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Classification

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Subtitle

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Title

34/10-7, DST 3
Composition, single flash and Bubble Point
of
Reservoir Fluid

STATOIL
EXPLORATION & PRODUCTION
LABORATORY

Nov.-83

LAB 83.67

Prepared		Approved	
25.11.83	Otto Rogne	30/11-83	D.Malthe-Sørenssen

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INTRODUCTION

The present report gives the experimental results of a PVT-analysis carried out on separator samples from test no 3 on well 34/10-7, obtained by Flopetrol 07.07.83. A summary of the results are on page 2. Sampling details are on page 3. As agreed upon, the analysis was terminated after it had been established that the reservoir composition and single flash parameters were identical to those measured on the bottom hole sample from the same test (report LAB 83.61).

The quality of the samples was checked by measuring the bubble point of the separator liquid at separator temperature, and the opening pressure and composition of the separator gas.These results are on page 4 and 7 respectively.

The composition of the separator liquid were determined through a single flash to standard conditions.These results are on page 6.

After recombination of the separator samples, a constant mass expansion and single flash were performed in order to determine the bubble point and reservoir fluid composition.These results are on page 9 and 10.

WELL:34/10-7
DST # 3

SUMMARY

Bubble point pressure	242.0	Barg at 72.8 C
Density at bubble point	0.679	g/cm3
Compressibility at bubble point	2.11 x 10-4	1/Bar
Flash formation volume factor of bubble point oil, one-stage flash	1.485	m3/Sm3 STO
Density of STO (single flash)	0.838	g/cm3
Gas solubility of bubble point oil, one stage flash	169.1	Sm3/m3

Standard condition gas: 1 atm (1.013 bar) and 15 C
Standard condition oil: atmospheric pressure and 15 C

*)

SAMPLING CONDITIONS

FIELD	Gullfaks
WELL	34/10-7
TEST	DST 3
PERFORATION	1807 - 1821 m RKB
DATE	07.07.83
SAMPLE	Separator samples
Oil bottle	83021222
Gas bottle	A14419
SEPARATOR PRESSURE	26.5 barg
SEPARATOR TEMPERATURE	47 C
BOTTOM HOLE PRESSURE	308 bar
BOTTOM HOLE TEMPERATURE	72.8 C
GOR (separator conditions)	121.2 Sm3/m3
GAS GRAVITY (field value)	0.680
Z FACTOR (field value)	0.9428

