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### EXPLORATION AND PRODUCTION TEST ON GAS FROM WELL 31/2-6 IN OFFSHORE FLATHEAD FIELD, NORTH SEA, NORWAY

Sampling and analysis of gas and condensate

by

F.E. JANSEN and D. BOON

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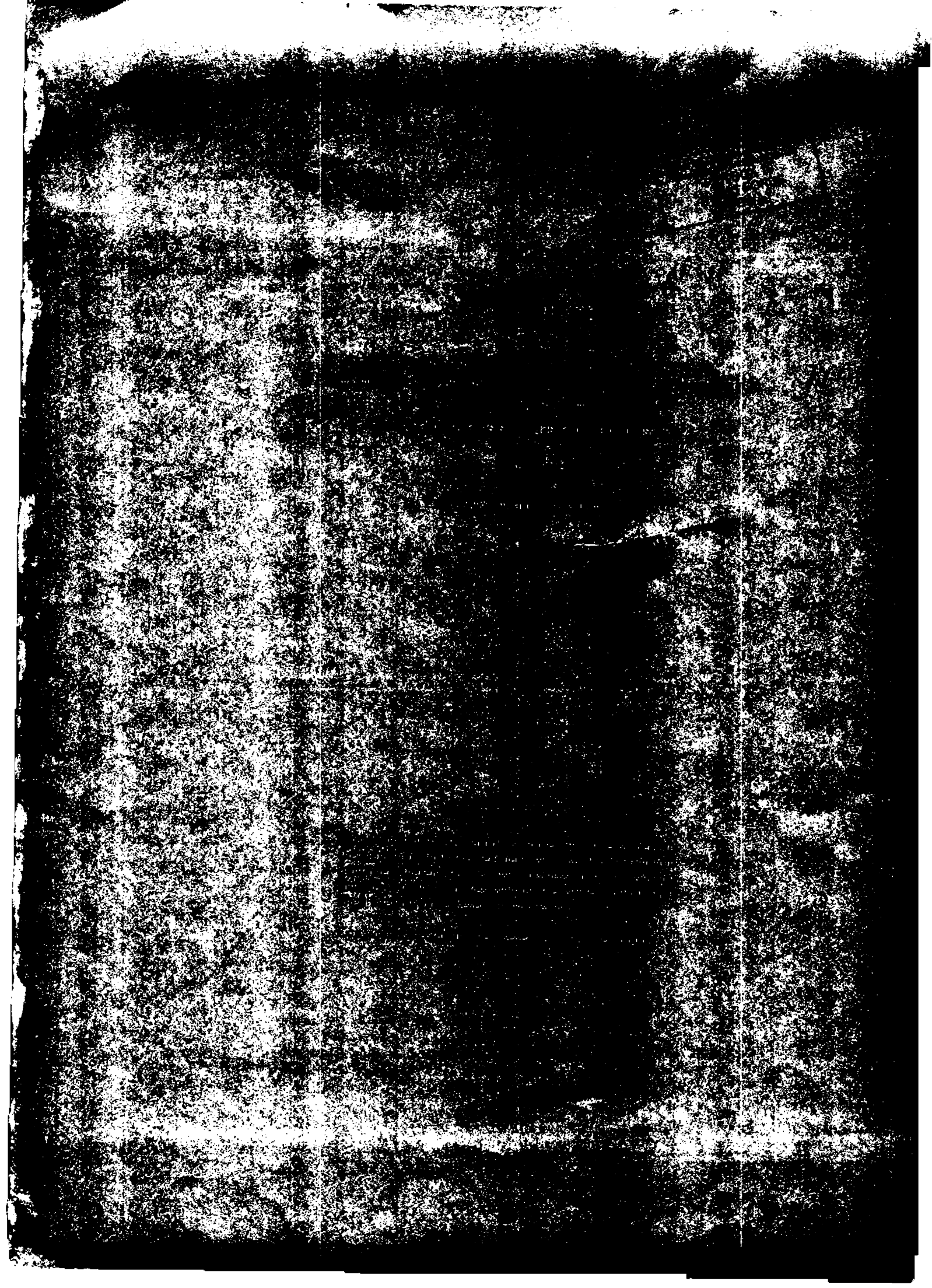
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Approved by: M.E. van Kreveld

SUMMARY

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During a production test in offshore Flathead Field, North Sea, Norway, sampling and analysis of gas and condensate have been carried out.

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

December 1981

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## 1. INTRODUCTION

A production test was carried out on gas from the 31/2-6 well, in the offshore Flathead Field, North Sea. Detailed information about the composition and phase behaviour of the gas was collected by KSLA and TRC.

TRC carried out phase separation tests to be able to predict phase behaviour and to determine the hydrocarbon composition. TRC will present their data in a separate report.

KSLA determined hydrogen sulphide, other sulphur compounds, mercury, radon-222 and carbon dioxide in the gas; and mercury, total sulphur and polonium in the condensate.

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

## 2. EXPERIMENTAL

The gas/condensate mixture coming 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, radon, carbon dioxide and mercury contents were determined on the platform. