7. PVT REPORTS

7.1. Reservoir Fluids

A large variety of reservoir fluids exists, and could be divided into 6 main groups:

- Black Oil
- Volatile Oil
- Near–critical Oil
- Gas Condensate
- Wet Gas
- Dry Gas

The properties of these fluids are unique for the individual reservoirs, and typical molar compositions could be seen in Tbl. 7.1.

Tbl. 7.1. Typical molar compositions of various reservoir fluids

Comp.	Dry Gas Mole%	Wet Gas Mole%	Gas cond. Mole%	Near–critical Oil, Mole%	Volatile Oil, Mole%	Black Oil, Mole%
CO_2	0.1	1.41	2.37	1.3	0.93	0.02
N_2	2.07	0.25	0.31	0.56	0.21	0.34
C_1	86.12	92.46	73.19	69.44	58.77	34.62
C_2	5.91	3.18	7.8	7.88	7.57	4.11
C_3	3.58	1.01	3.55	4.26	4.09	1.01
i–C_4	1.72	0.28	0.71	0.89	0.91	0.76
n–C_4		0.24	1.45	2.14	2.09	0.49
i–C_5	0.5	0.13	0.64	0.9	0.77	0.43
n–C_5		0.08	0.68	1.13	1.15	0.21
$C_{6(s)}$		0.14	1.09	1.46	1.75	1.61
C_{7+}		0.82	8.21	10.04	21.76	56.4
Σ	100	100	100	100	100	100

7.2 Reservoir distribution

A world wide distribution of these reservoirs based on GOR and reservoir temperature is presented in Fig 7.1.

The major type of reservoirs are classified as Oils with dissolved Gas, or Wet Gas reservoirs. Far less are Dry Gas or Gas Condensates. Gas Condensate reservoirs only account for about 10 % of the HC reservoirs, and are typically observed at higher reservoir temperatures. The solubility of higher molecule weight HC components increases with increasing reservoir pressure which increases with increasing temperature.

Undersaturated Oil reservoirs are quite common. The reservoir consists of an Oil zone above the Oil/Water contact. When the thickness of the oil zone increases, segregation may affect the Oil composition with dept and should be evaluated as a part of the reservoir fluid sampling program for the individual wells and in between the different wells.

Reservoir fluid analyses are used to evaluate the communication between different segments and fault systems of the reservoir

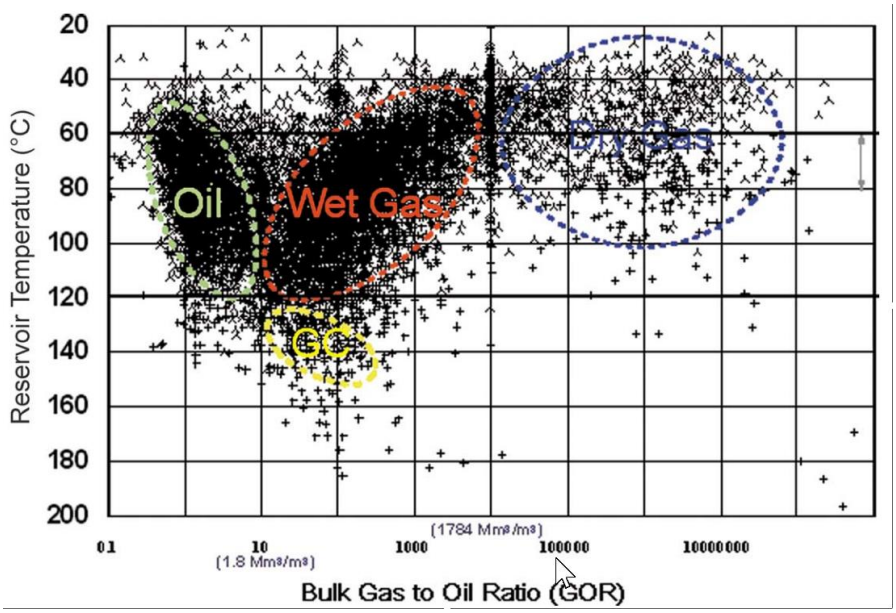
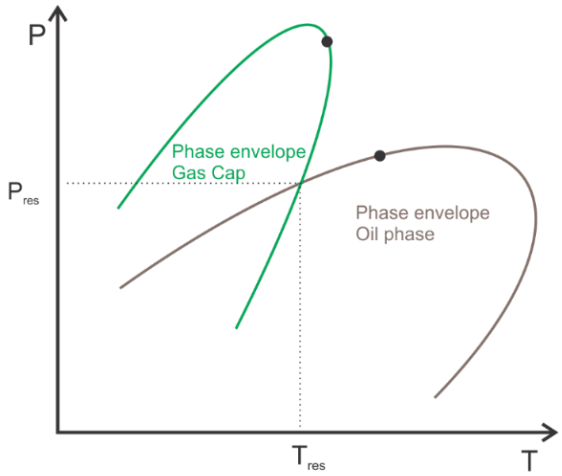


Fig. 7.1 World wide distribution of reservoir fluids based on temperature and GOR.

The aquifer could represent pressure support for the reservoir during oil production. With a weak aquifer, undersaturated oil reservoirs are good candidates for water injection to maintain reservoir pressure during oil production.

Some reservoirs consist of two HC phases, a gas saturated oil phase with as gas cap above. The reservoir fluids could be described with 2 crossing phase envelopes, the phase envelope of the gas cap and the phase envelope for the saturated oil phase in a PT diagram. Ideally the crospsing point would represent the reservoir pressure and temperature (P_{res}, T_{res}) as seen in Fig. 7.2.



7.2- Phase envelopes of an oil reservoir with gas cap.

The Oseberg field on the Norwegian continental shelf (NCS) is an example of this. Gas cap expansion gives pressure support during oil production, and gas reinjection is often a chosen production strategy for these reservoirs.

We also observe a large number of Gas reservoirs with a thin oil zone of 5 to 15 meters underneath. In the NCS we have several examples of these reservoirs, like:

- Frigg
- Sleipner
- Troll West
- Snøhvit

Some of these reservoirs are described as fill-spill reservoirs, previously filled with oil, but due to increase in gas cap, a large part of the trapped oil have been lost or drained into other potential reservoir traps in the migration pathway. Fig. 7.3 gives a schematic description of fill-spill reservoirs.

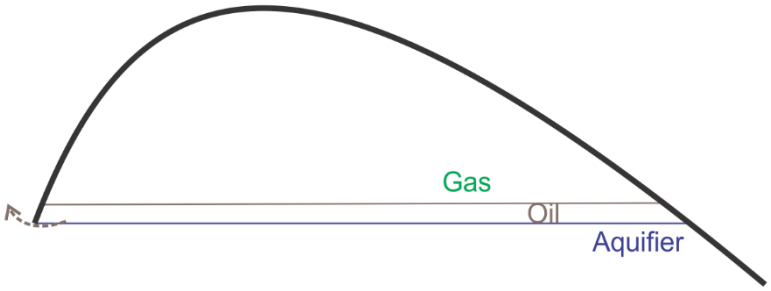


Fig.7.3 Schematic of Fill-spill reservoirs

Improved horizontal drilling techniques with long horizontal sections and inflow control valves, combined with 4D seismic for infill drilling have improved the possibility to produce the oil from these thin layers. Troll West which was the largest oil producing reservoir on the NCS for several years is an example of this.

