statoil

Den norske stats oljeselskap a.s

WELL TEST REPORT
PL. 050
WELL NO. 34/10-7

SEPTEMBER 1980

Leif Magne Meling

WELL DATA

Operator	:	Den norske stats oljeselskap a.s.
Well	:	34/10-7
Location	:	61°12'13.44"N 02°16'28.56"E
Classification	:	Exploration Well
Rig	:	Ross Rig
Spudded	:	January, 7th 1980
Completed	:	March, 24th 1980
RKB elevation	:	25 m
Water depth	:	204 m
Total depth	:	2250 m
Objective	:	Sandstone of middle jurassic age
Status	:	Temporary plugged and abandoned

TEST REPORT 34/10-7

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APPENDICES

1. INTRODUCTION

Well 34/10-7 is the sixth well drilled on the Delta structure in block 34/10. The well penetrated the Cook member of the Dunlin formation and was drilled into the Statfjord formation and reached a total depth of 2250 m RKB. The Brent formation was not present in this well.

This is the first well that penetrated hydrocarbon saturated Cook sand in the Delta-structure.

2. OBJECTIVES

The objectives of testing well 34/10-7 were:

1. To test the Cook formation for productivity, pressure and temperature.

2. To obtain representative samples of the reservoir fluid.

3. To run the repeat formation tester to obtain a pressure profile in the Cook and Statfjord formation.

3. CONCLUSIONS

1. RFT and DST data in Cook and Statfjord formation indicate that well 34/10-7 represent an other pressure system than in previous drilled wells.

2. The drill stem test indicate a permeability-thickness of 1954 md ft and a permeability of approximately 26 md. in the tested part of the Cook formation.

3. The DST analysis indicate no formation damage

4. PVT analysis indicate a lighter hydrocarbon system in the Cook formation in well 34/10-7 than in the Brent formation in previous drilled wells.

5. The gradient in the Cook formation is estimated to 0.076 bar/m. The gradient in the water zone in the Statfjord formation is estimated to 0.105 bar/m.

6. The maximum temperature recorded during the drill stem test was 77.7^{O}C or 171.9^{O}F. at 1836.5 m MSL.

7. No water was produced.

4. DISCUSSION

4.1. DST analysis

Only one drill stem test was run in well 34/10-7. The Cook formation was tested and the well was perforated from 1858 m RKB to 1865 m RKB.

The tested part of the Cook formation is shaly and the calcualted permeability is relative low (approx. 26 md). Other parts of the Cook formation are cleaner. The calcualted permeability from the DST in well 34/10-7 may not be representative for these cleaner parts of the Cook formation.

The DST analysis indicate that the total skin factor calculated (+7.6) is totaly dominated by the skin due to partial penetration. The partial penetration skin factor is also calculated to +7.6 and therefore the formation damage can be assumed to be zero.

The pressures calculated from the inital and final pressure build-up does not compare perfectly. The reservoir pressure calcualted by using the initial pressure build-up is 25 psi higher than the pressure calculated from the final build up. The reservoir pressure obtained from the initial build-up is assumed to be a more realistic value, because of the short extrapolation. The final build-up is probalby affected by the choke changes and the H_2S shut down during the drawdown prior to the build-up.

In appendix A2 are the reservoir pressures calculated from the PBU's compared with the RFT data. The initial PBU compare well with the RFT data. This pressure is only 12 psi lower than the RFT readings.

The actual productivity index calculated is 3.37 Nm^3PD/bar or 1.46 STBPD/psi. With normal completions in this formation (larger completion interval) the skin factor can be assumed to be zero and a productivity index of 6.99 Nm^3PD/bar or 3.03 STBPD/psi can be assumed. This is the teoretical productivity index for the tested part of the Cook formation.

The drill stem test was analysed by using the Horner method. No quantitative type curve analysis was possible due to very small wellbore storage. The type curve technique was only used to identify the semilog straight line. The analysis of the drill stem test can be found in appendix A1.

A thickness of 23.3 m, an average porosity of 26% and a water saturation of 37% was used in the DST analysis. These values are estimated from the CPI log in appendix A5. PVT properties were taken from the preliminary Core lab. report no. RFLA 80081 based on a sample taken during the drill stem test in the well.

4.2. RFT analysis

The repeat formation tester was run in the Cook and Statfjord formation and good data was obtained from 1812.5 m RKB to 2151.5 m RKB.

The data are listed and plotted versus depth in appendix A2, and compared with the DST analysis and RFT measurements in previous drilled wells. A gradient of 0.076 bar/m in the Cook formation and a gradient of 0.105 bar/m in the Statfjord formation are estimated. The RFT and DST analysis in the Cook and Statfjord formation indicate a higher pressure in well 34/10-7 than in previous drilled wells in the Delta structure. The pressure in the oil zone (Cook formation) is approximate 9.1 bar or 132 psi higher, and the pressure in the water zone is approximate 6.3 bar or 91 psi higher, than in previous drilled wells.

4.3. Reservoir temperature

The maximum temperature recorded during the drill stem test was 77.7^{o}C or 171.9^{o}F at 1836.5 m MSL (midpoint of production). This is approximate 6^{o}C or 10.8^{o}F higher than temperatures recorded in the Brent formation in previous drilled wells. But this is only a single data point and could be more misleading than conclusive.

A plot of the maximum recorded temperature versus depth for well 34/10-7 and previous drilled wells can be found in appendix A3.

4.4. Sampling

Surface samples, bottom hole samples and a RFT sample were taken of the reservoir fluid in the Cook formation. In the Statfjord formation a RFT sample was taken.

The samples taken in the Cook formation indicate a lighter hydrocarbon system compared with samples from the Brent formation in previous drilled wells. The RFT sample from the Statfjord formation contained mainly water with traces of hydrocarbons.

In appendix A4 the samples taken are listed. The analysis of a sample from the Cook formation is compared with the analysis of a representative sample of the reservoir fluid in the Brent formation (34/10-4, DST no. 2).

APPENDIX A1

BOTTOM HOLE PRESSURE REPORT

Well 34/10-7

Test no. DST No. 1

Test Date 16.3.80-18.3.80

Date of analysis 4.9.80

Gauge no. LY.DMR.-1402

SUMMARY OF THE RESULTS

	Final PBU	Initial PBU
	Semilog Analysis	Semilog Analysis
Kh md·ft	1954	
K md	25.6	
S	+7.55	
$\bar{P}$ (psia) at-1820 m ss	4557	4582

Max recorded Temp. 77.7°C/171.9°F

Remarks

$S_p = 7.6$

$S_f = S_T - S_p \approx 0$

Signature

Well 34/10-7, DST#1 Test date 16.3.80-18.3.80

Reservoir Parameters

Perforations 1858-1865 m RKB

Zone(s) Cook

Wellbore radius 0.11 m

RKB Elev 25m

Midpoint Production — 1836.5m ss Bomb at 1845m RKB — 1820m ss

Pressure Functions Evaluated at — ________ ss Datum Depth — ________ ss

Delta P required to correct to datum ________ Gradient ________ psi/ft

Estimated Average Pressure ________

Formation Volume Factor 1.457 vol/vol Viscosity 0.445 cp

Thickness 23.3m Porosity 26 % Drainage Area — acres

Oil Saturation 63 % Oil Compressibility 12.4 $\times 10^{-6} psi^{-1}$

Water Saturation 37 % Water Compressibility 3.0 $\times 10^{-6} psi^{-1}$

Gas Saturation — % Gas Compressibility — $10^{-6} psi^{-1}$

Formation Compressibility 3.0 $\times 10^{-6} psi^{-1}$

System Compressibility $C_t = S_0C_0 + S_wC_w + S_gC_g + C_f$

$C_t = 0.63 \times 12.4 \times 10^{-6} + 0.37 \times 3.0 \times 10^{-6} + - \times - 10^{-6} + 3.0 \times 10^{-6}$

$C_t = 11.9 \times 10^{-6} psi^{-1}$

Rates Reported on Test.

Choke 40/64 inches Oil Rate 2963 STBPD Gas Rate 2.09 MMSCFD

FTP ________ psig Water Rate 0 BWD GOR 705 SCF/STB

^{0}API 38.4 Gas Spec. Grav. 0.642

Cumulative Production Oil 1735 STB Gas ________

Water ________

Well 34/10-7, DST no.1
FINAL PBU

Test Date 16.3.80 - 18.3.80

Horner Analysis

Effective Production Time tp = Cumulative Production / Rate Reported on Test.

tp = 1735. / 2963×24×60 = 843 min.

Straight line starts at 90 min

Slope = 159.9 psi/cycle

$P_{wf's}$ = 2527.5 psia

P_{1hr} = 4368.6 psia

P^* = 4556.9 psia

Calculated Values

$$Kh = \frac{162.6\ Q\ B\mu}{M} = \frac{162.6\ (2963)(1.457)(0.445)}{159.9} = 1954 \text{ md.ft}$$

$$K = Kh/h = 1954 / (23.3 \times 3.2808) = 25.6 \text{ md.}$$

$$S = 1.1513 \left[\left[\frac{P1hr - Pwf\,s}{M} \right] + \text{Log}\left[\frac{tp+1}{tp} \right] - \text{Log}\left[\frac{K}{\varnothing \mu C_t\ rw^2} \right] + 3.2275 \right]$$

$$S = 1.1513 \left[\left[\frac{4368.6 - 2527.5}{159.9} \right] + \text{Log}\left[\frac{843 + 60}{843} \right] - \text{Log}\left[\frac{25.6}{(0.26)(0.445)(11.9 \times 10^{-6})(0.1 \times 3.28)^2} \right] + 3.2275 \right]$$

S = +7.55 $\quad \Delta P_s = 0.87\ m\ S = (0.87) \times (159.9) \times (7.55) = 1051$ psi

$$t_{DA} = \frac{0.000264\ Kt}{\varnothing \mu C_t A} = 0.000264 \qquad = $$

P_{DMBH} = 0

$$\bar{P} = P^* - P_{DMBH}\left[\frac{M}{2.303}\right] = 4557 \text{ psia} \quad @ - 1820 \text{ m ss}$$

= @ - ss Datum

$$PI_a = \frac{Q_o}{\bar{P}_R - P_{wf}} = \frac{2963}{4557 - 2528} = 1.46 \text{ STBPD/psi} = 3.37 \text{ m}^3\text{PD/bar}$$

$$PI_{S=0} = \frac{Q_o}{\bar{P}_R - P_{wf} - \Delta P_S} = \frac{2963}{4557 - 2528 - 1051} = 3.03 \text{ STBPD/psi} = 6.97 \text{ m}^3\text{PD/bar}$$

Well 34/10-7, DST no.1
INITIAL PBU

Test Date 16.3.80-18.3.80

Horner Analysis

Effective Production Time tp = Cumulative Production / Rate Reported on Test.

tp = ______ / ______ = 5 min.

