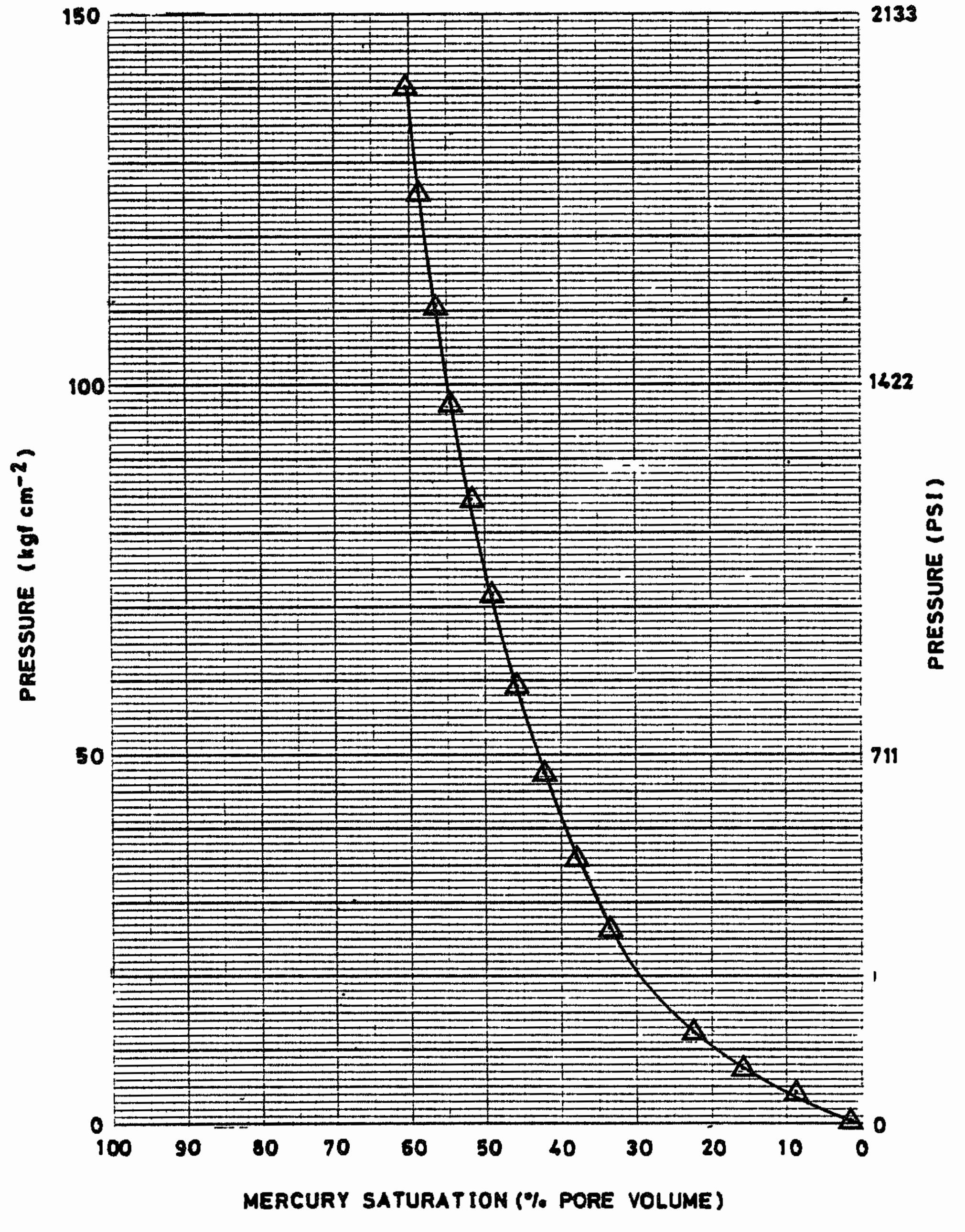

FIGURE 25

PORE THROAT SIZE DISTRIBUTION

COMPANY Statoil WELL 34/10-7

SAMPLE GK 19 DEPTH 1946.17m

POROSITY 25.4% GAS PERMEABILITY 5.79mD