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EXPLORATION AND PRODUCTION TESTS ON GAS
FROM WELL 31/6-5 IN OFFSHORE TROLL FIELD,
NORTH SEA, NORWAY

Sampling and analysis
of gas, condensate and water

by

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Approved by: M.E. van Kreveld

SUMMARY
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During production tests in offshore Trollfield, North SEA, Norway, sampling and analysis of gas, condensate and water have been carried out.

The present report describes the sampling and the analytical procedures applied, and presents the results obtained.

June 1984

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EXPLORATION AND PRODUCTION TESTS ON GAS
FROM WELL 31/6-S IN OFFSHORE TROLL FIELD,
NORTH SEA, NORWAY

Sampling and analysis
of gas, condensate and water

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1. INTRODUCTION

A production test was carried out on gas from the 31/6-S well in the offshore Troll Field, North Sea, Norway. Detailed information about the following trace components was obtained:

In the gas : Hydrogen sulphide (H₂S)
Other sulphur compounds
Mercury (Hg)
Radon-222 (Rn)
Carbon dioxide (CO₂)
Helium (He)
Nitrogen (N₂).

In the condensate : Mercury (Hg)
Total sulphur
Polonium-210 (Po)

In production water: pH
Chlorides (Cl⁻)
Calcium (Ca²⁺)
Mercury (Hg)

The present report describes briefly the sampling procedures followed and presents the results obtained.

2. EXPERIMENTAL

The gas/condensate/water mixture from the well was separated in a high-pressure test separator. The gas samples were taken from the gas outlet of the separator. The hydrogen sulphide, mercury, radon and carbon dioxide contents were determined at site. Separate gas samples were sent to the laboratory for the determination of the other sulphur compounds, helium and nitrogen.

The condensate samples from the separator were collected in glass bottles. The mercury content was determined at site, total sulphur and polonium content were determined in the laboratory.

The water samples from the separator were collected in glass bottles. The pH, chlorides and mercury content were determined at site, the calcium content was determined in the laboratory.

Table I summarizes the analytical methods applied and Table II gives a survey of the results obtained. Figure I shows the pH and the chloride content of the production water of the separator and the choke manifold versus the time of flow period IV.

3. RESULTS

The results obtained during the production test are presented below. A survey is given in Table II.

Throughout this section volumes of gas are considered at standard conditions (15°C, 1.013 bar).

3.1. Production test Ia3.1.1 Flow period I (first clean-up)

Date and time: 4/5/84, 19.00 h till
5/5/84, 07.00 h

Perforated interval: 1558-1568 m (5112-5144 ft)

Flow rate: 970,000 m³/d (34.25 MMscfd)

Separator temperature: 27°C- 34°C
80°F- 93°F

Separator pressure: 38 bar (550 psig)

<u>Production water</u>	<u>Content</u>	<u>Sampling time, h</u>
1. pH	4.4	02.15
	4.6	04.00
	4.6	06.00
	4.5	07.00
2. Cl ⁻	83.4 kg/m ³	02.15
	73.7 kg/m ³	04.00
	75.3 kg/m ³	06.00
	73.5 kg/m ³	07.00

3.1.2 Flow period II (second clean up)

Date: 5/5/84

Flow rate: 690,000 m³/d (24 MMscfd)

Separator temperature: 30°C (86°F)

Separator pressure: 27 bar (390 psig)

<u>Production water</u>	<u>Content</u>	<u>Sampling time, h</u>
1. pH	4.5	23.30
2. Cl ⁻	78.1 kg/m ³	23.30

3.1.3 Flow period III (second post acid clean up period, 25-50 %)

Date: 6/5/84
 Flow rate: 668,000 m³/d (23 MMscfd)
 Separator temperature: 32°C (90°F)
 Separator pressure: 43 bar (620 psig)

<u>Gas</u>	<u>Content</u>	<u>Sampling time, h</u>
1. H ₂ S	0.18 x10 ⁻⁶ m ³ /m ³	10.40
	0.16 x10 ⁻⁶ m ³ /m ³	11.20
2. CO ₂	0.35 % (v/v)	10.30
	0.35 % (v/v)	11.10
<u>Production water</u>	<u>Content</u>	<u>Sampling time, h</u>
1. pH	4.1	08.00
2. Cl ⁻	49.7 kg/m ³	08.00

3.2. Production test Ib3.2.1 Flow period IV

Date and time: 11/5/84, 18.00 h till
12/5/84, 13.00 h

Flow rate: 169,000 m³/d (7 MMscfd) -
1,240,000 m³/d (44 MMscfd)

Production water

<u>choke manifold</u>		<u>separator</u>		<u>sampling time</u>
pH	Cl ⁻	pH	Cl ⁻	
0.6	97.6	1.3	90.5	20.15
1.1	99.4	1.7	90.5	20.30
1.6	--	2.2	88.7	20.45
1.9	97.5	3.2	67.4	21.15
2.3	95.9	3.3	74.6	21.45
3.6	103	-	--	22.15
3.7	95.8	3.4	83.4	23.00
4.0	88.7	3.3	83.4	00.00
4.6	71.0	3.8	76.1	02.00
4.2	76.1	-	--	02.30
4.1	78.1	3.5	79.9	03.00
4.6	71.0	-	--	03.30
4.8	67.5	3.5	78.1	04.00
4.2	72.8	3.4	81.7	05.00
3.7	78.1	-	--	05.30
3.7	74.6	3.4	76.3	06.00
3.7	72.8	3.5	76.3	07.00
3.7	67.5	-	--	07.30
3.6	69.2	3.4	73.5	08.00
3.6	67.5	-	--	08.30
3.7	69.2	3.5	75.3	09.00
3.5	67.5	-	--	09.30