Straight line starts at 8 min

Slope = 302 psi/cycle

$P_{wf's}$ = 2997.5 psia

P_{1hr} = 4571.4 psia

P^* = 4581.9 psia

Calculated Values

$Kh = \frac{162.6 \; Q \; B\mu}{M}$ = 162.6 ______ = ―― md.ft

K = Kh/h = ______ / ______ = ―― md.

$$S = 1.1513 \left[\left[\frac{P_{1hr} - P_{wf\,s}}{M} \right] + \text{Log} \left[\frac{tp \;\; 1}{tp} \right] - \text{Log} \left[\frac{K}{\emptyset \mu C_t r_w^2} \right] + 3.2275 \right]$$

S = 1.1513 [[______] + Log [______] − Log [______] + 3.2275]

S = ――

$t_{DA} = \frac{0.000264 \; Kt}{\emptyset \mu C_t A}$ = 0.000264 ______ = ≈ 0

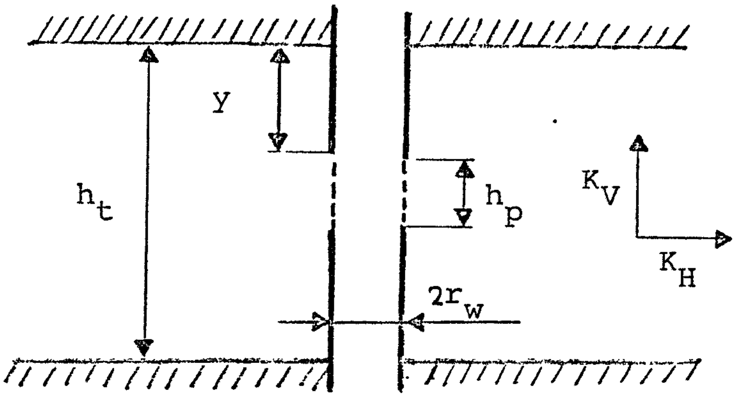
P_{DMBH} = 0

$\bar{P} = P^* - P_{DMBH} \left[\frac{M}{2.303} \right]$ = 4582. psia @ − 1820m ss

= ______ @ − ______ ss Datum

Well 34/10-7, DST no. 1 Test date 16.3.80-18.3.80

PARTIAL PENETRATION SKIN FACTOR



h_t = 23.3m ; 76.3ft

h_p = 7m , 23ft

y = 8m , 26.2ft

r_w = 0.11m , 0.36ft

K_H/K_V = 1.0

$$Z_m = y + h_p/2$$

$$r_{wc} = r_w e^{0.2126(z_m/h_t+2.753)}$$

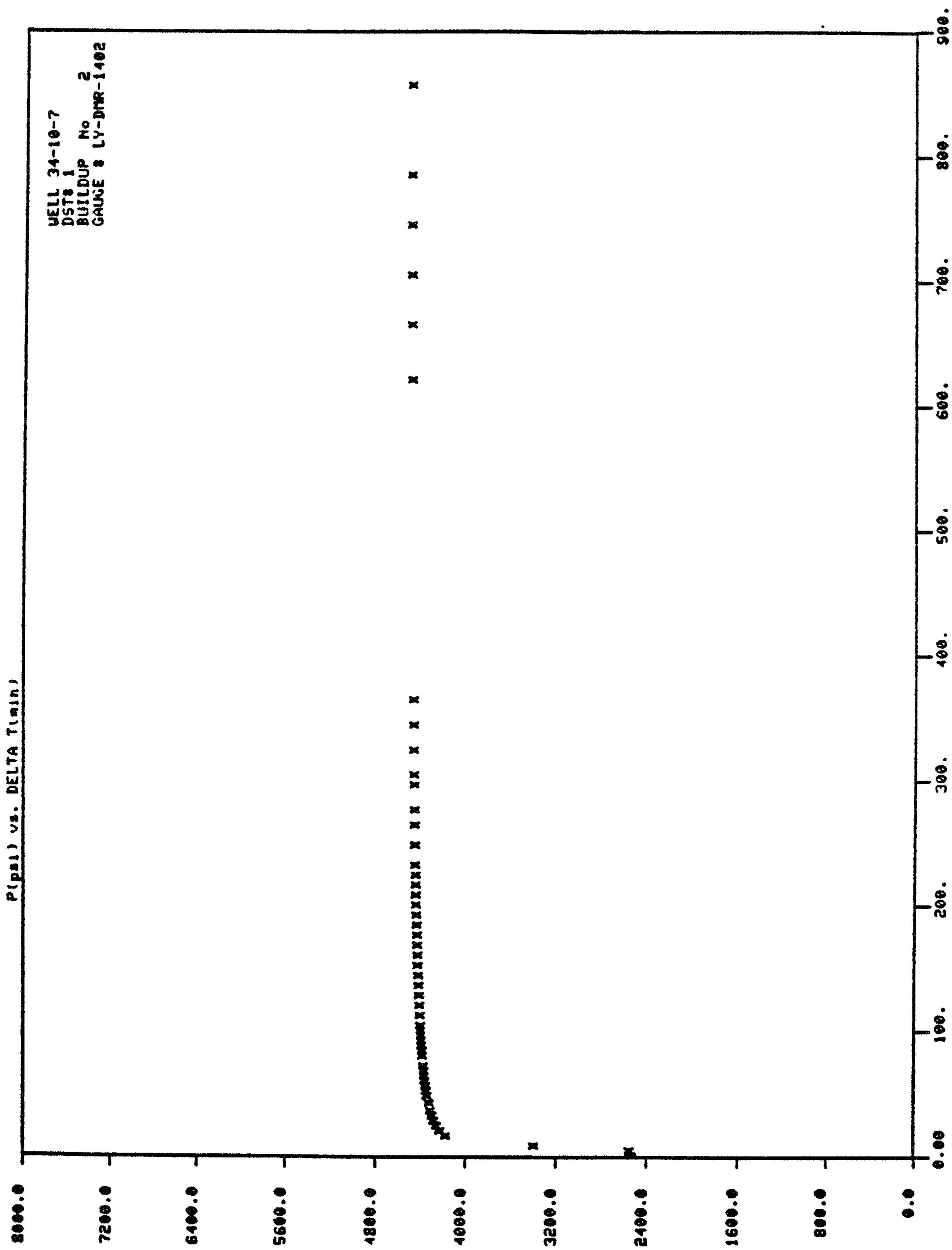
$$S_p = 1.35((h_t/h_p-1)^{0.825}(\ln(h_t(K_H/K_V)^{0.5}+7)$$

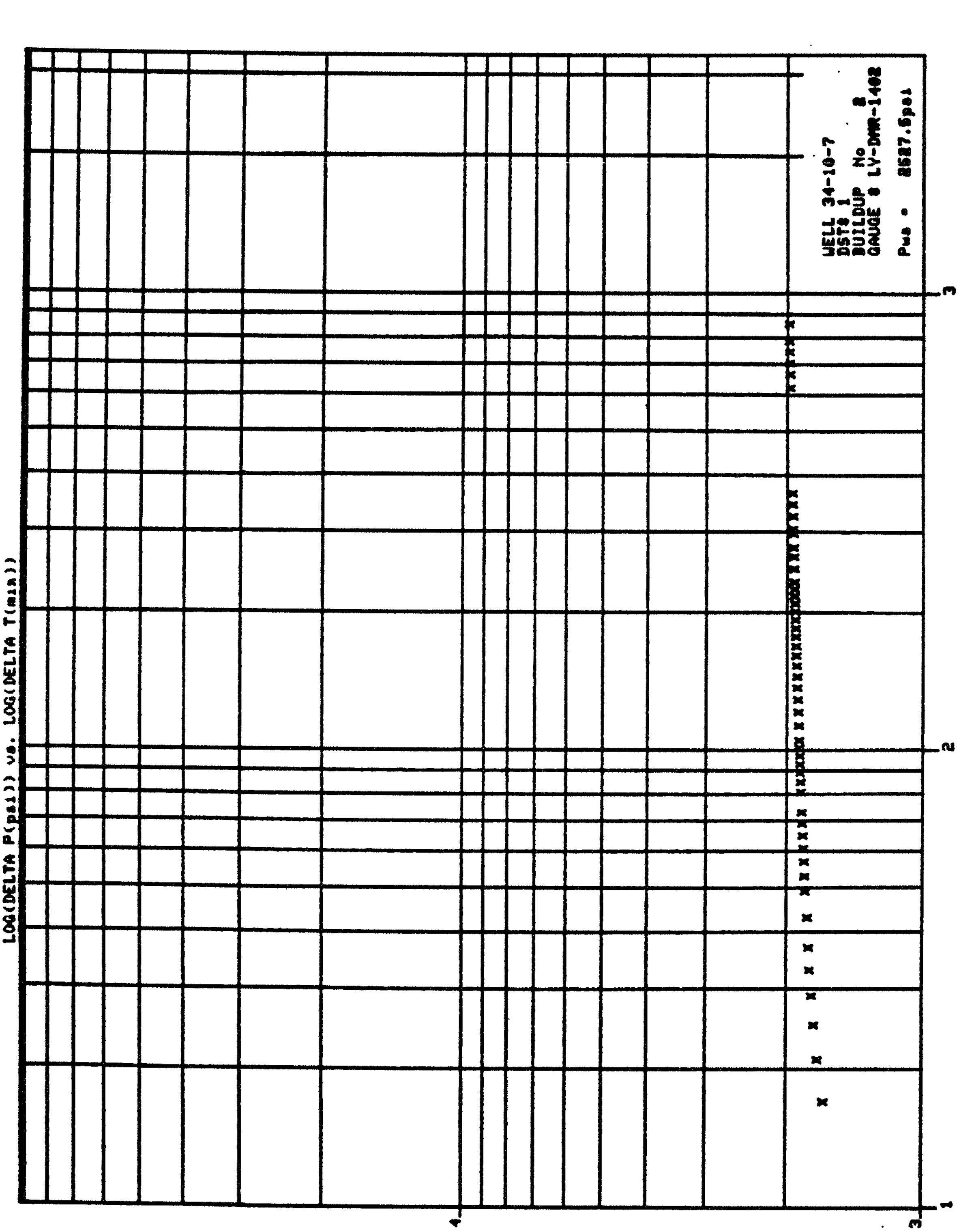
$$-(0.49+0.1\ln(h_t(K_H/K_V)^{0.5}))\ln r_{wc}-1.95))$$