*)
Data from Flopetrol Well Testing Report 83/2301/30

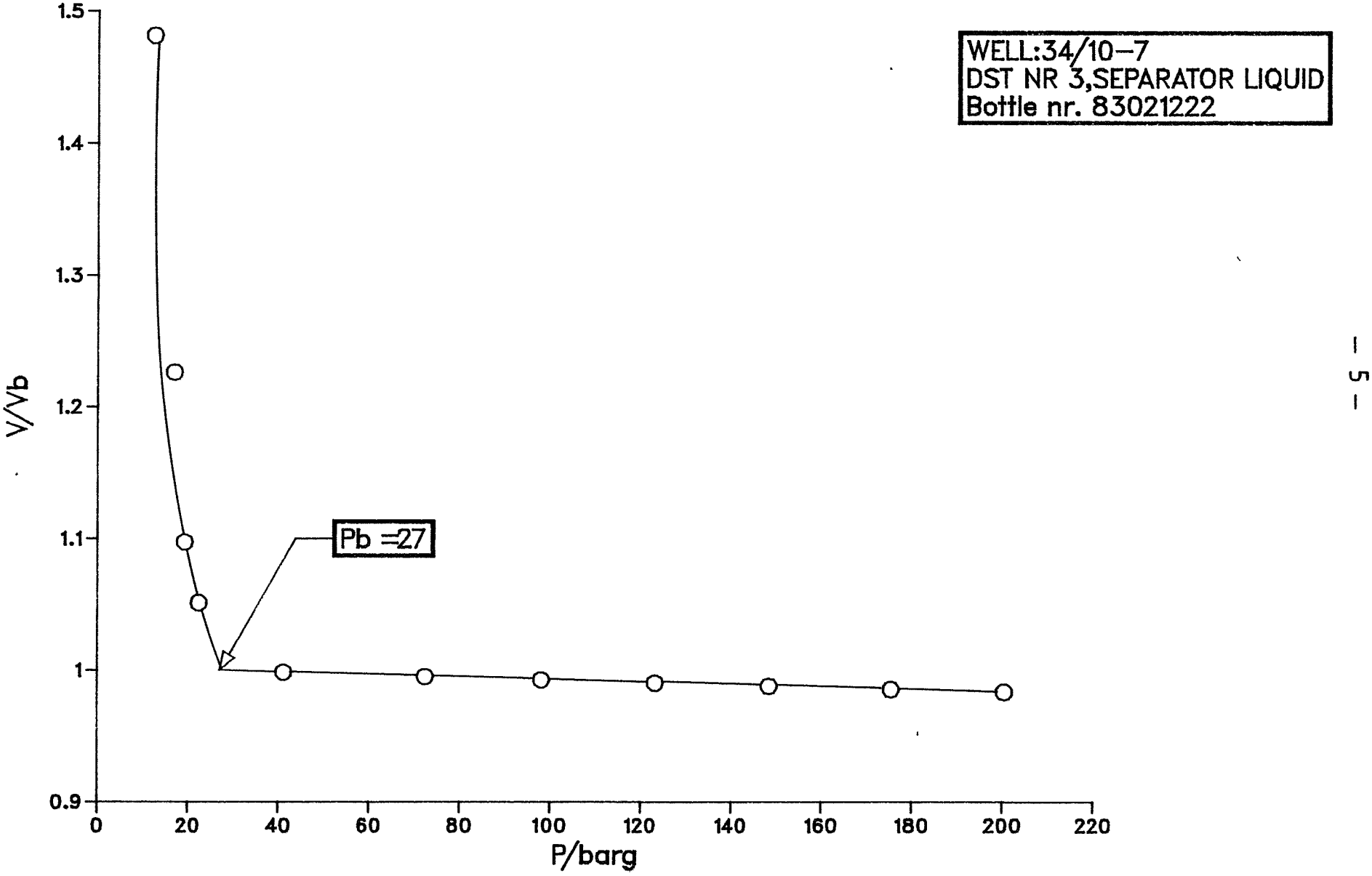
WELL:34/10-7
DST # 3
(bottle # 83021222)

BUBBLE POINT OF SEPARATOR OIL AT 47.3 C

	PRESSURE Barg	RELATIVE VOLUME V/Vb
	200.4	0.9837
	175.4	0.9857
	148.4	0.9881
	123.2	0.9905
	98.1	0.9929
	72.4	0.9954
	41.1	0.9985
Pb =	27.0	1.0000
	22.3	1.0514
	19.2	1.0972
	16.9	1.2261
	12.4	1.4816

FIG.1

CONSTANT MASS EXPANSION AT 47.3 °C



34/10-7
DST # 3

COMPOSITION OF SEPARATOR LIQUID
(Single flash to stock tank conditions)

	STOCK TANK OIL	EVOLVED GAS	RECOMBINED LIQUID		
	MOL%	MOL%	WEIGHT%	MOL WT	MOL%
NITROGEN	0.00	0.29	0.01	28.0	0.05
CARBONDIOXIDE	0.00	0.18	0.01	44.0	0.03
METHANE	0.00	48.85	0.87	16.0	8.97
ETHANE	0.00	17.53	0.59	30.1	3.22
PROPANE	1.06	17.81	1.10	44.1	4.14
i-BUTANE	0.70	3.27	0.41	58.1	1.17
n-BUTANE	2.54	6.78	1.17	58.1	3.32
i-PENTANE	1.87	1.65	0.80	72.2	1.83
n-PENTANE	2.69	1.69	1.10	72.2	2.51
HEXANES	5.02	1.03	2.21	85.1	4.29
HEPTANES	9.31	0.71	4.31	92.1	7.73
OCTANES	11.08	0.21	5.81	105.7	9.08
NONANES	8.16	0.01	4.88	121.0	6.66
DECANE PLUS	57.57	0.00	76.73	270.0	47.00
	100.00	100.00	100.00		100.00
MOL WEIGHT	195.5	31.10			165.31