3.2.2 Flow period V (multirate 25, 50, 75, 100 %)

Date and time: 12/5/84, 16.30 h till
13/5/84, 08.30 h

Flow rate 25%: 470,000 m³/d (16.7 MMscfd)
(16.30-20.30 h)

50%: 765,000 m³/d (27.0 MMscfd)
(20.30-00.30 h)

75%: 1,038,000 m³/d (37.0 MMscfd)
(00.30-04.30 h)

100%: 1,220,000 m³/d (43.1 MMscfd)
(04.30-08.30 h)

Separator temperatures :

25%: 30 °C (86 °F)

50%: 30 °C (86 °F)

75%: 31 °C (88 °F)

100%: 31 °C (88 °F)

Separator pressures:

25%: 36.5 bar (530 psig)

50%: 41.3 bar (600 psig)

75%: 38.6 bar (560 psig)

100%: 40.0 bar (575 psig)

<u>Gas</u>	<u>Content</u>	<u>Sampling time, h</u>
1. H ₂ S	0.06 x 10 ⁻⁶ m ³ /m ³	19.15
	0.08 x 10 ⁻⁶ m ³ /m ³	19.50
	0.06 x 10 ⁻⁶ m ³ /m ³	22.55
	0.06 x 10 ⁻⁶ m ³ /m ³	02.40
	0.09 x 10 ⁻⁶ m ³ /m ³	04.10
	0.08 x 10 ⁻⁶ m ³ /m ³	06.30
	0.09 x 10 ⁻⁶ m ³ /m ³	07.00

2. CO ₂	0.35	% (v/v)	19.00
	0.36	% (v/v)	19.30
	0.37	% (v/v)	22.30
	0.35	% (v/v)	23.10
	0.37	% (v/v)	02.20
	0.37	% (v/v)	03.40
	0.36	% (v/v)	06.10
	0.35	% (v/v)	07.10

3. Rn	71	Bq/m ³	22.37
	88	Bq/m ³	07.20

<u>Production water</u>	<u>Content</u>		<u>Sampling time, h</u>
1. pH	3.6		19.00
	3.6		22.30
	3.7		02.40
	3.7		06.30
2. Cl ⁻	71.0	kg/m ³	19.00
	69.3	kg/m ³	22.30
	68.5	kg/m ³	02.40
	67.5	kg/m ³	06.30
3. Ca ²⁺	32.8	kg/m ³	19.00
	30.3	kg/m ³	22.30
	30.5	kg/m ³	02.40
	28.1	kg/m ³	06.30

3.2.3 Flow period VI (Nautilus flow I)

Date and time: 13/5/84, 13.10 - 19.15 h
 Flow rate: 797,000 m³/d (28 MMscfd) -->
 455,000 m³/d (16 MMscfd)
 Separator temperature: 30 °C (86 °F)
 Separator pressure: 43.4 bar (630 psig)

<u>Gas</u>	<u>Content</u>	<u>Sampling time, h</u>
1. H ₂ S	0.07 x10 ⁻⁶ m ³ /m ³	15.20
	0.08 x10 ⁻⁶ m ³ /m ³	16.20
	0.08 x10 ⁻⁶ m ³ /m ³	18.45
2. Other sulphur compounds:		
COS	< 0.1 x10 ⁻⁶ m ³ /m ³	19.05
Mercaptans	< 0.1 x10 ⁻⁶ m ³ /m ³	19.05
Alkylsulphides	< 0.1 x10 ⁻⁶ m ³ /m ³	19.05
Thiophenes	< 0.1 x10 ⁻⁶ m ³ /m ³	19.05
3. CO ₂	0.35 % (v/v)	15.00
	0.36 % (v/v)	17.05
	0.35 % (v/v)	18.55
4. Hg	0.050 x10 ⁻⁶ g/m ³	16.10
	0.055 x10 ⁻⁶ g/m ³	16.40
	0.050 x10 ⁻⁶ g/m ³	17.30
	0.050 x10 ⁻⁶ g/m ³	17.50
5. Rn	89 Bq/m ³	17.00

6. He	0.020 % (v/v)	19.10
7. N ₂	1.74 % (v/v)	19.10

<u>Condensate</u>	<u>Content</u>	<u>Sampling time, h</u>
1. Hg	0.020 g/m ³	18.00
2. Total sulphur	103 g/m ³	18.00
3. Po	< 1 kBq/m ³	18.00

<u>Production water</u>	<u>Content</u>	<u>Sampling time, h</u>
1. pH	3.9	18.00
2. Cl ⁻	69.1 kg/m ³	18.00
3. Ca ²⁺	23.7 kg/m ³	18.00
4. Hg	< 0.001 g/m ³	18.00

3.2.4 Flow period VII (Nautilus flow III)

Date and time: 14/5/84, 13.15 - 24.00 h
 Flow rate: 325,000 m³/d (11.5 MMscfd)
 Separator temperature: 34°C (93°F)
 Separator pressure: 41.4 bar (600 psig)