S_p = + 7.6

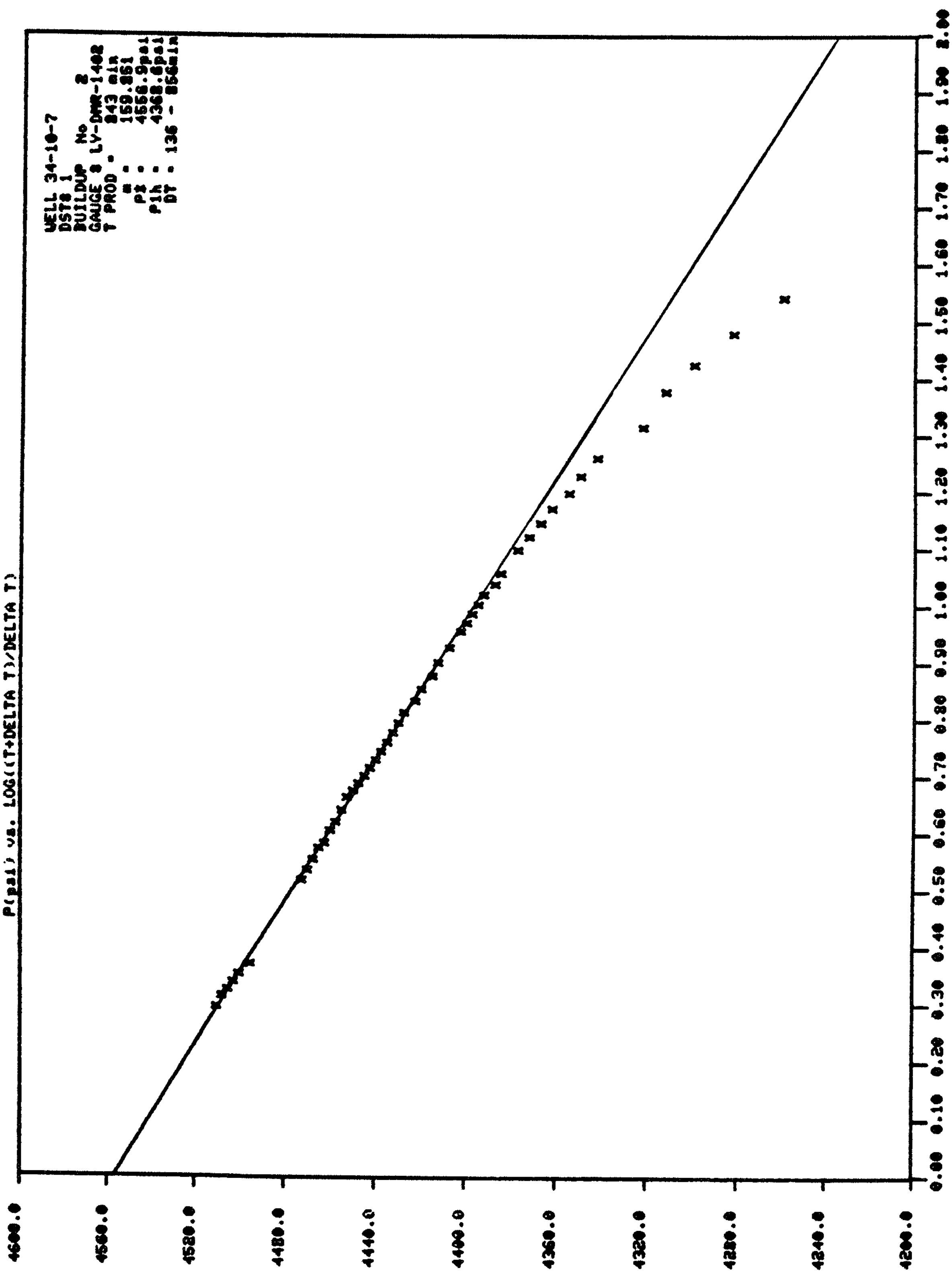
BRØNN 34-10-7 DST# 1
BUILDUP NUMMER 2
GAUGE LY-DMR-1402

NR.	TID	TRYKK
1	18.56	2527.500
2	19.00	2552.500
3	19.04	3397.500
4	19.12	4177.500
5	19.16	4230.000
6	19.20	4260.000
7	19.24	4282.500
8	19.28	4300.000
9	19.32	4312.500
10	19.38	4322.500
11	19.44	4342.500
12	19.48	4350.000
13	19.52	4355.000
14	19.56	4362.500
15	20.00	4367.500
16	20.04	4372.500
17	20.08	4377.500
18	20.16	4385.000
19	20.20	4387.500
20	20.24	4392.500
21	20.28	4395.000
22	20.32	4397.500
23	20.36	4400.000
24	20.40	4402.500
25	20.48	4407.500
26	20.56	4412.500
27	21.04	4415.000
28	21.12	4420.000
29	21.20	4422.500
30	21.28	4427.500
31	21.36	4430.000
32	21.44	4432.500
33	21.52	4435.000
34	22.00	4437.500
35	22.08	4440.000
36	22.16	4442.500
37	22.24	4445.000
38	22.32	4447.500
39	22.40	4450.000
40	22.48	4452.500
41	23.04	4455.000
42	23.20	4457.500
43	23.32	4460.000
44	23.52	4462.500
45	0.00	4465.000
46	0.20	4467.500
47	0.40	4470.000
48	1.00	4472.500
49	5.16	4495.000
50	6.00	4500.000
51	6.40	4502.500
52	7.20	4505.000
53	8.00	4507.500
54	[illegible]	[illegible]


P(psi) vs. DELTA T(min)
WELL 34-10-7
DST# 1
BUILDUP No 2
GAUGE # LY-DMR-1402
0.00
100.
200.
300.
400.
500.
600.
700.
800.
900.
0.0
800.0
1600.0
2400.0
3200.0
4000.0
4800.0
5600.0
6400.0
7200.0
8000.0