Reservoir fluid samples are brought to the laboratory for fluid property analyses. The same reservoir could have variation in the oil properties within the oil column, and the same reservoir could have different type of oil compositions in different segments. The PVT analyses of the reservoir fluids contribute with important information for production strategies, and process system design during field development, and for reservoir management during production.

Reservoir fluid samples are brought to the laboratory for

- Composition analyses
  - GC
  - Vacuum destillation
- Fluid recombination
  - Reservoir fluid
- Fluid properties
  - Density
  - viscosity
- PVT properties/behavior
  - CME
  - DGL
  - CVD
  - Separator tests info

The Fluid properties are reported in PVT-report for the individual samples.

The data in the PVT report are important when the Reservoir fluid properties are modeled in the PVT simulator (ex. PVT-sim, NOVA, etc) based on chemical composition, and for tuning the modeled fluid properties based on available laboratory data (P_s, GOR etc.) on the analyzed reservoir fluid.

When the reservoir fluid is well described in the PVT-simulator, we could calculate steps in between the available experimental results, and are needed for optimal process design.

PVT simulators are also used to generate the fluid properties needed in reservoir simulators to predict the fluid flow in the reservoir during the production.

On the next pages we are presenting two typical PVT report:

- Black oil
- Gs Condensate

PVT report

Black Oil system
Under saturated reservoir Oil with dissolved gas

INTRODUCTION

The present report gives the results of a PVT analysis of a recombined sample from well XU.

The quality of the separator samples was checked by determining the bubble point of the liquid at separator temperature, and the pressure and composition of the gas samples.

The composition of the separator liquid was determined by single flash to atmospheric conditions, followed by gas chromatographic analysis of the stabilized oil and gas.

Mathematical recombination of the oil and gas composition according to the measured gas oil ratio then gave the final separator liquid composition.

Physical recombination of the separator samples according to the given gas oil ratio gave a reservoir fluid which was used for constant mass expansion, single flash, differential liberation, viscosity measurements and separator test.

The recombined reservoir fluid composition was determined by single flash in the same manner as described for the separator liquid.
The measured reservoir fluid composition agrees within experimental error with the one calculated in the appendix from the composition of the separator samples and the gas oil ratio thus confirming a correct recombination.

SAMPLE DATA 1

Field	X
Well	XU
Test	PT1
Intervall tested	1833.8 m
Producing zone	Brent
Reservoir fluid	Oil
Static bottom hole conditions	
Reservoir pressure	308.3 Bar
Reservoir temperature	71.6 °C
Date of sampling	22.07.86
Time of sampling	08.30
Type of sample	Separator
Oil bottle	K-1410
Gas bottle	A-14604
Gas bottle	
Separator conditions	
Separator pressure	26.2 Bar
Separator temperature	35.0 °C
Dynamic bottom hole conditions	
Flowing pressure	
Flowing temperature	
Well head conditions	
Well head pressure	
Well head temperature	
Flow rates	
Separator gas rate	52.9 x 10^3 Sm^3/D
Separator oil rate	658 m^3/D
Gas oil ratio	80.4 Sm^3/ m^3 sep.liquid
Gas gravity	0.62
Z factor	0.9468

WELL : XU
Test: PT1
BOTTLE: K-1410

BUBBLE POINT OF SEPARATOR LIQUID AT 35.0 °C

PRESSURE BAR	REL VOL V/V_b
198.8	0.9856
172.0	0.9873
148.4	0.9892
113.5	0.9918
82.9	0.9941
53.7	0.9963
33.5	0.9978
26.8	1.0016
P_b = 26.3	1.0000
21.9	1.0865
14.9	1.3252
11.3	1.5629

WELL: XU
Test: PT1
BOTTLE: K-1410

COMPOSITION OF SEPARATOR LIQUID

(Sinqle flash to stock tank conditions)

	Stabilized Oil	Evolved Gas	Recombined Liquid		
	Mol%	Mol%	Weight%	Mol Wt	Mol%
Nitrogen	0.00	0.06	0.00	28.0	0.008
Carbon dioxide	0.00	2.88	0.08	44.0	0.383
Methane	0.00	65.65	0.66	16.0	8.738
Ethane	0.05	20.34	0.39	30.1	2.749
Propane	0.52	4.74	0.22	44.1	1.081
i-Butane	0.61	2.21	0.23	58.1	0.824
n-Butane	0.69	1.60	0.22	58.1	0.808
i-Pentane	1.16	0.98	0.39	72.2	1.140
n-Pentane	0.54	0.36	0.17	72.2	0.512
Hexanes	2.02	0.51	0.72	83.5	1.823
Heptanes	5.97	0.48	2.26	91.7	5.241
Octanes	8.60	0.17	3.69	105.0	7.476
Nonanes	6.93	0.01	3.33	117.6	6.010
Decanes plus	72.91	0.00	87.65	294.8	63.205
Sum	100.00	100.00	100.00		100.00
Mol Weight	241.5	24.25			210

Gas oil ratio	= 13.2 Sm^3/Sm^3
Flash formation volume factor of bubble point liquid	= 1.048m^3/Sm^3
Density at bubble point	= 0.853 g/cm^3
Density of STO	= 0.881 g/cm^3
Gas gravity (air= 1)	= 0.837
Density of C10+	= 0.902 g/cm^3

WELL: XU
Test: PT1
BOTTLE: K-1410

DETAILED COMPOSITION OF SEPARATOR LIQUID TO C10 PLUS

	Weight %	Mol Wt	Mol %	Density g/cm^3 at 15°C
Nitrogen	0.000	28.01	0.008	
Carbondioxide	0.079	44.01	0.383	
Methane	0.659	16.04	8.738	
Ethane	0.389	30.01	2.749	
Propane	0.224	44.10	1.081	
i-Butane	0.225	58.12	0.824	
n-Butane	0.221	58.12	0.808	
i-Pentane	0.387	72.15	1.140	
n-Pentane	0.174	72.15	0.512	
C6 Paraffines	0.615	86.20	1.518	0.663
C6 Naphtenes	0.101	70.10	0.305	0.750
C6 Total	0.716	83.51	1.823	0.675
C7 Paraffines	0.652	100.20	1.383	0.686
C7 Naphtenes	1.558	88.98	3.722	0.765
C7 Aromates	0.050	78.10	0.136	0.884
C7 Total	2.260	91.66	5.241	0.745
C8 Paraffines	0.799	114.20	1.487	0.705
C8 Naphtenes	2.368	105.38	4.777	0.771
C8 Aromates	0.525	92.10	1.212	0.871
C8 Total	3.692	104.99	7.476	0.771
C9 Paraffines	1.010	128.30	1.673	0.721
C9 Naphtenes	1.179	121.60	2.061	0.792
C9 Aromates	1.137	106.20	2.276	0.872
C9 Total	3.326	117.63	6.010	0.798
Decanes plus	87.647	294.80	63.205	0.902
Benzene	0.050	78.11	0.136	0.884
Toluene	0.525	92.14	1.211	0.871
Xylenes	0.893	106.17	1.789	0.865
Mecyclopentan	0.415	84.16	1.049	0.753
Cyclohexane	0.550	84.16	1.390	0.783
Mecyclohexane	0.980	98.19	2.122	0.774