<u>Gas</u>	<u>Content</u>	<u>Sampling time, h</u>
1. H ₂ S	0.08 x10 ⁻⁶ m ³ /m ³	19.55
	0.08 x10 ⁻⁶ m ³ /m ³	22.45
2. Other sulphur compounds:		
COS	< 0.1 x10 ⁻⁶ m ³ /m ³	20.25
Mercaptans	< 0.1 x10 ⁻⁶ m ³ /m ³	20.25
Alkylsulphides	< 0.1 x10 ⁻⁶ m ³ /m ³	20.25
Thiophenes	< 0.1 x10 ⁻⁶ m ³ /m ³	20.25
3. CO ₂	0.35 % (v/v)	19.45
	0.35 % (v/v)	23.00
4. Hg	0.050 x10 ⁻⁶ g/m ³	20.45
	0.050 x10 ⁻⁶ g/m ³	21.10
	0.055 x10 ⁻⁶ g/m ³	21.55
5. He	0.020 % (v/v)	20.30
8. N ₂	1.74 % (v/v)	20.30
	2.6 % (v/v)	01.50

Amsterdam, June 1984

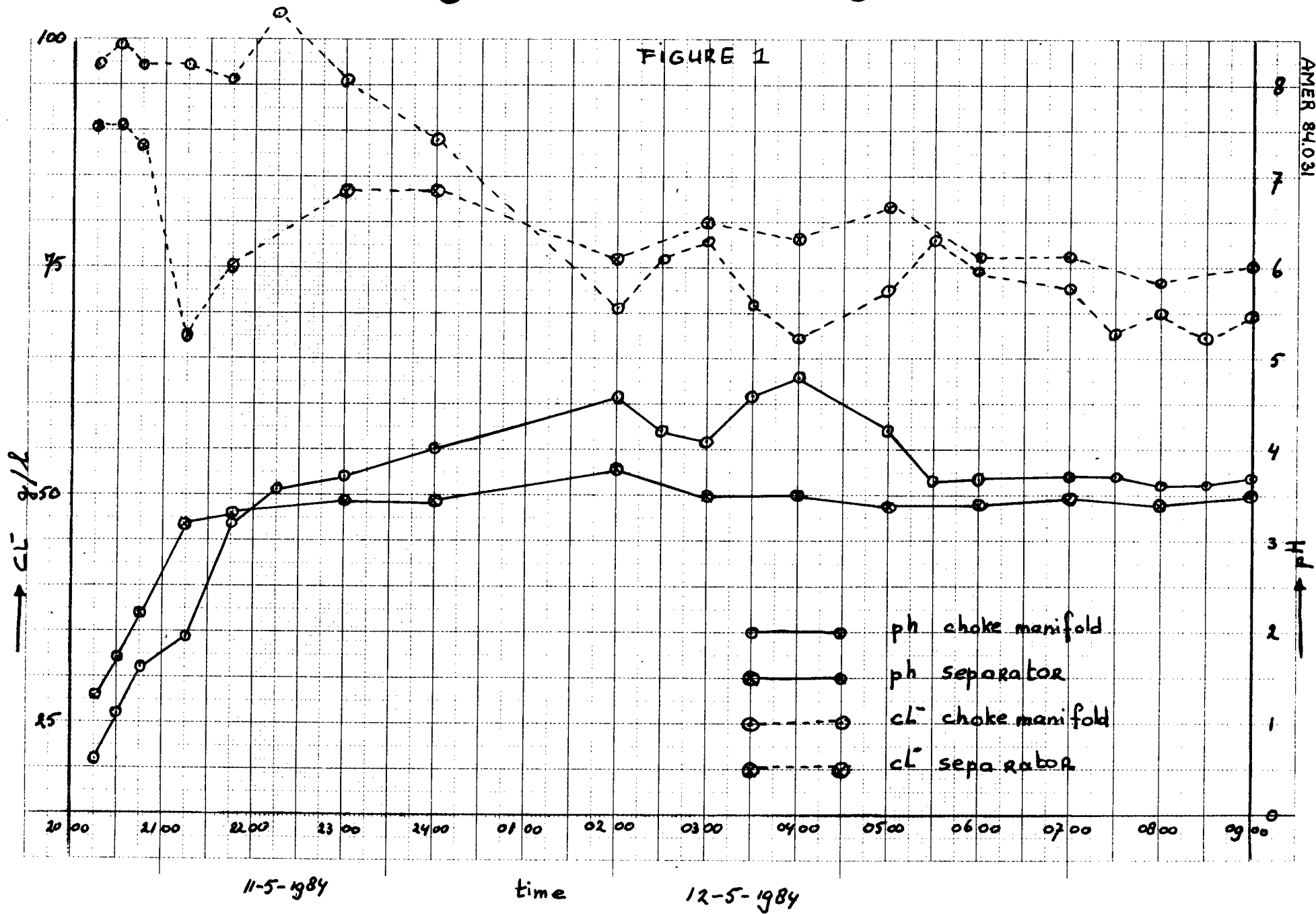
TABLE I
SURVEY OF THE ANALYTICAL METHODS APPLIED

1. <u>Gas phase</u>	
Hydrogen sulphide (H_2S)	Drager tube No. CH 298
Other sulphur compounds	Gas chromatographic analysis with microcoulometric detection
Carbon dioxide (CO_2)	Drager tube No. CH 25101
Mercury (Hg)	Flameless atomic absorption spectrophotometry
Radon-222	Radiochemical analysis
Helium (He)	Gas chromatographic analysis with thermal conductivity detection
Nitrogen (N_2)	Gas chromatographic analysis with thermal conductivity detection
2. <u>Condensate</u>	
Mercury (Hg)	Flameless atomic absorption spectrophotometry
Total sulphur	Microcoulometric analysis
Polonium-210 (Po)	Radiochemical analysis
3. <u>Production water</u>	
pH	Electrochemical analysis
Chlorides (Cl^-)	Argentometric titration
Calcium (Ca^{2+})	Complexometric titration
Mercury (Hg)	Flameless atomic absorption spectrophotometry