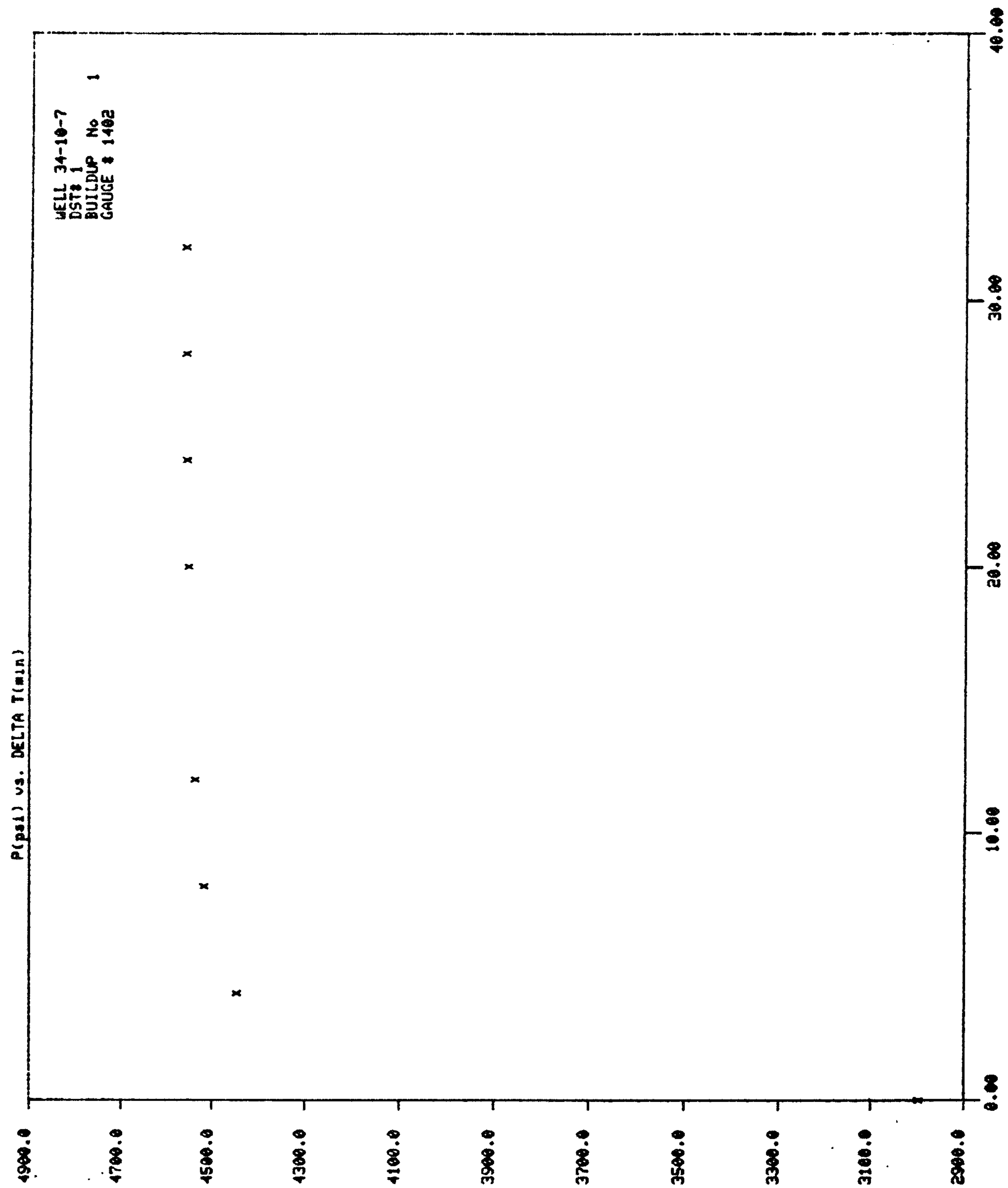


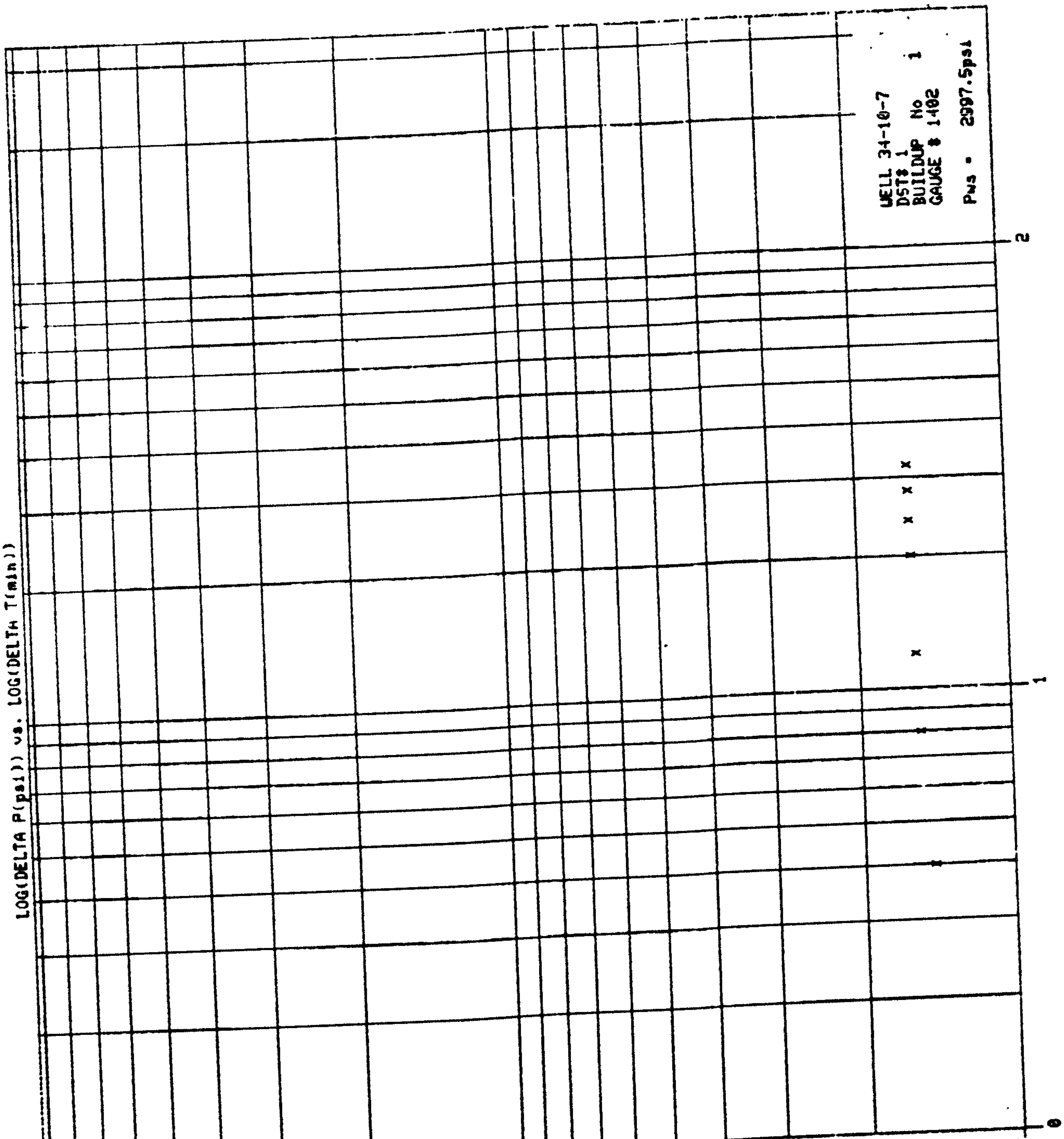
LOG(DELTA P(psi)) vs. LOG(DELTA T(min))
WELL 34-10-7
DST# 1
BUILDUP No
GAUGE # LY-DMR-1402
Pws = 8527.5psi
1
2
3
3
4

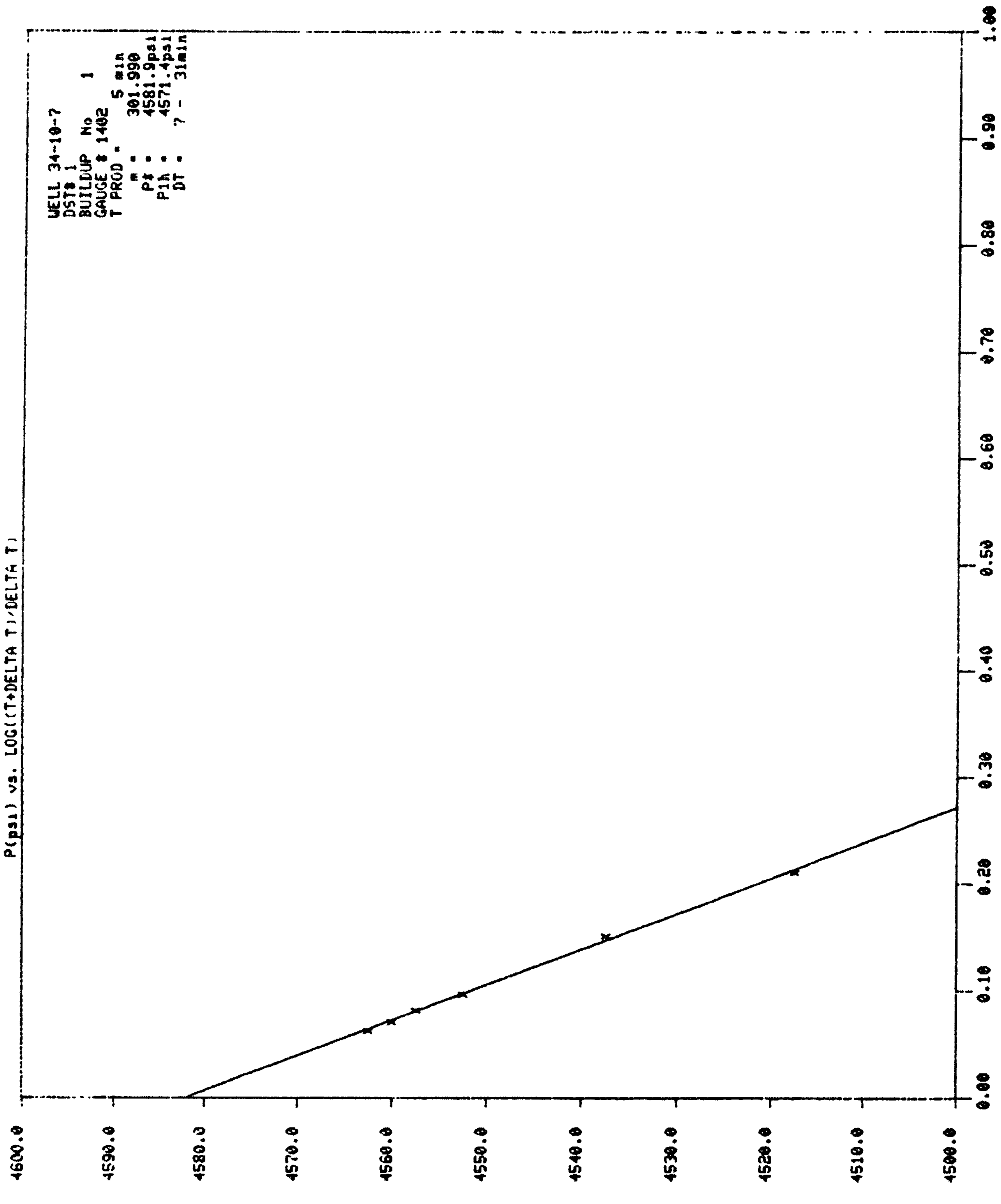

P(psi) vs. LOG((T+DELTA T)/DELTA T)
WELL 34-10-7
DST# 1
BUILDUP No 2
GAUGE # LY-DMR-1402
T PROD = 843 min
m = 159.851
P* = 4556.9psi
Pih = 4368.6psi
DT = 136 - 856min
4600.0
4560.0
4520.0
4480.0
4440.0
4400.0
4360.0
4320.0
4280.0
4240.0
4200.0
0.00 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 0.90 1.00 1.10 1.20 1.30 1.40 1.50 1.60 1.70 1.80 1.90 2.00

BRØNN 34-10-7   DST# 1
BUILDUP NUMMER   1
GAUGE 1402

NR.	TID	TRYKK
1	21.32	2997.500
2	21.36	4445.000
3	21.40	4517.500
4	21.44	4537.500
5	21.52	4552.500
6	21.56	4557.500
7	22.00	4560.000
8	22.04	4562.500