WELL: XU
Test: PT1
Bottle A-14604

DETAILD COMPOSITION OF SEPARATOR GAS TO C10 PLUS

	Weight %	Mol Wt	Mol %
Nitrogen	1.029	28.01	0.659
Carbondioxide	4.217	44.01	1.719
Methane	81.105	16.04	90.698
Ethane	9.346	30.07	5.575
Propane	1.587	44.10	0.646
i-Butane	0.775	58.12	0.239
n-Butane	0.517	58.12	0.160
i-Pentane	0.389	72.15	0.097
n-Pentane	0.142	72.15	0.035
C6 Paraffines	0.229	86.18	0.048
C6 Naphtenes	0.040	70.14	0.010
C6 Total	0.269	83.35	0.058
C7 Paraffines	0.090	100.21	0.016
C7 Naphtenes	0.246	87.83	0.050
C7 Aromates	0.008	78.11	0.002
C7 Total	0.344	90.49	0.068
C8 Paraffines	0.046	114.12	0.007
C8 Naphtenes	0.131	101.26	0.023
C8 Aromates	0.029	92.14	0. 006
C8 Total	0.206	102.41	0.036
C9 Paraffines	0.021	126.37	0.003
C9 Naphtenes	0.012	125.00	0.02
C9 Aromates	0.016	106.17	0.003
C9 Total	0.049	118.68	0.007
Decane plus	0.025	140.00	0.003
Sum	100		100
Benzene	0.008	78.11	0.002
Toluene	0.029	92.14	0.006
Xylenes	0.013	106.17	0.002
Mecyclopentan	0.090	84.16	0.019
cyclohexane	0.084	84.16	0.018
Mecyclohexane	0.083	98.19	0.015

Gas molecular weight	= 17.94
Gas qravity	= 0.619

RECOMBINATION OF SEPARATOR SAMPLES

Oil bottle: K-1410
Gas bottle: A-14604

Field values:

Gas rate	= 52.9 x 10^3 Sm^3/D
Oil rate	= 658 separator m^3/D
Gas Oil ratio	= 80.4 Sm^3/m^3
Gas gravity	= 0.62
Z factor	= 0.9468

Lab values

Gas gravity	= 0.619
Z factor	= 0.9488

Corrected Gas Oil ratio:

$$GOR = GOR_{field}\sqrt{\frac{Gravity_{field} \cdot Z_{field}}{Gravity_{lab} \cdot Z_{lab}}}$$

GOR = 80.4 Sm^3/m^3 separator liquid

Recombination:

Surface samples physically recombined in the ratio of 80.4 standard cm^3 gas per cm^3 of bubble point separator liquid.

WELL: XU
Test: PT1
Recombined
Sample

CONSTANT MASS EXPANSION AT 71.6 °C

PRESSURE BAR	REL VOL V/V_b	COMPRESSIBILITY 1/BAR	Y-FACTOR
401.7	0.9811	1.05E-04	
380.1	0.9836	1.08E-04	
362.S	0.9853	1.11E-04	
343.8	0.9873	1.14E-04	
325.3	0.9895	1.16E-04	
307.4	0.9915	1.19E-04	
291.4	0.9934	1.21E-04	
274 .9	0.9955	1.24E-04	
254.3	0.9981	1.27E-04	
P_b = 239.0	1.0000	1.29E-04	
235.0	1.0033		5.10
215.1	1.0230		4.84
182.4	1.0678		4.58
142.8	1.1651		4.08
113.3	1.2946		3.77
91.7	1.4568		3.52
77.1	1.6193		3.39
65.7	1.8158		3.23

FOR $P < P_b$ $Y = 2.527 + 1.09E\text{-}02 \times P$

FOR $P > P_b$ $V/V_b = 1.03540 - 1.6728E\text{-}04 \times P + 8.0182E\text{-}08 \times P^2$

WELL: XU
Test: PT1
Recombined
Sample

COMPOSITION OF RESERVOIR FLUID

(Single flash to ambient conditions)

	Stabilized Oil	Evolved Gas	Recombined liquid		
	Mol %	Mol %	Weight %	Mol Wt	Mol %
Nitrogen	0.00	0.76	0.09	28.0	0.40
Carbondioxide	0.00	1.87	0.35	44.0	1.00
Methane	0.17	84.91	5.85	16.0	45.40
Ethane	0.20	7.70	1.01	30.1	4.20
Propane	0.17	1.51	0.31	44.1	0.89
i-Butane	0.25	0.84	0.26	58.1	0.56
n-Butane	0.33	0.68	0.24	58.1	0.52
i-Pentane	0.75	0.56	0.37	72.2	0.63
n-Pentane	0.38	0.22	0.17	72.2	0.29·
Hexanes	1.74	0.37	0.68	83.5	1.01
Heptanes	5.70	0.41	2.12	91.7	2.38
Octanes	8.65	0.15	3.47	105.0	4.11
Nonanes	7.11	0.02	3.14	117.6	3.12
Decanes plus	74.56	0.00	81.94	293.6	34.77
Sum	100.00	100.00	100.00		100.00
MOL WEIGHT	244.4	19.94			124.58

Gas oil ratio	= 97.8 Sm^3/Sm^3 STO
Flash formation volume factor of bubble point liquid	= 1.261 m^3/Sm^3
Density at bubble point	= 0.766 g/cm^3
Density ot STO	= 0.883 g/cm^3 at 15 °C
Gas gravity (air=1)	= 0.688
Density of C10+	= 0.902 g/cm^3

WELL: XU
Test: PT1
Recombined
Sample

DETAILED COMPOSITION OF RESERVOIR FLUID TO C10 PLUS

(Single flash to ambient conditions)