TABLE II
SURVEY OF FINAL RESULTS

<u>Gas</u>		
1. H ₂ S,	10 ⁻⁶ m ³ /m ³	0.07
2. Other sulphur compounds,		
COS	10 ⁻⁶ m ³ /m ³	< 0.1
Mercaptans	10 ⁻⁶ m ³ /m ³	< 0.1
Alkylsulphides	10 ⁻⁶ m ³ /m ³	< 0.1
Thiophenes	10 ⁻⁶ m ³ /m ³	< 0.1
3. CO ₂ ,	%(v/v)	0.35
4. Hg,	g/m ³	0.050
5. Rn,	Bq/m ³	89
6. He,	%(v/v)	0.020
7. N ₂ ,	%(v/v)	1.74
<u>Condensate</u>		
1. Hg,	g/m ³	0.02
2. Total sulphur,	g/m ³	103
3. Po-210,	kBq/m ³	< 1
<u>Production water</u>		
1. pH,		3.7
2. Cl ⁻ ,	kg/m ³	70
3. Ca ²⁺ ,	kg/m ³	32.8-28.1
4. Hg,	g/m ³	< 0.001

FIGURE 1



EXPLORATION AND PRODUCTION

THE COMPOSITION OF STATOIL (NORWAY) GAS WELL

TROLL 31/6-5, MAY 1985

Nautilus Contract No. T-4362, Task Order 1 d.6.6.84

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SUMMARY

The Nautilus (Thornton) well-head testing equipment has been used for Statoil in the Norwegian sector of the North Sea to perform separation tests on gas well 31/6-5 in the East Troll field. Due to technical problems of establishing stable well flow rates it was only possible to perform single stage separations during the time available.

The composition of the well stream has been determined from these tests by recombining measured equilibrium phase data obtained at controlled temperature and pressure. The experimental results are compared with down stream phase compositions and properties calculated using a computer program based on an advanced equation-of-state.

T H O R N T O N R E S E A R C H C E N T R E

OPERATIONS EQUIPMENT & MEASUREMENT DIVISION

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EXPLORATION AND PRODUCTIONTHE COMPOSITION OF STATOIL (NORWAY) GAS WELLTROLL 31/6-5

Nautilus contract No. T-4362, Task Order 1 d. 6.6.84

1. INTRODUCTION

In May 1984 the Thornton well-head testing equipment was employed on the rig "Deep Sea Bergen" as part of the Nautilus Ventures hydrocarbon fluid evaluation service on Troll well 31/6-5.

The objective of the Thornton work was to obtain a detailed and accurate well stream composition together with gas/liquid equilibrium data at precise conditions of temperature and pressure.

Production of the well proved to be erratic with major technical problems prior to and during the expected Thornton sampling period. As a result, sampling was limited to two single stage separations and an extended flow period to provide PVT samples for Statoil's own use.

2. TEST PROGRAMME

The Thornton mixing manifold, described in section 3, was inserted into the well stream flow line at the end of a series of multi-sequential flow periods, although experience has shown that extensive multi-sequential and isochronal tests can be performed with the manifold in place throughout. A welcome feature of the programme agreed with Statoil was the reservation of a test period following their multi-sequential and isochronal tests exclusively for our purposes.

Experience of previous testing in the Troll field and computer simulations indicated that the optimum conditions should probably be:

Two stage tests at:	<u>Pressure</u>	<u>Temperature</u>
	<u>(bar)</u>	<u>(°C)</u>
1st stage	70	0-10
2nd stage	35	-15

In the event sampling conditions were selected by Statoil, based on their data, as follows:

1. Two stage tests at:	<u>Pressure</u>	<u>Temperature</u>
	<u>(bar)</u>	<u>(°C)</u>
1st stage	69	30
2nd stage	45	-15
2. Single stage tests at:	30	0

Samples of gas and liquid were also to be taken at both sets of conditions for separate PVT tests by Statoil. It was pointed out that a long flow period would be required to accommodate both the Thornton and PVT sampling at the first set of conditions.

Summary of Thornton Testing

- 13.5.84 Thornton sampling began at 17.23 hours, using the conditions for two stage tests. Otis readings indicated a continual drop in well flow rate. Sampling was abandoned at 19.30 hours. The initial flow rate during this period was $0.768 \cdot 10^6 \text{ M}^3(\text{st})/\text{d}$ falling to $0.443 \cdot 10^6 \text{ M}^3(\text{st})/\text{d}$ using a 48/64" choke.
- 14.5.84 Sampling commenced at 18.53. Again a large reduction in well flow rate, from $0.516 \cdot 10^6 \text{ M}^3(\text{st})/\text{d}$ to $0.442 \cdot 10^6 \text{ M}^3(\text{st})/\text{d}$ using a 40/64" choke, caused sampling to be halted.

The choke size was reduced to 32/64" at 20.30 hours and a stable flow rate of approximately $0.325 \times 10^6 \text{ M}^3(\text{st})/\text{d}$ was achieved until 08.00 hours on 15.5.84. The data presented in this report is based on samples taken during the period. The production test was subsequently abandoned.