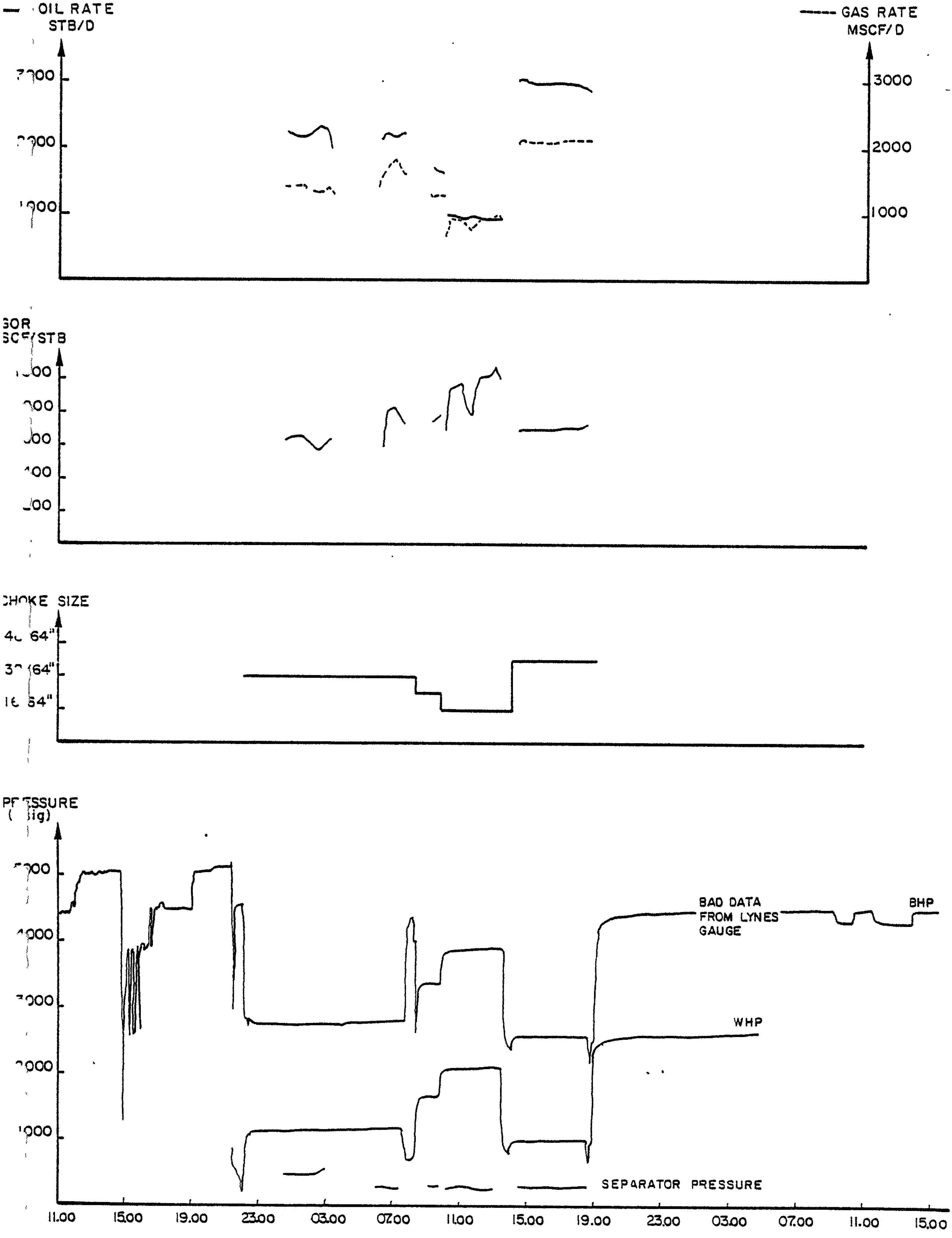

P(psi) vs. DELTA T(min)
WELL 34-10-7
DST# 1
BUILDUP No 1
GAUGE # 1402
0.00
10.00
20.00
30.00
40.00
4900.0
4700.0
4500.0
4300.0
4100.0
3900.0
3700.0
3500.0
3300.0
3100.0
2900.0


LOG(DELTA P(psi)) vs. LOG(DELTA T(min))
WELL 34-10-7
DST# 1
BUILDUP No 1
GAUGE # 1402
Pws = 2997.5psi
2
1
0
3
4


P(psi) vs. LOG((T+DELTA T)/DELTA T)
WELL 34-10-7
DST# 1
BUILDUP No 1
GAUGE # 1402
T PROD = 5 min
m = 301.990
P* = 4581.9psi
P1h = 4571.4psi
DT = 7 - 31min
4600.0
4590.0
4580.0
4570.0
4560.0
4550.0
4540.0
4530.0
4520.0
4510.0
4500.0
0.00
0.10
0.20
0.30
0.40
0.50
0.60
0.70
0.80
0.90
1.00

34/10-7 DST 1

PRESSURE, CHOKE AND FLOWDIAGRAM



Date/Time	Bottom hole Press. Psi	Bottom hole Temp. F	Well head Press. Psi	Well head Temp. F	Chokes Manifold	Chokes Heater 64. inc.	Separator data Press. Psi	Separator data Temp. F	Gas rat. mmscf/d	Oil rate stb/d	GOR scf/stb	Oil API	Gas S.G.	Liq. and gas analysis at goos neck Water %	Temp °C	Sedim. %	Oil Sp.grav	Co2	H_2S
17.3.80																			
00.02	Flowed thru separator																		
00.30	2740	162	1136	49	32		480	46	1.402	2215	633	39.6	.642	0	7	Traces	.784	0.2	0
01.00	2737	163	1137	"	"		"	50	1.418	2165	655	"	"	0		"			
01.30	2732	"	1139	50	"		"	"	1.426	2171	657	"	"	0	6.5	"	.845		
02.00	2745	164	1148	"	"		"	"	1.344	2242	599	"	"						
02.30	2742	"	"	"	"		"	55	1.326	2314	573	"	"	0	6	Traces	.845		
03.00	2747	165	1154	"	"		565	"	1.404	2250	624	"	"						
03.30	Separator by-passed, back pressure valve sticking.																		
04.30	Flowed thru separator, back pressure valve rapaired.																		
06.00	2770	166	1171	48	32		300	55	1.404	–	–	"	"	0	8	Traces	.840		
06.30	"	167	1173	47	"		310	56	1.709	2227	808	"	"						
07.00	"	"	1175	"	"		300	56	1.799	2157	834	"	"						
07.30	2777	"	1180	"	"		"	"	1.624	2205	736	"	"						
07.40	Shut-in due to H2S-alarm, at 7.37													0	5	Traces	.824		0
08.48	Thru separator. 24/64" choke on manifold																		
09.15	3367	167	1652	48	24		310	51	1.263	1696	745	39.5	"						
09.45	3370	"	"	49	"		325	52	1.278	1639	780	"	"	0	7	Traces	.845		
10.15	3812	166	2073	51	16		275	50	.925	980	943	"	"						
11.00	3862	"	2090	52	"		310	48	.895	928	964	"	"						
11.30	3870	"	2094	57	"		285	50	.771	972	793	"	"						
12.00	3872	"	2095	56	"		270	52	.936	918	1020	"	"						
12.30	3855	165	2098	53	"		"	"	.937	920	1018	"	"						
13.00	3857	"	2100	52	"		275	56	.988	917	1078	"	"						
13.18	Bypassed separator.															0.4			
13.52	Thru separator.				Choke increased to 40/64														
14.30	2570	168	998	50	40		305	64	2.106	3034	694	38.4	"	0	9	Traces	.843		
15.00	2572	"	1001	51	"		"	67	2.071	2987	693	"	"						
15.30	2567	"	"	50	"		"	69	2.067	2978	694	"	"						

Date/Time	Bottom hole		Well head		Chokes		Separator data							Liq. and gas analysis at goos neck					
	Press. Psi	Temp. F	Press. Psi	Temp. F	Manifold	Heater 64. inc.	Press. Psi	Temp. F	Gas rat. mmscf/d	Oil rate stb/d	GOR scf/stb	Oil API	Gas S.G.	Water %	PH	Sedim. %	Oil API	Co2	H_2S
16.00	2570	168	1005	50	40		305	73	2.071	2974	696	38.4	0.642	0		Traces			
16.30	2567	"	1006	"	"		"	75	2.067	2975	695	"	"						
17.00	"	"	1010	"	"		300	77	2.099	2970	707	"	"						
17.30	2570	169	1012	51	"		"	80	2.106	2959	712	"	"						
18.00	"	"	1013	50	"		"	85	2.109	2932	719	"	"						
18.30	2572	"	"	"	"		300	86	2.106	2855	728	"	"						
18.55	Well shut-in for final build-up																		