GAS OIL RATIO	=	22.6	Sm3/m3
FORM VOL FACTOR(Bo)	=	1.099	m3/Sm3
DENSITY AT BUBBLE P	=	0.783	g/cm3
DENSITY OF STO	=	0.831	g/cm3
GAS GRAVITY(air=1)	=	1.074	
DENSITY OF C10+	=	0.868	g/cm3

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WELL:34/10-7
DST # 3
(bottle A14419)

COMPOSITION OF SEPARATOR GASS

COMPONENT	MOL %
NITROGEN	1.409
CARBONDIOXIDE	0.187
METHANE	84.328
ETHANE	7.714
PROPANE	3.826
i-BUTANE	0.527
n-BUTANE	1.032
i-PENTANE	0.253
n-PENTANE	0.269
HEXANES	0.192
HEPTANES	0.164
OCTANES	0.079
NONANES	0.020
DECANES PLUS	0.000

	100.000
MOL WT	19.71

Opening pressure in bottle at room temp: 27 barg

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RECOMBINATION OF SEPARATOR SAMPLES

FIELD VALUES

GOR = 121.2 Sm3/m3 separator liquid
Gas gravity = 0.680 (air = 1)
Z factor = 0.9428

LAB VALUES

Gas gravity = 0.6805 (air = 1)
Z factor = 0.9387

CORRECTED GOR

$$GOR = GOR(field) \times \sqrt{\frac{Grav(field) \times Z(field)}{Grav(lab) \times Z(lab)}}$$

GOR = 121.4 Sm3/m3 separator liquid

RECOMBINATION

The surfase samples were physically recombined in the rati
of 121.4 standard cm3 of separator gas per cm3 of bubble
point separator liquid.

34/10-7
DST3

COMPOSITION OF RESERVOIR FLUID
(Single flash to stock tank conditions)

	STOCK TANK OIL	EVOLVED GAS	RECOMBINED LIQUID		
	MOL%	MOL%	WEIGHT%	MOL WT	MOL%
NITROGEN	0.00	1.21	0.24	28.0	0.77
CARBONDIOXIDE	0.00	0.18	0.06	44.0	0.11
METHANE	0.00	74.76	8.51	16.0	47.34
ETHANE	0.07	8.96	1.92	30.1	5.70
PROPANE	0.51	6.60	2.16	44.1	4.37
i-BUTANE	0.34	1.29	0.62	58.1	0.94
n-BUTANE	1.33	3.01	1.56	58.1	2.40
i-PENTANE	1.26	0.99	0.88	72.2	1.09
n-PENTANE	1.99	1.12	1.16	72.2	1.44
HEXANES	4.52	0.86	2.10	85.0	2.20
HEPTANES	9.28	0.73	3.98	92.0	3.86
OCTANES	11.47	0.26	5.16	105.5	4.37
NONANES	8.49	0.03	4.25	121.0	3.14
DECANE PLUS	60.74	0.00	67.40	269.9	22.27
	100.00	100.00	100.00		100.00
MOL WEIGHT	202.3	23.73			89.22

GAS OIL RATIO	=	169.1	Sm3/m3
FORM VOL FACTOR(Bo)	=	1.485	m3/Sm3
DENSITY AT BUBBLE P	=	0.679	g/cm3
DENSITY OF STO	=	0.838	g/cm3
GAS GRAVITY(air=1)	=	0.819	
DENSITY OF C10+	=	0.868	g/cm3