3. EXPERIMENTAL

The Thornton well-head testing equipment consists of a heavy duty sampling manifold containing a mixing device in one leg (Figure 1) which is placed in the well effluent flow line between the well head and choke manifold. After passing through the phase mixing device a homogeneous side stream is directed isokinetically, via a sample probe, to a miniature laboratory housing a series of small scale separators (Figure 2). Each separator is maintained at a predetermined temperature and pressure. Separations were performed in the 5 dm^3 treatment stage. The condensate collected in each test was flashed quantitatively to atmospheric pressure and gas volumes were measured by meters as shown in Figure 2.

"Tank oil" and test condition condensate/gas ratios (CGR) were calculated and these are reported based on $1 \times 10^6 \text{ M}^3(\text{st})$ of gas passed through the Thornton equipment.

Samples of vented condensates and gases were retained for compositional analysis using standard gas chromatography methods. The analytical data were recombined in the appropriate mole ratios to yield a detailed description of the well stream originally sampled.

Single stage separation conditions used for Troll 31/6-5 were as follows:

Test 1	30 bar	-1°C
Test 2	30 bar	0°C

4. RESULTS

Details of the tests performed including CGR's, both at test conditions and when vented to atmospheric pressure are given in Table 1.

Tables 2 and 3 show the gas liquid equilibrium data for each test. The compositional data shows isomeric splits for butane and pentane. Benzene, toluene and xylene are recorded as individual components. The recombined well-head fluid, phase compositions and equilibrium data for each test is given in the tables. Also shown are the Gross Heating Values for each gas phase.

The resulting measured well-head fluids obtained from recombination methods were used in computer flash calculations to predict theoretical phase compositions at the experimental conditions. The resulting data obtained are shown in Table 4 and 5.

Schematic presentations of the gas/liquid equilibrium data for each test are given in Figures 3 and 4. Table 7 gives conversion factors for SI to FPS units.

5. DISCUSSION

The experimental data in Tables 2 and 3 for both tests indicates very good agreement in all aspects.

Computer predicted gas compositions are also in reasonable agreement with those obtained experimentally (compare Tables 2 and 3 with Tables 4 and 5 respectively). Reasonable agreement is achieved with the liquid comparisons and condensates/gas ratios in view of the very low values of the latter.

Overall the data is considered reliable and should be confirmed by future testing of subsequent wells in the East Troll field.

TABLE 1

Summary of condensate/gas ratios determined in Thornton tests

Test	Date/time	Well flow rate ⁽¹⁾ 10 ⁶ m ³ (st)/d	Test conditions bar/°C	Condensate gas ratio m ³ /10 ⁶ m ³ (st)	
				At test conditions	At atmospheric ⁽²⁾ conditions
1	14.5.84 2312 h	0.32	30/-1	23.23	21.01
2	15.5.84 0151 h	0.32	30/0	23.29	20.90

Note (1) Otis data

Note (2) Amount of liquid at atmospheric conditions relative to separation gas.

TABLE 2

Test-1 Experimental Phase Compositions (mol%)

Component	Well-head fluid	Separator 30.0 bar -1 °C	
		Liq.	Gas
C1	92.725	16.320	93.093
C2	3.530	4.286	3.526
C3	0.462	2.454	0.452
iC4	0.268	3.378	0.253
nC4	0.064	1.279	0.058
iC5	0.060	2.390	0.049
nC5	0.017	1.138	0.012
C6	0.116	15.142	0.043
C7	0.128	23.900	0.013
C8	0.043	8.986	
C9	0.035	7.245	
C10	0.024	4.911	
C11	0.012	2.553	
C12	0.007	1.479	
C13	0.004	0.843	
C14	0.003	0.537	
C15	0.001	0.264	
C16		0.099	
C17		0.073	
C18		0.010	
BENZ	0.001	0.024	0.001
TOL	0.002	0.461	
XYL	0.006	1.323	
N2	2.149	0.739	2.156
CO2	0.343	0.166	0.344
Mol.ratio		0.0048	0.9952
Mol.mass kg/kmol	17.556	86.029	17.225
C7+	0.265	52.684	0.013
GHV(calc) MJ/m ³ (st)	39.04		38.42
T/C LGR m ³ /10 ⁶ m ³ (st)		23.23	

Compositions on a water free basis.

TABLE 3

Test-2 Experimental Phase Compositions (mol%)

Component	Well-head fluid	Separator 30.0 bar 0 °C	
		Liq.	Gas
C1	92.370	16.646	92.733
C2	3.469	4.460	3.464
C3	0.455	2.418	0.446
iC4	0.263	3.209	0.249
nC4	0.062	1.150	0.057
iC5	0.057	2.166	0.047
nC5	0.016	1.074	0.011
C6	0.114	14.941	0.043
C7	0.130	24.118	0.014
C8	0.044	9.171	
C9	0.035	7.369	
C10	0.024	4.924	
C11	0.012	2.469	
C12	0.007	1.517	
C13	0.004	0.754	
C14	0.002	0.515	
C15	0.001	0.214	
C16		0.060	
C17		0.075	
C18		0.008	
BENZ	0.002	0.022	0.002
TOL	0.002	0.429	
XYL	0.006	1.251	
N2	2.606	0.867	2.614
CO2	0.319	0.173	0.320
Mol.ratio		0.0048	0.9952
Mol.mass kg/kmol	17.589	85.633	17.261
C7+	0.267	52.874	0.014
GHV(calc) MJ/m ³ (st)	38.85		38.23
T/C LGR m ³ /10 ⁶ m ³ (st)		23.29	

Compositions on a water free basis.