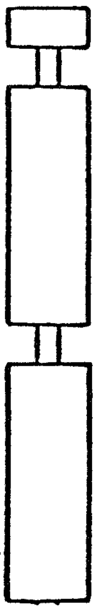
LAYOUT OF TESTSTRING
DST. NO. 1

TESTSTRING	I.D inchs.	O.D inchs.	Length ft.	m	Depth (m)
Surface test tree	2.88	-		-	6.86
4 3/8 stub ACME pin x 3½ tds pin	2.75	5.00		0.46	above
3½ TDS tubing 2 joints	2.75	4.25		18.33	rotary
X-over 3½ TDS box x 4½ otis ACME pin	2.81	6.00		0.26	11.93
Lubricator valve	3,00	13.75		1.60	12.19
X-over 4½ otis ACME box x 3½ TDS pin	2.69	5.56		0,51	13.79
3½ TDS tubing 7 stds + 2 singles	2.75	4.25		206.5	14.30
X-over 3½ TDS box x 4½ otis ACME pin	3.00	6.00		0.865	220.80
Sub sea test tree	1.98	13.38		4.98	221.67
X-over 4½ otis ACME pin x 3½ P-105 VAM pin	2.63	5.50		0.395	226.65
3½ P-105 VAM tubing	2.63 drift)	4.06		1344.87	227.04
3½ VAM tubing box-3½ if pin	2.00	4.87		0.30	1571.91
Slip joint	2.00	5.00		5.54	1572.21
Slip joint	2.00	5.00		4.01	1577.75
6 STD of drill collars	2.25	4.75		171.18	1581.76
X-over 3½ if box x 2 7/8 EUE pin	2.25	4.62		0.22	1581.76
RTTS circ. valve	2.44	4.87		1.00	1752.94
X-over 2 7/8 EUE box x 3½ if pin	2.50	4.75		0.21	1753.16
1 STD of drill collars	2.25	4.75		28.53	1754.16
Slip joint	2.00	5.00		4.01	1754.37
Slip joint	2.00	5.00		4.01	1782.90
1 STD of drill collars	2.25	4.75		28.53	1786.91
APR-A reverse valve	2.00	4.62		0.91	1790.92
APR-N tester valve	2.25	5.00		3.89	1819.45
Big John Jars	2.37	4.62		1.57	1820.36
3½ if box-3½ FH pin	2.50	4.75		0.23	1824.25
X-over 3½ FH box x 2 7/8 EUE pin	2.50	4.50		0.20	1826.05
RTTS circ. valve	2.44	4.87		0.91	1826.25
RTTS safety joint	2.44	5.00		0.84	1827.16
RTTS packer - 7" above	2.18	5.75		0.52	1828.00
RTTS packer - 7" below	-	-		0.80	1828.52
Perforated joint	2.44	3.13		2.35	1829.32
X-over 2 7/8 EUE box x 2 3/8 EUE box	1.94	3.69		0.40	1831.67
2 3/8 EUE Pin x pin Xn-nipple NoGo	1.81	2.50		0.21	1832.07
X-over 2 3/8 EUE box x 2 3/8 pin	2.19	3.13		0.28	1832.28
2 joints 2 7/8 EUE tubing	2.44	3.69		19.00	1832.56
X-over 2 7/8 EUE box x 2 3/9 EUE pin	1.94	3.69		0.28	1851.56

LAYOUT OF TESTSTRING
DST. NO. 1

TESTSTRING	I.D inchs.	O.D inchs.	Length ft.	Length m	Depth (m)
2 3/8 EU box x pin safety joint	1.94	2.94		0.17	1851.84
X-over 2 3/8 EU box x 2 7/8 EUE pin	2.19	3.13		0.28	1852.01
X-over 2 7/8 EUE box x 3½ TDS pin	2.44	4.00		0.23	1852.29
2 joints painted 3½ TDS tubing	2.63(drift)	4.25		18.40	1852.52
3½ TDS bull plug		3.50		0.20	1870.92
					1871.12

WELL NO.: 34/10-7 DST NO.: 1 DATE: 16.3



XN-nipple: 1842.1 m

GAUGE TYPE AND NUMBER : 1) MR 312 10 K. S/N 1092

DEPTH, PRESSURE ELEMENT : 55.25 in RANGE : 0-10,000 psi

MODE : 2 minute DELAY : 4 hours

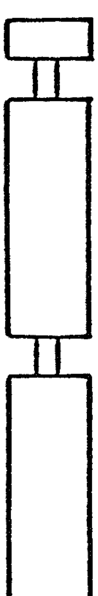
ACTUATED : time 03.34 date : 16.3.80 WILL RUN OUT : time 20-34 date 17.3.8

GAUGE TYPE AND NUMBER : 1) MR 312 10 K. S/N 1402

DEPTH, PRESSURE ELEMENT : 110.50 in RANGE : 0-10,000 psi

MODE : 4 minute DELAY : 4 hours

ACTUATED : time 03.34 date : 16.3.80 WILL RUN OUT : time 06.34 date 19.3.8



DST-hanger: 1851,88 m

GAUGE TYPE AND NUMBER : Amerada, No. 34524

DEPTH, PRESSURE ELEMENT : 185 cm RANGE : 10 000 psi

MODE : 72 h DELAY : 0

ACTUATED : time 02:58 date : 16.3 WILL RUN OUT : time 02:58 date 19.3

GAUGE TYPE AND NUMBER : Amerada, No. 32328

DEPTH, PRESSURE ELEMENT : 390 cm RANGE : 10 000 psi

MODE : 72 h DELAY : 0

ACTUATED : time 02:58 date : 16.3 WILL RUN OUT : time 02:58 date 19.3

DIARY OF EVENTS	WELL No. 34/10-7	DST No. 1
	ZONE TESTED DUNLIN	PERFS. 1858 - 1865

DATE	TIME	OPERATIONS
		PERFORATING
16.3	0005	Rigged up Schlumberger 4" 4spf HJ casing gun
	0040	RIH w/casing gun
	0120	Fired gun. 89 shots.
	0155	Casing gun on deck, all shots fired. Rigged down Schlumberger.
		RUN TESTRING
	0225-2010	Ran and pressure tested test string
		PRESSURE RECORDERS
		DST hanger: 2 x Amerada, 0 - 10000 psi. 72 hr clock (1842.1 m) activated 16/3 at 0258 hrs.
		XN nipple: 1 Lynes MDR 312, 0 - 10000 psi, 34 hr. clock (1832.1 m) with 7 hr delay. Activated at 0334
		1 Lynes MDR 312, 0 - 1000 psi, 68 hr. clock with 7 hr. delay. Activated at 0334.
	2010	Sat Halliburton RTTS packer at 1828.5 m.
	2020	Found Lynes probe for readout on drillfloor damaged. Replaced it with probe on separator.
		INITIAL FLOW
	2122	Opened APR-n valve. Got response on WHP. Opened well on 48/64" choke on Halliburton choke manifold. Flowed approximately 6 bbl to surge tank in 5 min. WHP 68 - 71 psi.
		INITIAL BUILD-UP
	2127	Closed APR-n valve.
	2128	Closed Halliburton choke manifold.
	2130	WHP = 760 psi.

COMMENTS:

Painted tailpipe. (Photographed)

PE:

DIARY OF EVENTS		WELL No. 34/10-7 ZONE TESTED DUNLIN	DST No. 1 PERFS. 1858 - 1865
DATE	**TIME**	**OPERATIONS**	
		SECOND FLOW	
	2201	Opened APR-n valve and started 2nd flow on 32/64" fixed choke.	
		WHP = 1572 psi before opening choke. Dropped to about 230 psi and then started to build up.	
	2222	Oil to surface. Started taking BS & W.	
	2300	WHP = 1118 psi.	
17.3	0015	Directed flow thru separator.	
	0100	WHP = 1137 psi.	
	0200	WHP = 1148 psi slow increase.	
	0330	Bypassed separator due to high variations in seaprator pressure and differential pressure. Checked back-up valve.	
	0429	Directed flow thru separator.	
	0500	WHP = 1169 psi.	
	0630	Unable to get perfectly stable flow on separator.	
		WHP = 1173 psi.	
	0648	Started taking PVT. sample no. 1. 1 oil + 1 gas.	
	0730	Finished PVT no. 1.	
	0733	H_2S alarm went off. Well shut in on APR-n valve. Bled off on choke manifold. No H_2S present.	
	0815	Opened APR-n valve, and opened well to flow on 24/64" choke to burner. WHP = 870 psi.	
	0847	Directed flow thru separator Measured rates.	
	0947	Choked back to 16/64" choke.	
	1000	Switched over to other burner due to wind conditions.	
	1055	Flowed to tank to measure rates against separator. Meter factor 0.76, with 1"-orifice plate.	
	1155	Changed separator gas orifice plate from 1" to 1.5".	
	1300	Flushed from tank.	
	1319	Directed flow to burner.	
	1325	Choked adjustable choke to 16/64". Bypassed Halliburton.	

COMMENTS:

PE:

DIARY OF EVENTS	WELL No. 34/10-7	DST No. 1
	ZONE TESTED DUNLIN	PERFS. 1858 - 1865

DATE	TIME	OPERATIONS
	1352	Directed flow thru separator.
	1355	Changed over to Halliburton 40/64" fixed choke. Separator meter factor = 0.76. Measured rates.
	1533	Started sampling PVT sample no. 2. and no. 3: 2 oil and 2 gas samples.
	1704	Finished PVT-sampling.
	1830	Closed APR-n valve for annular pressure bleed off.
	1832	By-passed choke manifold. Adjustable choke 40/64".
	1833	Closed choke manifold.
	1836	Opened bypass. Bled off to 600 psi.
	1840	Shut in at choke manifold.
	1845	Flowed on 40/64" fixed choke.
		FINAL BUILD-UP
	1855	Shut-in at choke manifold for final build-up.
18.3	0100-0516	Bad data from Lynes gauge in this period.

COMMENTS:

PE:

DIARY OF EVENTS		WELL No. 34/10-7 ZONE TESTED DUNLIN	DST No. 1 PERFS. 1858 - 1865

DATE	TIME	OPERATIONS
		BOTTOM HOLE SAMPLING
	0912	Opened well on 10/64" choke to tank. Flow rate measured to 504 BPD.
	1010	Closed choke manifold.
	1012	Closed lubricator valve and bled off at choke manifold. Installed two bottom-hole samplers in tandem and one Lynes 3/4 (0 - 5000 psi) gauge on wireline. Samplers set to close at 1316 hrs.
	1117	Started RIH/w samplers. Speed 100'/min.
	1126	Opened well on 10/64" choke. Flow to tank. Rate measured to 480 BPD.
	1215	Samplers at 1790 m, TD.
	1340	WHP = 2469 psi.
	1346	Started POOH/w samplers. Speed 100'/min.
	1450	At surface w/samplers. Samplers checked for leak. Negative. Started transfering samplers.
	1530	Started bullheading.