	WEIGHT %	MOL WT	MOL %	DENSITY g/cm^3 at 15 °C
Nitrogen	0.091	28.01	0.403	
Carbondioxide	0.353	44.01	1.000	
Methane	5.845	16.04	45.396	
Ethane	1.014	30.07	4.202	
Propane	0.314	44.10	0.887	
i-Butane	0.262	58.12	0.561	
n-Butane	0.242	58.12	0.518	
i-Pentane	0.375	72.15	0.647	
n-Pentane	0.170	72.15	0.294	
C6 Paraffines	0.583	86.20	0.843	0.663
C6 Naphtenes	0.095	70.11	0.169	0.750
C6 Total	0.678	83.51	1.011	0.675
C7 Paraffines	0.613	100.20	0.762	0.686
C7 Naphtenes	1.461	88.98	2.046	0.765
C7 Aromates	0.044	78.10	0.070	0.884
C7 Total	2.118	91.68	2.878	0.745s
C8Paraffines	0.749	114.20	0.817	0.705
C8 Naphtenes	2.226	105.40	2.631	0.765
C8 Aromates	0.492	92.10	0.666	0.871
C8 Total	3.467	104.99	4.114	0.7674
C9 Paraffines	0.932	128.29	0.905	0.121
C9 Naphtenes	1.126	121.70	1.152	0.192
C9 Aromates	1.078	106.20	1.264	0.872
C9 Total	3.135	117.60	3.322	0.798
Decanes plus	81.936	293.59	34.767	0.902
Sum	100.000		100.000	
Benzene	0.044	78.11	0.070	0.884
Toluene	0.492	92.14	0.666	0.871
Xylenes	0.846	106.17	0.992	0.865
MeCyclopentan	0.391	84.16	0.579	0.753
Cyclohexane	0.516	84.16	0.763	0.783
MeCyclohexane	0.921	98.19	1.169	0.774

WELL: XU
Test: PT1
Recombined
Sample

DIFFERENTIAL DEPLETION AT 71.6 °C

Pressure BAR	Oil FORM VOL FACT B_{od}	SOLUTION GOR R_{sd}	GAS FORM VOL FACT B_g	RES OIL DENSITY g/cm^3	COMPR FACTOR Z	GAS VISCOSITY cP
239 .0	1.258	94.4		0.761		
220.6	1.242	86.5	4.86E-03	0.760	0.887	0.0203
191.5	1.218	75.2	5.58E-03	0.774	0.884	0.0186
161.5	1.195	63.7	6.62E-03	0.782	0.884	0.0172
131.7	1.171	52.2	8.20E-03	0.790	0.893	0.0159
101.5	1.147	40.5	1.08E-02	0.799	0.905	0.0147
71.7	1.122	28.9	1.57E-02	0.809	0.931	0.0138
31.5	1.089	12.7	3.67E-02	0.822	0.957	0.0128
1.0	1.052			0.839		
1.0 *	1.000			0.882		

* at 15 °C

B_{od} : Volume of oil at P and T per volume of residual oil at 15°C and atm P
R_{sd} : Standard m^3 gas per m^3 residual oil at 15°C and atm P
B_g : m^3 gas at T and P per standard m^3 gas

WELL
Test PT 1
Recombined
sample

DIFFERENTIAL DEPLETION AT 71.6 °C

(Molecular composition of differentially liberated gas, mol %)

P/Bar Comp	220.6	191.5	161.5	131.7	101.5	71.7	31.5	1.0
N2	1.27	1.16	1.07	0.84	0.57	0.26	0.10	0.00
C02	1.28	1.36	1.39	1.49	1.56	1.75	2.22	3 .14
C1	91.47	91.78	91.89	91.82	91.77	91.13	87.17	68.58
C2	4.11	4.05	4.16	4.35	4.70	5.43	8.22	18.79
C3	0.55	0.53	0.52	0.56	0.56	0.63	1.04	3.74
i-C4	0.27	0.25	0.22	0.23	0.24	0.26	0.41	1.79
n-C4	0.20	0.18	0.17	0.18	0.17	0.18	0.29	1.36
i-C5	0.18	0.15	0.14	0.13	0.12	0.12	0.19	0.94
n-C5	0.07	0.06	0.06	0.06	0.05	0.05	0.07	0.35
C6	0.17	0.14	0.12	0.11	0.09	0.09	0.12	0.58
C7	0.25	0.20	0.16	0.14	0.11	0.09	0.13	0.57
C8	0.16	0.12	0.09	0.08	0.05	0.01	0.04	0.16
C9	0.02	0.02	0.01	0.01	0.01	0.00	0.00	0.00
C10+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Mol wt	18.09	17.95	17.89	17.87	17.83	17.92	18.76	23.61
Gravity	0.625	0.620	0.618	0.617	0.616	0.619	0.648	0.815

WELL
Test PT 1
Recombined
sample

DIFFERENTIAL DEPLETION AT 71.6 °C

(Molecular composition of residual oil)

COMPONENT	MOL%
Nitrogen	0.00
carbondioxide	0.00
Methane	0.27
Ethane	0.77
Propane	0.56
i-Butane	0.59
n-Butane	0.64
i-Pentane	1.07
n-Pentane	0.50
Hexanes	1.92
Heptanes	5.80
Octanes	9.03
Nonanes	7.20
Decanes Plus	71.65
sum	100

Density at 15 °C = 0.882 g/cm^3
Mole weight = 241.8

WELL
Test PT 1
Recombined
sample

VISCOSITY OF RESERVOIR OIL AT 71.6 °C.

Pressure (Bar)	Viscosity (cP)
326.0	1.238
301.7	1.188
279 .9	1.160
253.8	1.112
242.9	1.102
P_b = 239.0	1.095
227.4	1.120
211.6	1.141
199.7	1.176
187.6	1.201
159.9	1.310
137.3	1.455
112.7	1.575
88.2	1.780
37.5	2.322
11.9	2.870
1.0	3.250

WELL
Test PT 1
Recombined
sample

MULTI STAGE SEPARATOR TEST

PRESSURE Bar	TEMPERATURE °C	GAS OIL RATIO Sm^3/Sm^3 STO	GAS GRAVITY Air = 1	VOLUME FACTOR m^3/Sm^3 STO
239.0	71.6			1.246
69.7	55.4	63 .8	0.613	1.100
19.5	67.9	21.8	0.666	1.065
1.0	64.2	7.8	0.848	1.041
1.0	15.0	0		1.000

GAS OIL RATIO
Standard m^3 gas (15 °C, 1 atm) per m^3 stock tank oil at 15 °C

FORM FACTOR
m^3 oil at P and T per m^3 stock tank oil at 15 °C

WELL
Test PT 1
Recombined
sample

COMPOSITION OF SEPARARTOR GAS (mol %)

	Stage1 69.7 bar	Stage2 19.5 bar	Stage3 1 bar
Nitrogen	0.768	0.208	0.000
Carbondioxide	1.532	2.285	3.082
Methane	91.767	84.937	64.465
Ethane	4.706	9.549	21.231
Propane	0.534	1.356	4.631
i-Butane	0.212	0.559	2.227
n-Butane	0.146	0.392	1.632
i-Pentane	0.098	0.252	1.070
n-Pentane	0.037	0.092	0.380
Hexanes	0.066	0.151	0.572
Heptanes	0.083	0.157	0.518
Octanes	0.042	0.057	0.172
Nonanes	0.007	0.004	0.017
Decanes plus	0.002	0.001	0.003
Sum	100.000	100.000	100.000
Molecular wt	17.75	19.29	21.56
Gravity (air=1)	0.613	0.666	0.848