TABLE 4

Test-1 Computer Predicted Phase Compositions (mol%)

Component	Well-head fluid	Separator 30.0 bar -1 °C	
		Liq.	Gas
C1	92.725	14.561	93.027
C2	3.530	3.900	3.529
C3	0.462	1.940	0.456
iC4	0.268	2.866	0.258
nC4	0.064	0.984	0.060
iC5	0.060	2.037	0.052
nC5	0.017	0.830	0.014
C6	0.116	13.787	0.060
C7	0.128	24.602	0.033
C8	0.043	10.217	0.004
C9	0.035	8.832	0.001
C10	0.024	6.173	
C11	0.012	3.107	
C12	0.007	1.817	
C13	0.004	1.039	
C14	0.003	0.779	
C15	0.001	0.260	
C16			
C17			
C18			
BENZ	0.001	0.132	
TOL	0.002	0.406	
XYL	0.006	1.446	
N2	2.149	0.108	2.157
CO2	0.343	0.176	0.344
Mol. ratio		0.0038	0.9962
Mol. mass kg/kmol	17.556	91.07	17.267
C7+	0.265	58.678	0.038
GHV(calc) MJ/m ³ (st)	39.04		38.51
T/C LGR m ³ /10 ⁶ m ³ (st)		19.33	

Compositions on a water free basis.

TABLE 5

Test-2 Computer Predicted Phase Compositions (mol%)

Component	Well-head fluid	Separator 30.0 bar 0 °C	
		Liq.	Gas
C1	92.370	14.398	92.665
C2	3.469	3.760	3.468
C3	0.455	1.867	0.450
iC4	0.263	2.738	0.254
nC4	0.062	0.928	0.059
iC5	0.057	1.884	0.050
nC5	0.016	0.761	0.013
C6	0.114	13.358	0.064
C7	0.130	25.057	0.036
C8	0.044	10.614	0.004
C9	0.035	9.007	0.001
C10	0.024	6.305	
C11	0.012	3.176	
C12	0.007	1.857	
C13	0.004	1.062	
C14	0.002	0.531	
C15	0.001	0.266	
C16			
C17			
C18			
BENZ	0.002	0.261	
TOL	0.002	0.409	
XYL	0.006	1.469	
N2	2.606	0.131	2.615
CO2	0.319	0.161	0.320
Mol. ratio		0.0038	0.9962
Mol. mass kg/kmol	17.589	91.522	17.304
C7+	0.267	59.753	0.041
GHV(calc) MJ/m ³ (st)	38.85		38.32
T/C LGR m ³ /10 ⁶ m ³ (st)		19.43	

Compositions on a water free basis.

TABLE 6

Summary of experimentally determined well-head fluid compositions (Mole %)

Component	Test 1 Separation at 30.0 bar -1°C	Test 2 Separation at 30.0 bar 0°C
C1	92.725	92.370
C2	3.530	3.469
C3	0.462	0.455
iC4	0.268	0.263
nC4	0.064	0.062
iC5	0.060	0.057
nC5	0.017	0.016
C6	0.116	0.114
C7	0.128	0.130
C8	0.043	0.044
C9	0.035	0.035
C10	0.024	0.024
C11	0.012	0.012
C12	0.007	0.007
C13	0.004	0.004
C14	0.003	0.002
C15	0.001	0.001
C16		
C17		
C18		
BENZ	0.001	0.002
TOL	0.002	0.002
XYL	0.006	0.006
N2	2.149	2.606
CO2	0.343	0.319
Mol. mass kg/kmol	17.556	17.589
C7+	0.265	0.267
GHV (calc) MJ/m ³ (st)	39.04	38.85

Compositions on a water free basis.

TABLE 7Conversion factors

$\text{psig} = \frac{\text{bar} - 1.01325}{0.06895}$	$^{\circ}\text{F} = ^{\circ}\text{C} \times \frac{9}{5} + 32$
$\text{bb1} = \frac{\text{m}^3}{5.6254}$	$\text{scf} = \frac{\text{m}^3(\text{st})}{0.02826}$
$\text{bb1/MMscf} = \frac{\text{m}^3/10^6 \text{m}^3(\text{st})}{5.6254}$	$\text{Btu/scf} = \frac{\text{MJ/m}^3(\text{st})}{37.3307 \times 10^{-3}}$