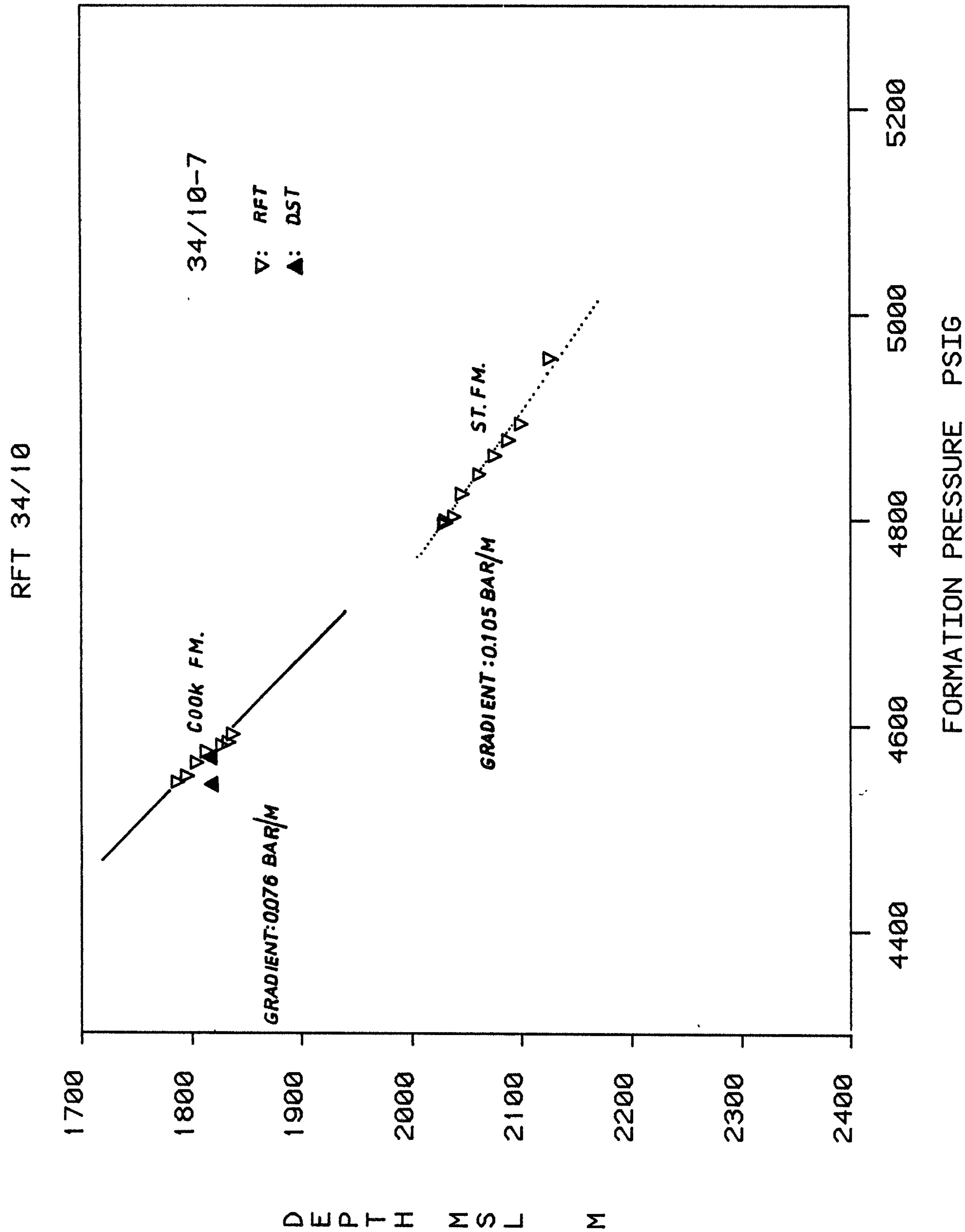
COMMENTS:

PE:

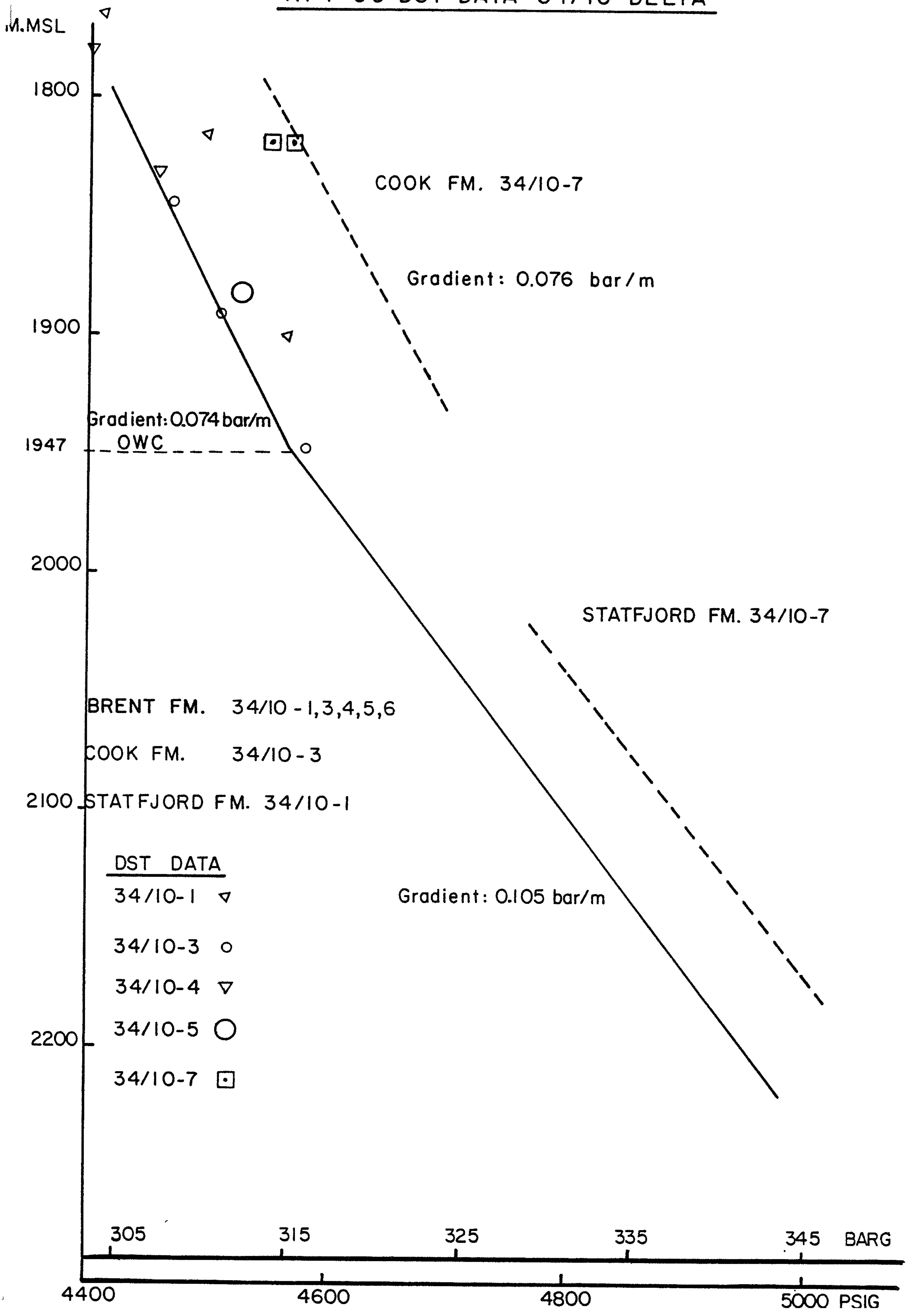
34/10-7 REPEAT FORMATION TEST.

The repeat formation tester was run in the Cook and Statfjord formation and good data was obtained from both formations. The data below are corrected for pressure and temperature effects. Thirty-two tests was preformed in the well and seventeen of these tests were succesful. In the Cook formation a 2 3/4 gallon sample was taken at 1796 m MSL, seven other attemts was done, but all of them failed. In the Statfjord formation a 2 3/4 gallon sample was taken at 2030 m MSL, an attemt to fill the 1 gallon chamber was unsuccessful.

Depth (m SS)	Com. Pressure (psig)	Formation
- 1787.5	4544	Cook
- 1796.0	4550	"
- 1805.0	4563	"
- 1814.0	4574	"
- 1828.0	4580	"
- 1834.0	4583	"
- 1838.0	4591	"
- 2030.0	4796	Statfjord
- 2031.0	4799	"
- 2031.5	4797	"
- 2039.0	4803	"
-2046.5	4825	"
- 2062.0	4844	"
- 2076.0	4862	"
- 2088.5	4877	"
- 2100.0	4893	"
- 2126.5	4957	"