WELL
Test PT 1
Recombined
sample

COMPOSITION OF STOCK TANK OIL

	WEIGHT %	MOL %
Nitrogen	0.00	0.00
Carbondioxide	0.00	0.00
Methane	0.01	0.18
Ethane	0.09	0.72
Propane	0.11	0.59
i-Butane	0.15	0.62
n-Butane	0.16	0.68
i-Pentane	0.34	1.12
n-Pentane	0.16	0.53
Hexanes	0.69	2.00
Heptanes	2.23	5.93
Octanes	3.70	8.59
Nonanes	3.43	7.10
Decanes Plus	88.98	71.93
Sum	100.00	100.00

Molecular Wt 243.8
Density at 15°C 0.881g/cm^3

Appendix

WELL
Test PT 1

COMPOSITION OF RESERVOIR FLUID
(Mathematical recombination of separator samples)

	SEPARATOR LIQUID	SEPARATOR GAS	RECOMBINED FLUID		
	MOL %	MOL %	WEIGHT %	MOL WT	MOL %
Nitrogen	0.01	0.66	0.07	28.0	0.31
carbondioxide	0.38	1.72	0.36	44.0	1.00
Methane	8.74	90.70	6.02	16.0	46.32
Ethane	2.75	5.57	0.99	30.1	4.04
Propane	1.08	0.65	0.32	44.1	0.88
i-Butane	0.82	0.24	0.26	58.1	0.56
n-Butane	0.81	0.16	0.24	58.1	0.51
i-Pentane	1.14	0.10	0.39	72.2	0.66
n-Pentane	0.51	0.04	0.17	12.2	0.29
C6Total	1.82	0.06	0.69	83.5	1.01
C7Total	5.24	0.07	2.13	91.6	2.87
C8Total	7.48	0.04	3.46	105.0	4.06
C9Total	6.01	0.01	3.11	117.6	3.26
Decanes Plus	63.21	0.00	81.80	294.8	34.22
Sum	100.00	100.00	100.00		100.00
MOL Weight	212.6	17.94			123.33
Mol Ratio	54.14	45.86			100.00
Mass Ratio	93.33	6.67			100.00

GASS OIL RATIO = 80.4 Sm^3 gas/m^3 separator oil

Separator gas sample: A-14604
Separator liquid sample: K-1410

Appendix

WELL
Test PT 1

DETAILD COMPOSITION OF RESERVOIR FLUID TO C10 PLUS

(Mathematical recombination of separator samples)

	WEIGHT %	MOL WT	MOL %	DENSITY g/cm3 at 15°C
Nitrogen	0.070	28.01	0.307	
carbondioxide	0.355	44.01	0.996	
Methane	6.025	16.04	46.323	
Ethane	0.986	30.07	4.045	
Propane	0.315	44.10	0.881	
i-Butane	0.262	58.12	0.556	
n-Butane	0.241	58.12	0.511	
i-Pentane	0.387	72.15	0.662	
n-Pentane	0.172	72.15	0.293	
C6 Paraffines	0.590	86.20	0.844	0.663
C6 Naphtenes	0.097	70.10	0.170	0.750
C6 Total	0.686	83.50	1.014	0.675
C7 Paraffines	0.614	100.20	0.756	0.686
C7 Naphtenes	1.470	88.97	2.038	0.765
C7 Aromates	0.047	78.10	0.074	0.884
C7 Total	2.132	91.65	2.869	0.745
C8 Paraffines	0.749	114.20	0.809	0.705
C8 Naphtenes	2.219	105.37	2.597	0.771
C8 Aromates	0.492	92.10	0.659	0.871
C8 Total	3.459	104.97	4.064	0.771
C9 Paraffines	0.944	128.30	0.907	0.721
C9 Naphtenes	1.101	121.60	1.117	0.792
C9 Aromates	1.062	106.20	1.233	0.872
C9 Total	3.107	117.64	3.257	0.798
DecanesPlus	81.803	294.79	34.222	0.902
Sum	100		100	
Benzene	0.047	78.11	0.074	0.884
Toluene	0.492	92.14	0.658	0.871
Xylenes	0.835	106.17	0.970	0.865
MeCyclopentan	0.394	84.16	0.577	0.753
cyclohexane	0.519	84.16	0.761	0.783
Mecyclohexane	0.920	98.19	1.156	0.774

7.4 Gas Condensate PVT report

PVT- rapport

Gas Condensate

CONTENTS

INTRODUCTION

The present report gives the results of a PVT analysis on a recombined sample from well.

The quality of the separator samples was checked by determining the bubble point of the separator liquid, the opening pressure of the gas bottles and the composition of the gas samples. The gas samples contained some air which made an accurate determination of nitrogen impossible. The sample with the least amount of air, and probably the most correct nitrogen analysis, was used for recombination.

The composition of the separator liquid was determined by a single flash to atmospheric conditions, GC analysis of the stabilized oil and gas, and mathematical recombination according to the measured gas oil ratio.

The composition of the separator gas was determined by GC analysis after heating the gas bottles over night at separator temperature.

The reservoir fluid composition was calculated by mathematical recombination of the separator fluid compositions according to the separator gas oil ratio as determined from data in the well test report.

Physical recombination of the separator samples according to the separator gas oil ratio gave a reservoir fluid wish was used for the constant mass expansion and constant volume depletion. A correct recombination was confirmed by a single flash of the recombined fluid, as given in the appendix. The composition determined from the flash is slightly lighter than the one calculated by recombination. This is occasionally observed with gas condensates, and is due to the difficulties involved in quantitatively separating all the liquid from the large volume of the flashed gas.

An extended reservoir fluid composition to C20+ is calculated from the recombined reservoir fluid composition to C10+ and additional TBP data from the distillation report.

The measured dew point of 250 bar is probably not significantly different from the reported reservoir pressure of 256 bar.

SAMPLE DATA [1]

Field	
Well	
Test	
Interval tested	2479-2489 m
Producing zone	Tomma
Reservoir fluid	Gas
Static bottom hole conditions	
Reservoir pressure [2]	256 Bar
Reservoir temperature [2]	96 °C
Date of sampling	10.02.87
Time of sampling	14:30
Type of sample	Separator
Oil bottle	K-4617
Gas bottle	A-14415
Gas bottle	A-14397
Separator conditions	
Separator pressure	32.9 Bar
Separator temperature	31 °C
Dynamic bottom hole conditions	
Flowing pressure	252 Bar
Flowing temperature	96 °C
Well head conditions	
Well head pressure	169 Bar
Well head temperature	48 °C
Flow rates [3]	
Separator gas rate	750.7 x 10^3 Sm^3/D
Separator oil rate	388.6 m^3/D
Gas oil ratio	1932 Sm^3/m^3
Gas gravity	0.718
Fpv factor	1.0456

1) Data from Flopetrol Well Testing Report
2) Data from
3) Average values over sampling period

WELL :