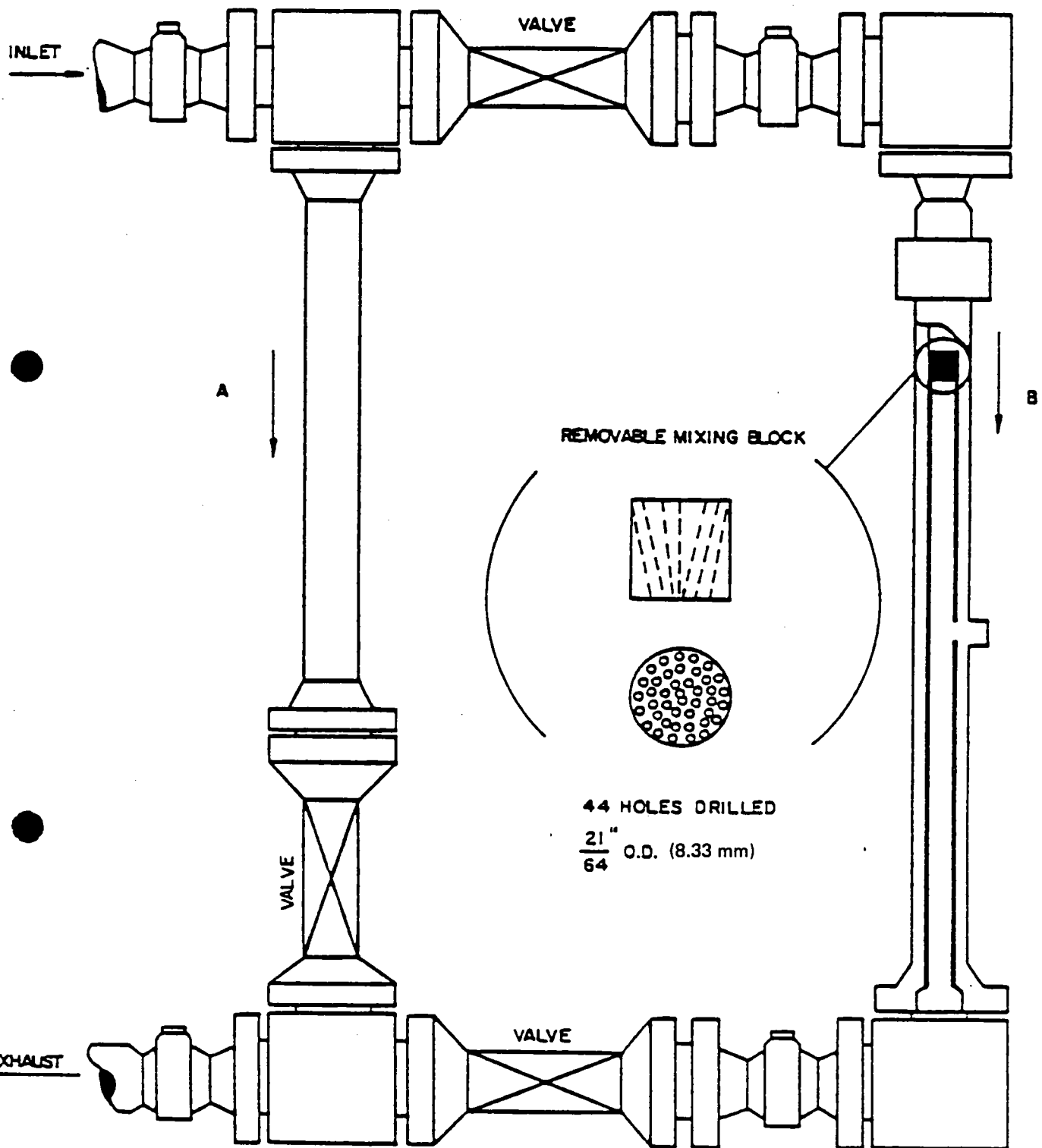


FIG.1 - Mixing manifold

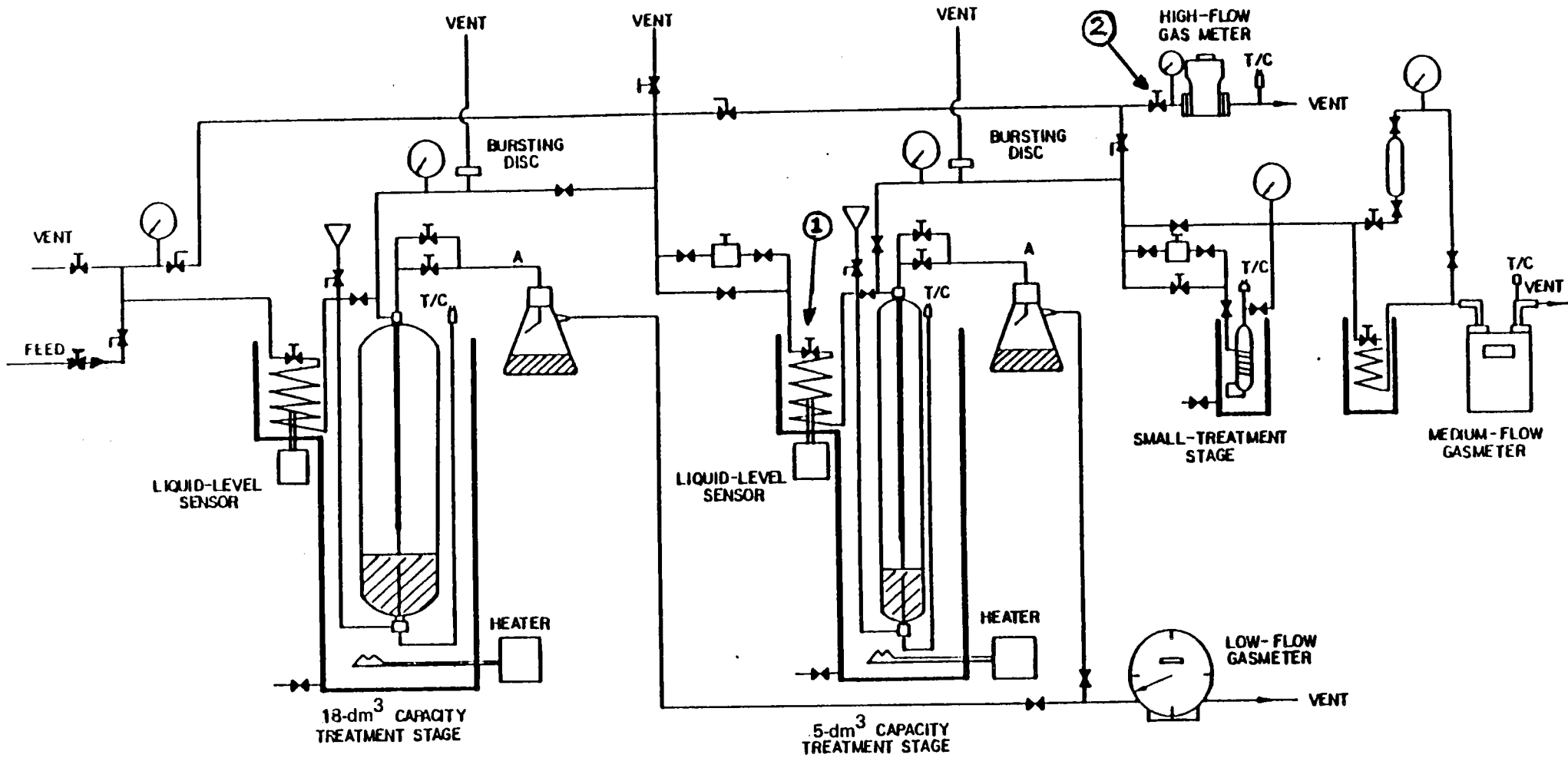
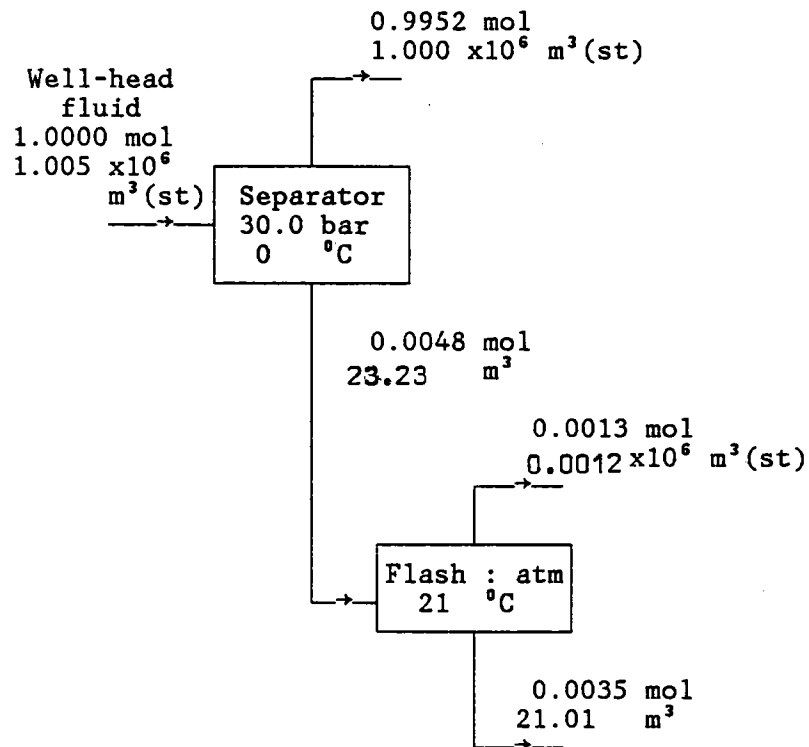