WELL:34/10-7
DST # 3

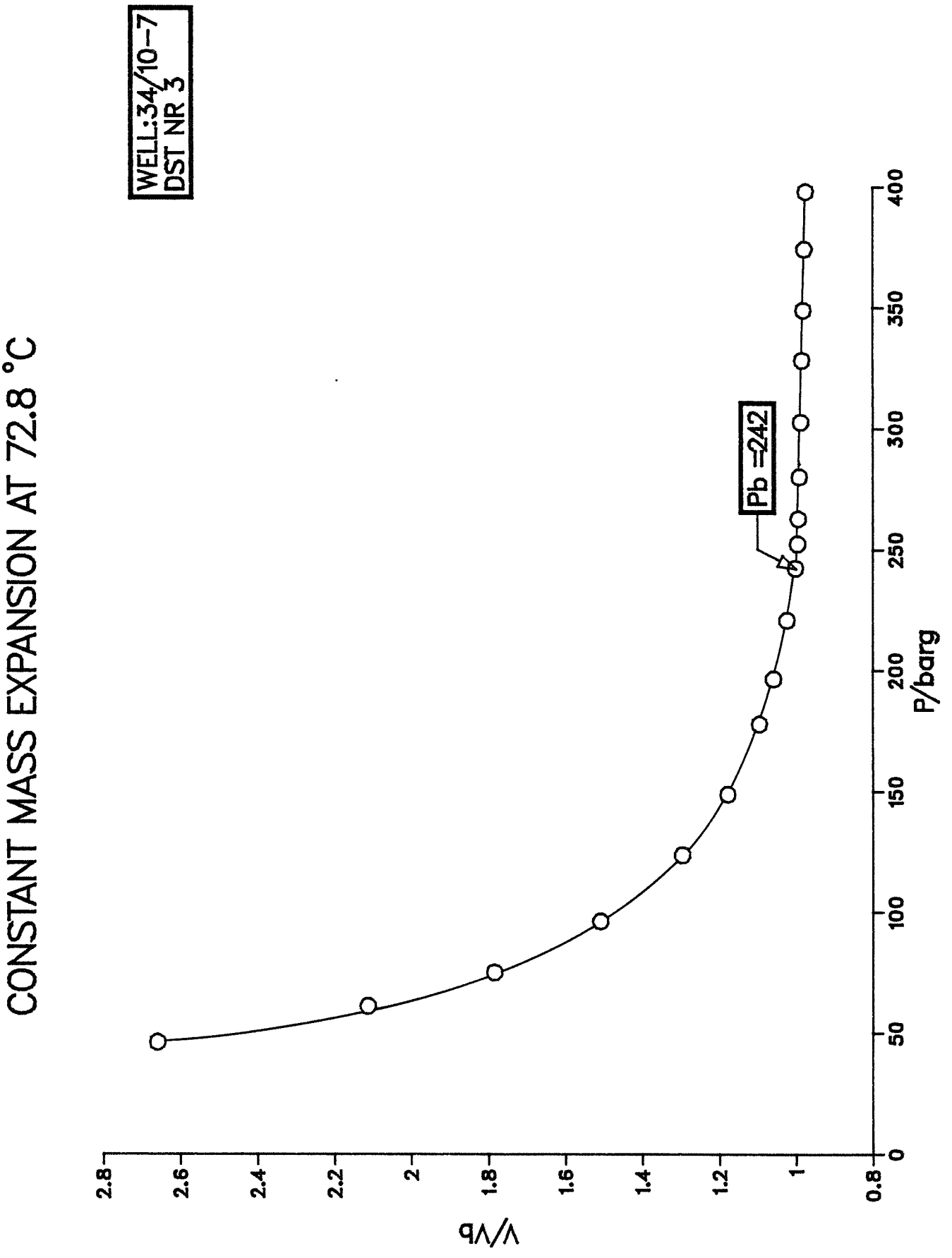
CONSTANT MASS EXPANSION AT 72.8 C

	PRESSURE BARG	REL VOL V/Vb	COMPRESSIBILITY 1/BAR	Y-FACTOR
	398.0	0.9754	9.83E-05	
	374.2	0.9790	1.16E-04	
	348.9	0.9820	1.35E-04	
	328.2	0.9852	1.50E-04	
	302.6	0.9884	1.68E-04	
	280.0	0.9919	1.85E-04	
	262.7	0.9948	1.97E-04	
	252.3	0.9967	2.04E-04	
	242.2	1.0019	2.11E-04	
Pb =	242.0	1.0000	2.11E-04	
	220.7	1.0239		4.03
	196.4	1.0590		3.93
	177.8	1.0957		3.77
	148.7	1.1790		3.50
	123.6	1.2968		3.23
	96.2	1.5090		2.98
	75.0	1.7850		2.84
	61.1	2.1136		2.66
	46.2	2.6602		2.55

FOR P < Pb Y = 2.143 +8.91E-03 x P

FOR P > Pb V/Vb = 1.07281 -3.9041E-04xP +3.6998E-07xPxP

FIG.2


CONSTANT MASS EXPANSION AT 72.8 °C
WELL:34/10-7
DST NR 3
Pb =242
V/Vb
P/barg
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0
50
100
150
200
250
300
350
400