DST : 3

BOTTLE : K-4617

BUBBLE POINT OF SEPARATOR LIQUID AT 31.0 °C

PRESSURE Bar	REL VOL V/V_b
201.4	0.9729
168.5	0.9776
128.2	0.9836
96.9	0.9886
78.3	0.9921
55.6	0.9960
43.5	0.9981
Pb = 33.7	1.0000
33.2	1.0050
32.5	1.0331
30.7	1.0921
27.9	1.2018
24.0	1.4113
19.1	1.8207

WELL :

DST : 3

BOTTLE: K-4617

COMPOSITION OF SEPARATOR LIQUID

(Single flash to ambient conditions)

	Stabilized OIL	Evolved GAS	RECOMBINED FLUID		
	MOL %	MOL %	Weight %	MOL WT	MOL %
Nitrogen	0.00	0.12	0.02	28.0	0.05
Carbondioxide	0.00	0.62	0.14	44.0	0.26
Methane	0.00	28.26	2.38	16.0	11.98
Ethane	0.24	16.94	2.73	30.1	7.32
Propane	2.07	23.93	6.20	44.1	11.34
i-Butane	1.34	5.32	2.18	58.1	3.03
n-Butane	5.19	13.06	6.14	58.1	8.52
i-Pentane	4.26	3.55	3.54	72.2	3.93
n-Pentane	6.29	3.99	4.75	72.1	5.31
Hexanes	10.67	2.24	7.45	84.7	7.09
Heptanes	18.62	1.54	12.86	91.1	11.37
Octanes	18.08	0.42	13.68	10.3	10.59
Nonanes	8.99	0.03	7.65	119.0	5.19
Decanes plus	24.27	0.00	30.30	175.0	13.98
SUM	100.00	100.00	100.00		100.00
MOL WEIGHT	110.5	40.30			80.73

Gas oil ratio	= 118.3 Sm^3/Sm^3 STO
Flash formation volume factor of bubble point liquid	= 1.434 m^3/Sm^3 STO
Density at bubble point	= 0.664 g/cm^3
Density of stabilized oil	= 0.751 g/cm^3 at 15 °C
Gas gravity	= 1.391
Density of C10+	= 0.826 g/cm^3 at 15 °C

WELL :

DST : 3

BOTTLE: K-4617

DETAILED COMPOSITION OF SEPARATOR LIQUID TO C10 PLUS

	WEIGHT %	MOL WT	MOL %	DENSITY g/cm^3 15 °C
Nitrogen	0.017	28.01	0.050	
Carbondioxide	0.144	44.01	0.264	
Methane	2.380	16.04	11.980	
Ethane	2.725	30.07	7.316	
Propane	6.196	44.10	11.341	
i-Butane	2.180	58.12	3.028	
n-Butane	6.137	58.12	8.523	
i-Pentane	3.540	72.15	3.961	
n-Pentane	4.747	72.15	5.311	
C6 Paraffines	6.882	86.20	6.445	0.663
C6 Naphtenes	0.563	70.11	0.648	0.750
C6 Total	7.445	84.73	7.094	0.669
C7 Paraffines	4.901	100.20	3.948	0.687
C7 Naphtenes	7.326	87.31	6.773	0.766
C7 Aromates	0.632	78.10	0.653	0.884
C7 TotaJ	12.858	91.26	11.375	0.738
C8 Paraffines	3.854	114.20	2.725	0.705
C8 Naphtenes	8.028	103.02	6.291	0.772
C8 Aromates	1.797	92.10	1.575	0. 871
C8 Total	13.679	104.27	10.590	0.763
C9 Paraffines	2.945	128.29	1.853	0.721
C9 Naphtenes	2.435	121.91	1.612	0.792
C9 Aromates	2.266	106.20	1.723	0.872
C9 Total	7.647	118.97	5.188	0.784
Decanes plus	30.304	175.00	13.979	0.826
	100		100	

	Component Group	Weight%	Mol%
Benzene	C7 Aromates	0.632	0.653
Toluene	C8 Aromates	1.797	1.574
Xylenes	C9 Aromates	1.723	1.310
MeCyclopentane	C7 Naphtenes	2.474	2.373
Cyclohexane	C7 Naphtenes	2.993	2.871
MeCyclohexane	C8 Naphtenes	4.711	3.873

WELL :

DST : 3

BOTTLE: A-14397

DETAILED COMPOSITION OF SEPARATOR GAS TO C10 PLUS

	WEIGHT %	MOL WT	MOL %
Nitrogen	1.241	28.01	0.926
Carbondioxide	1.748	44.01	0.831
Methane	60.860	16.04	79.317
Ethane	14.770	30.07	10.268
Propane	11.610	44.10	5.504
i-Butane	1.957	58.12	0.704
n-Butane	4.001	58.12	1.439
i-Pentane	1.010	72.15	0.293
n-Pentane	1.110	72.15	0.322
C6 Paraffines	0.660	86.18	0.160
C6 Naphtenes	0.081	70.14	0.024
C6 Total	0.741	84.08	0.184
C7 Paraffines	0.169	100.21	0.035
C7 Naphtenes	0.413	86.29	0.100
C7 Aromates	0.045	78.11	0.012
C7 Total	0.626	88.95	0.147
C8 Paraffines	0.054	114.19	0.010
C8 Naphtenes	0.173	99.99	0.036
C8 Aromates	0.045	92.14	0.010
C8 Total	0.271	101.05	0.056
C9 Paraffines	0.015	125.87	0.003
C9 Naphtenes	0.011	125.00	0.002
C9 Aromates	0.017	106.17	0.003
C9 Total	0.043	117.06	0.008
Decanes plus	0.011	140.00	0.002
SUM	100		100

	Component Group	Weight%	Mol
Benzen,	C7 Aromates	0.045	0.012
Toluene	C8 Aromates	0.045	0.010
Xylenes	C9 Aromates	0.013	0.003
Mecyclopentane	C7 Naphtenes	0.178	0.044
Cyclohexane	C7 Naphtenes	0.163	0.041
MeCyclohexane	CB Naphtenes	0.134	0.028

Gas molecular weight = 20.90 Gas gravity = 0.722

WELL :
TEST : 3
BOTTLE: A-14415

DETAILED COMPOSITION OF SEPARATOR GAS TO C10 PLUS

	WEIGHT%	MOL WT	MOL%
Nitrogen	0.353	28.01	0.62
Carbondioxide	1.820	44.01	0.862
Methane	61.451	16.04	79.843
Ethane	14.934	30.07	10.351
Propane	11.731	44.10	5.544
i-Butane	1.972	58.12	0.707
n-Butane	4.026	58.12	1.444
i-Pentane	1.009	72.15	0.291
n-Pentane	1.106	72.15	0.319
C6 Paraffines	0.650	86.18	0.157
C6 Naphtenes	0.081	70.14	0.024
C6 Total	0.731	84.06	0.181
C7 Paraffines	0.158	100.21	0.033
C7 Naphtenes	0.400	86.23	0.097
C7 Aromates	0.044	78.11	0.012
C7 Total	0.601	88.81	0.141
C8 Paraffines	0.041	114.18	0.008
C8 Naphtenes	0.156	99.82	0.033
C8 Aromates	0.039	92.14	0.009
C8 Total	0.236	100.64	0.049
C9 Paraffines	0.009	125.71	0.001
C9 Naphtenes	0.007	125.00	0.001
C9 Aromates	0.011	106.17	0.002
C9 Total	0.027	116.33	0.005
Decanes Plus	0.003	140.00	0.000
SUM	100.000		100.000