FIG.2-Well-head testing unit

FIGURE 3

Test-1 Mass and Volume Balance

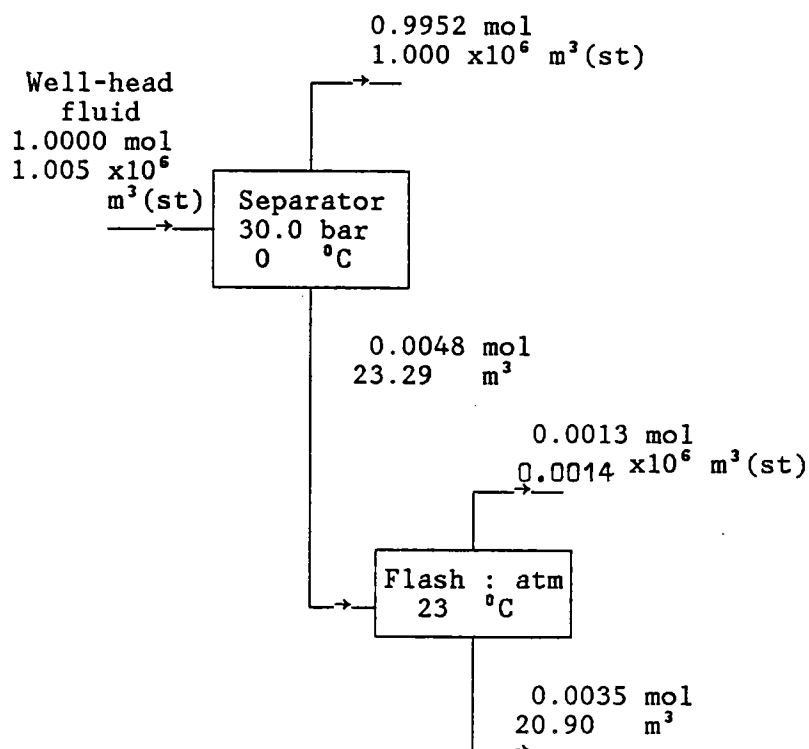


NOTE. The mass and volume balances, based on 1 mol of input fluid and $10^6 \text{ m}^3(\text{st})$ of final gas respectively, are not equivalent.

Flash : atm implies flash to prevailing atmospheric pressure.

FIGURE 4

Test-2 Mass and Volume Balance



NOTE. The mass and volume balances, based on 1 mol of input fluid and $10^6 \text{ m}^3(\text{st})$ of final gas respectively, are not equivalent.

Flash : atm implies flash to prevailing atmospheric pressure.