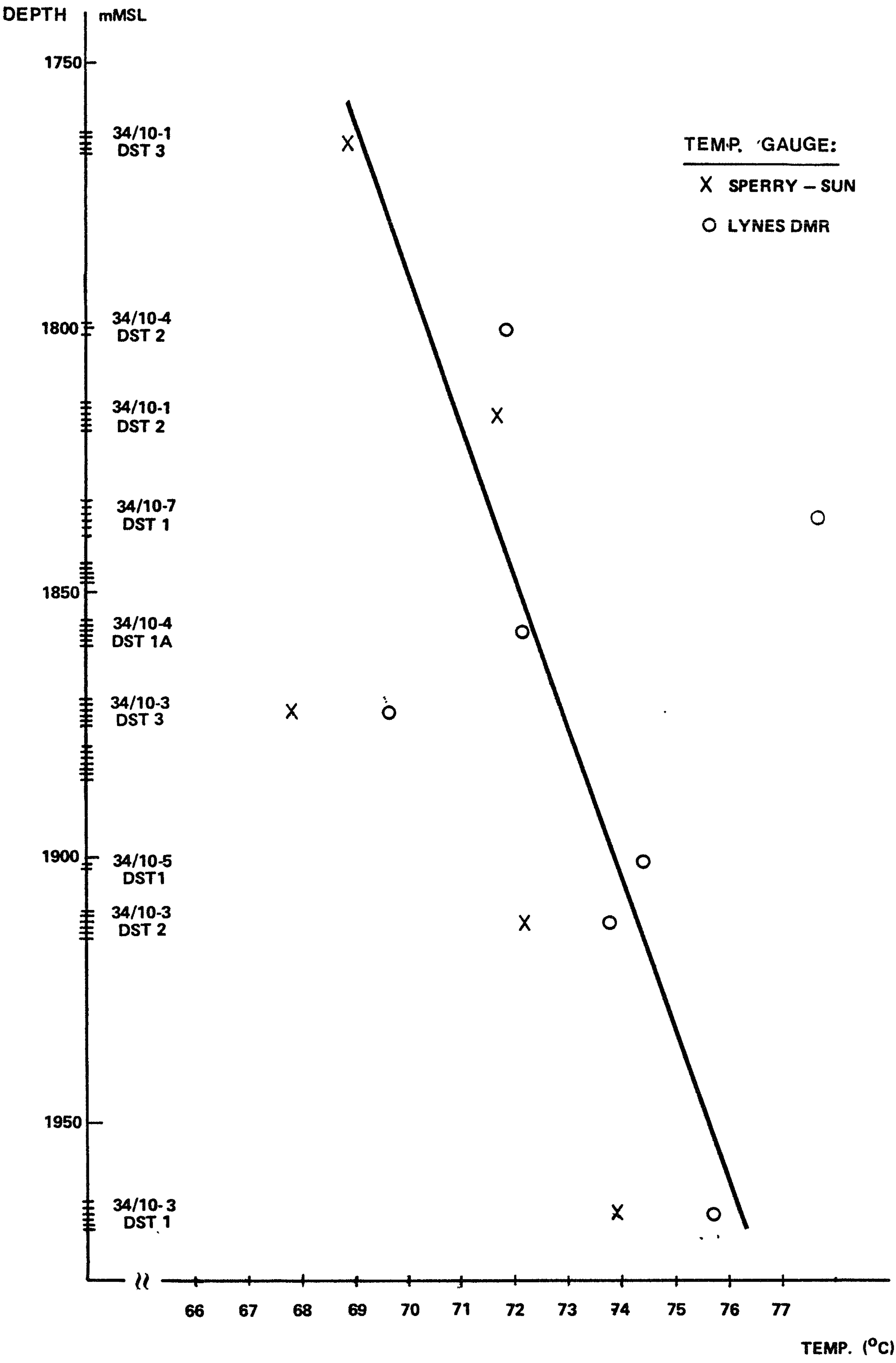

RFT 34/10
34/10-7
▽: RFT
▲: DST
COOK FM.
GRADIENT:0.076 BAR/M
ST. FM.
GRADIENT:0.105 BAR/M
4400
4600
4800
5000
5200
FORMATION PRESSURE PSIG
1700
1800
1900
2000
2100
2200
2300
2400
DEPTH MSL M

RFT OG DST DATA 34/10 DELTA



APPENDIX A3

RESERVOIR TEMPERATURE 34/10-DELTA



APPENDIX A4 PAGE

34/10-7 RESERVOIR FLUID STUDY COMPARED WITH DATA FROM 34/10-4, DST no. 2

The data below are based on Statoil's "short PVT program" (single flash).

		34/10-4 , DST No 2 bottle 22226-111	34/10-7, DST No. 1 bottle 20584/92
Bubble point pressure, Bar	:	243.7	237
Gas/oil ratio, Sm^3/Nm^3	:	101.1	153.4
Formation volume factor, vol/vol	:	1.266	1.438
Oil density, g/cm^3	:	0.8822	0.8387
Gas gravity, air = 1.0	:	0.700	0.800
C_{7+} density, g/cm^3	:	0.8870	0.8516
C_{7+} mol weight, g/mol	:	237	242
Compressibility, vol/vol/ Bar x 10^5	:	12.2	16.3

Components

H_2S	:	-	-
CO_2	:	0.98	0.82
N_2	:	0.52	0.13
C_1	:	44.10	47.25
C_2	:	3.79	6.08
C_3	:	1.35	4.72
iC_4	:	0.62	1.05
nC_4	:	0.79	2.63
iC_5	:	0.67	1.17
nC_5	:	0.40	1.51
C_6	:	0.97	2.31
C_{7+}	:	45.81	32.33
		100.0	100.0

SURFACE SAMPLING ON SEPARATOR

DST no.1 (1858 - 1865 m RKB)

DATE/TIME	SAMPLE No.	TYPE OF SAMPLE	TRANSFER TIME	BOTTLE NO.
17. March				
06:50	1	OIL	30 min	22400
07:08	1	GAS	22 min	A-3369
15:35	2	OIL	30 min	8088
15:38	2	GAS	17 min	A-4501
16:22	3	OIL	28 min	73-FA-230:30
16:30	3	GAS	15 min	A-4915

BOTTOM HOLE SAMPLING

DST no.1 (1856 - 1865 m RKB)

DATE/TIME	SAMPLE No.	BOTTLE No.	DEPTH (m)
18 March			
13:16	1	20584 - 92	1785
13:16	2	12689/59	1782

APPENDIX A5 PAGE

GRAPHICAL LOG-PRESENTATION

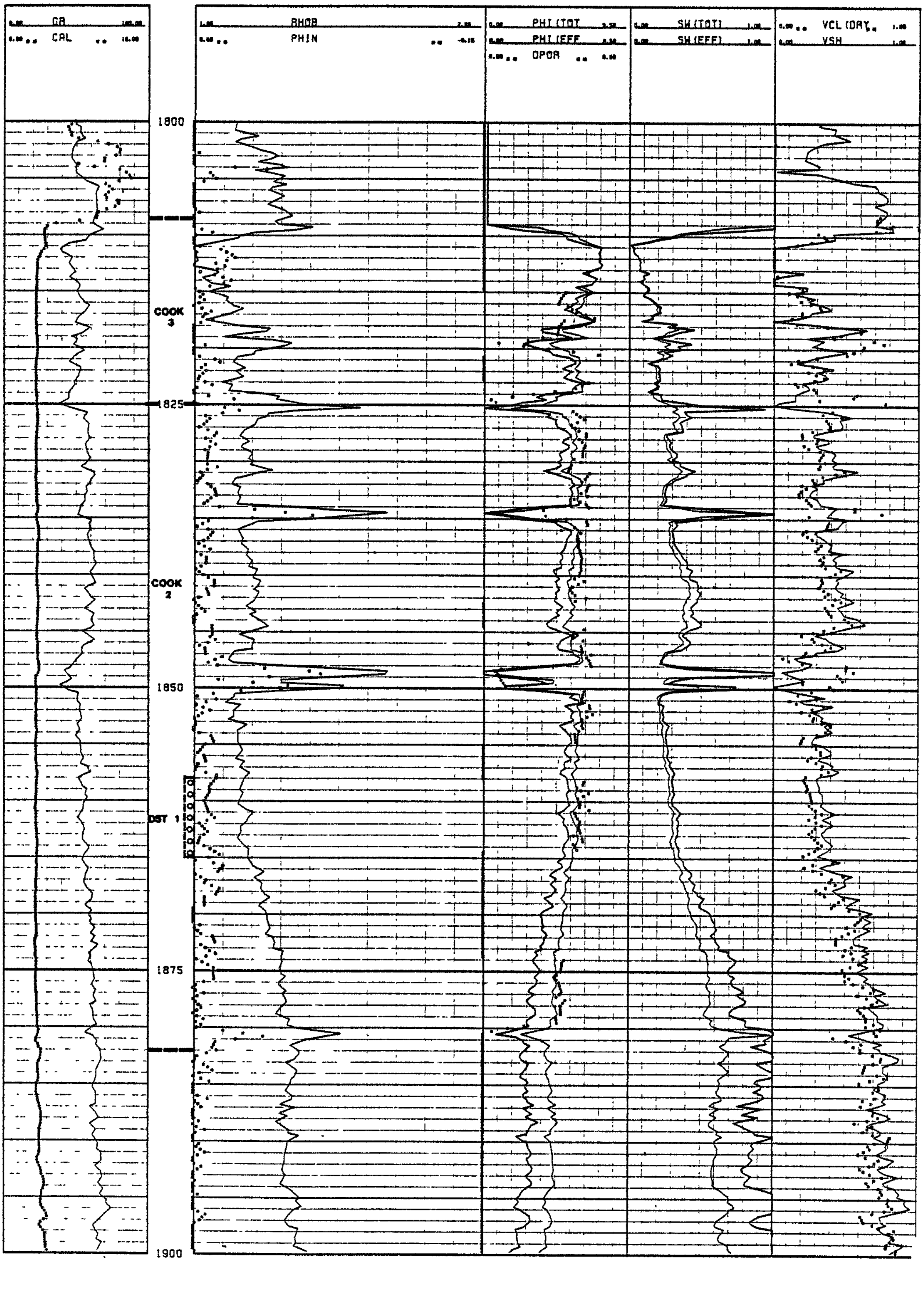
WELL : 34-10-7 DEPTH INTERVALL :1800.00-1900.00 (METER)

ENGINEER :THY SCALE 1:200

DATE: 13.58.27 28 AUGUST 1980

STATOIL

COOK-MEMBER MICRO-POROSITY CONSEPT
USING HYDROGEN INDEX AND C.E.C.



DATA USED IN THE ANALYSIS

The cutoffs used to calculate porosity, watersaturation and net pay are:

Porosity, Ø	<	12%
Water saturation, Sw	>	65%
Shale volume, VSH	>	75%

From these cutoffs the following are calculated.

h = 23.25 m (1850 - 1873.25 m RKB)

Ø = 26%

Sw = 37%

These values are used in the DST analysis.