	Component Group	Weight%	Mol%
Benzene	C7 Aromates	0.044	0.012
Tolurne	CB Aromates	0.039	0.009
Xylenes	C9 Aromates	0.008	0.002
MeCyclopentane	C7 Naphtenes	0.174	0.043
Cyclohexane	C7 Naphtenes	0.158	0.039
MeCyclohexane	cs Naphtenes	0.123	0.026

Gas molecular weight = 20.84 Gas gravity = 0.720

WELL
DST 3

RECOMBINATION OF SEPARATOR SAMPLES

Oil bottle	K-4617
Gas bottle	A-14397

Field values:

GOR	= 1932 Sm^3/m^3 separator oil
Gas gravity	= 0.718
Z factor	= 0.915

Lab values

Gas gravity	= 0.722
Z factor	= 0.903

Corrected GOR:

$$GOR = GOR_{(field)} \cdot \sqrt{\frac{Gravity_{field} \cdot Z_{field}}{Gravity_{lab} \cdot Z_{lab}}}$$

$GOR = 1939.7$ Sm^3/m^3 separator liquid

Recombination:
The surface samples were physically recombined in the ratio of 1940 standard cm^3 gas per cm^3 of bubble point separator liquid.

WELL :
DST : 3
Recombined fluid:
A-14397
K-4617

COMPOSITION OF RESERVOIR FLUID

(Mathematical recombination of separator samples)

	SEPARATOR LIQUID	SEPARATOR GAS	RECOMBINED FLUID		
	MOL %	MOL %	WEIGHT%	MOL WT	MOL%
Nitrogen	0.05	0.93	0.90	28.0	0.85
Carbondioxide	0.26	0.83	1.30	44.0	0.78
Methane	11.98	79.32	44.53	16.0	73.18
Ethane	7.32	10.27	11.41	30.1	10.00
Propane	11.34	5.50	10.10	44.1	6.04
i-Butane	3.03	0.70	2.02	58.1	0.92
n-Butane	8.52	1.44	4.60	58.1	2.08
i-Pentane	3.96	0.29	1.72	72.2	0.63
n-Pentane	5.31	0.32	2.13	72.2	0.78
Hexanes	7.09	0.18	2.61	84.6	0.81
Heptanes	11.37	0.15	4.04	91.0	1.17
Octanes	10.59	0.06	4.01	104.1	1.02
Nonanes	5.19	0.01	2.17	118.9	0.48
Decanes plus	13.98	0.00	8.47	175.0	1.28
SUM	100.00	100.00	100.00		100.00
MOL WEIGHT	80.7	20.90			26.36
MOL RATIO	9.11	90.89			100.00
MASS RATIO	27.92	72.08			100.00

GASS OIL RATIO = 1939.7 Sm^3 gas/m^3 separator oil

Separator gas sample: A-14397

Separator liquid sample: K-4617

WELL :
DST : 3
Recombined fluid:
A-14397
K-4617

DETAILED COMPOSITION OF RESERVOIR FLUID TO C10 PLUS

	WEIGHT %	MOL WT	MOL%	DENSITY g/cm^3 15 °C
Nitrogen	0.900	28.01	0.847	
Carbondioxide	1.300	44.01	0.779	
Methane	44.535	16.04	73.180	
Ethane	11.408	30.07	9.999	
Propane	10.099	44.10	6.036	
i-Butane	2.019	58.12	0.916	
n-Butane	4.597	58.12	2.085	
i-Pentane	1.716	72.15	0.627	
n-Pentane	2.125	72.15	0.776	
C6 Paraffines	2.397	86.19	0.733	0.663
C6 Naphtenes	0.216	70.12	0.081	0.750
C6 Total	2.613	84.59	0.814	0.669
C7 Paraffines	1.490	100.20	0.392	0.687
C7 Naphtenes	2.343	87.18	0.708	0.766
C7 Aromates	0.209	78.10	0.070	0.884
C7 Total	4.041	90.99	1.170	0.740
C8 Paraffines	1.115	114.20	0.257	0.705
C8 Naphtenes	2.366	102.86	0.606	0.772
C8 Aromates	0.534	92.10	0.153	0.871
C8 Total	4.014	104.11	1.016	0.763
C9 Paraffines	0.833	128.26	0.171	0.721
C9 Naphtenes	0.688	121.94	0.149	0.792
C9 Aromates	0.645	106.20	0.160	0.872
C9 Total	2.166	118.94	0.480	0.784
Decanes Plus	8.467	174.96	1.276	0.826
	100.000		100.000	

	Component Group	Weight%	Mol%
Benzene	C7 Aromates	0.209	0.070
Toluene	C8 Aromates	0.534	0.153
Xylenes	C9 Aromates	0.490	0.122
Mecyclopentane	C7 Naphtenes	0.819	0.257
Cyclohexane	C7 Naphtenes	0.953	0.299
MeCyclohexane	C8 Naphtenes	1.412	0.379

WELL :
DST : 3
Recombined fluid:
A-14397
K-4617

EXTENDED RESERVOIR FLUID COMPOSITION TO C20+

	WEIGHT %	MOL WT	MOL %	DENSITY g/cm^3 15°C
Nitrogen	0.900	28.01	0.847	
Carbondioxide	1.300	44.01	0.779	
Methane	44.535	16.04	73.180	
Ethane	11.408	30.07	9.999	
Propane	10.099	44.10	6.036	
i-Butane	2.019	58.12	0.916	
n-Butane	4.597	58.12	2.085	
i-Pentane	1.716	72.15	0.627	
n-Pentane	2.125	72.15	0.776	
C6 Paraffines	2.397	86.2	0.733	0.663
C6 Naphtenes	0.216	70.1	0.081	0.750
C6 Total	2.613	84.6	0.814	0.669
C7 Paraffines	1.490	100.2	0.392	0.687
C7 Naphtenes	2.343	87.2	0.708	0.766
C7 Aromates	0.209	78.1	0.010	0.884
C7 Total	4.041	91. 0	1.170	0.740
C8 Paraffines	1.115	114.2	0.257	0.705
C8 Naphtenes	2.366	102.9	0.606	0.772
C8 Aromates	0.534	92.1	0.153	0.871
C8 Total	4.014	104.1	1.016	0.763
C9 Paraffines	0.833	128.3	0.171	0.721
C9 Naphtenes	0.688	121.9	0.149	0.792
C9 Aromates	0.645	106.2	0.160	0.872
C9 Total	2.166	118.9	0.480	0.784
C10 fraction	1.623	133	0.321	0.796
C11 fraction	1.263	145	0.228	0.796
C12 fraction	0.952	158	0.159	0.809
C13 fraction	0.913	171	0.140	0.820
C14 fraction	0.744	183	0.101	0.830
C15 fraction	0.592	197	0.079	0.837
C16 fraction	0.386	210	0.048	0.848
C17 fraction	0.417	226	0.049	0.845
C18 fraction	0.323	241	0.035	0.845
C19 fraction	0.295	250	0.031	0.854
C20+ fraction	0.959	319	0.079	0.891

WELL :
DST : 3
Recombined fluid:
A-14397
K-4617

CONSTANT MASS EXPANSION AT 96 °C

PRESSURE Bara	REL VOL V/V_d	RETROGRADE LIQ. VOL% of V_d	Z-FACTOR
601.4	0.6814		1.4017
549.4	0.7010		1.3173
503.3	0.7215		1.2421
470.2	0.7386		1.1879
440.1	0.7560		1.1381
410.7	0.7765		1.0908
374.5	0.8071		1.0338
340.1	0.8431		0.9808
304.8	0.8904		0.9283
274.4	0.9440		0.8860
251.2	0.9974		0.8570
P_d -= 250.0	1.0000		0.8551
248.4	1.0011	0.03	
245.0	1.0140	0.13	
239.1	1.0309	0.36	
230.6	1.0592	0.85	
218.9	1.1024	1.67	
209.5	1.1441	2.41	
191.4	1.2388	3.86	
170.0	1.3883	5.31	
150.1	1.5764	6.29	
132.6	1.8034	6.88	
119.6	2.0194	7.11	
106.6	2.2945	7.18	
93.4	2.6561	7.14	

WELL :
DST : 3
Recombined fluid:
A-14397
K-4617

CONSTANT VOLUME DEPLETION AT 96 °C

PRESS Bara	RETROGR LIQUID VOL % of Vd	CUMUL PRODUCED % MOL	COMPRESSIBILITY FACTOR		WELL STREAM VISCOSITY cP
			EQUIL GAS Z	TWO PHASE Z (2p)	
250.0	0.00	0.00	0.8550	0.855	0.0296
236.5	0.51	3.09	0.8344	0.834	0.0276
206.2	2.63	13.05	0.8072	0.810	0.0246
180.9	4.32	22.64	0.8057	0.800	0.0217
151.4	5.49	35.00	0.8130	0.796	0.0189
130.4	5.83	44.07	0.8248	0.797	0.0174
100.1	5.76	57.24	0.8494	0.800	0.0156
71.4	5.32	69.36	0.8858	0.797	0.0143
51.1	4.87	77.71	0.9054	0.784	0.0136

WELL :
DST : 3
Recombined fluid:
A-14397
K-4617

CONSTANT VOLUME DEPLETION AT 96 °C

(Molecular composition of well stream, mol %)

PRESSURE Bara	250.0	236.5	206.2	180.9	151.4	130.4	100.1	71.4	51.1
Nitrogen	0.85	0.82	0.82	0.83	0.86	0.85	0.84	0.85	0.83
carbondioxide	0.78	0.79	0.79	0.79	0.81	0.81	0.81	0.81	0.81
Methane	73.18	73.51	74.17	74.89	75.66	76.14	76.54	76.10	75.53
Ethane	10.00	10.03	10.05	10.06	10.09	10.13	10.12	10.32	10.39
Propane	6.04	6.08	6.06	6.00	5.95	5.93	5.92	6.10	6.27
i-Butane	0.92	0.93	0.92	0.91	0.89	0.88	0.87	0.90	0.94
n-Butane	2.08	2.11	2.10	2.05	2.00	1.96	1.94	2.01	2.11
i-Pentane	0.63	0.62	0.61	0.59	0.56	0.54	0.53	0.55	0.58
n-Pentane	0.78	0.77	0.78	0.74	0.70	0.67	0.65	0.67	0.72
Hexanes	0.81	0.80	0.78	0.73	0.66	0.61	0.58	0.58	0.63
Heptanes	1.17	1.11	1.03	0.93	0.81	0.71	0.65	0.65	0.69
Octanes	1.02	0.94	0.83	0.71	0.56	0.45	0.39	0.37	0.39
Nonanes	0.48	0.44	0.38	0.30	0.20	0.14	0.10	0.08	0.08
Decanes plus	1.28	1.05	0.69	0.47	0.24	0.16	0.08	0.03	0.02
SUM	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
MOL WEIGHT	26.36	26.00	25.08	24.30	23.50	23.04	22.71	22.75	22.99
MOL WT C10+	175.0	173.0	157.0	152.9	149.4	149.0	147.4	142.7	143.0
GRAVITY (Air=1)		0.898	0.866	0.839	0.811	0.795	0.784	0.786	0.794

WELL :
DST : 3
Recombined fluid:
A-14397
K-4617

CONSTANT VOLUME DEPLETION AT 96 C
RESIDUAL LIQUID
(Molecular composition of liquid remaining in cell at 51.1 Bara)

Nitrogen	0.03
Carbondioxide	0.22
Methane	13.17
Ethane	5.09
Propane	6.13
i-Butane	1.53
n-Butane	4.33
i-Pentane	2.24
n-Pentane	3.12
Hexanes	5.27
Heptanes	10.83
Octanes	12.76
Nonanes	7.90
Decanes plus	27.37
SUM	100.00

DENSITY = 0.627 g/cm^3 at 51.1 Bara and 96.0 °C
MOL WEIGHT = 102.8
MOL WT C10+ = 189

Appendix

WELL :
DST : 3
Recombined fluid:
A-14397
K-4617

SINGLE FLASH OF RESERVOIR FLUID

	STABILIZED OIL	EVOLVED GAS	RECOMBINED FLUID		
	MOL %	MOL %	WEIGHT %	MOL WT	MOL %
Nitrogen	0.00	0.83	0.88	28.0	0.81
carbondioxide	0.00	0.80	1.33	44.0	0.79
Methane	0.00	75.40	45.59	16.0	73.65
Ethane	0.00	10.22	11.58	30.1	9.98
Propane	0.15	6.20	10.31	44.1	0.66
i-Butane	0.12	0.95	2.08	58.1	0.93
n-Butane	0.53	2.15	4.74	58.1	2.11
i-Pentane	0.60	0.62	1.73	72.2	0.62
n-Pentane	1.02	0.78	2.18	72.2	0.73
Hexanes	3.16	0.73	2.56	84.6	0.79
Heptanes	10.09	0.83	3.66	90.9	1.04
Octanes	18.06	0.43	3.36	103.9	0.84
Nonanes	14.48	0.06	1.83	119.5	0.40
Decancs plus	51.79	0.00	8.17	174.4	1.21
SUM	100.00	100.00	100.00		100.00
MOL WEIGHT	140.6	23.18			25.91

Gas oil ratio = 5623 Sm^3/Sm^3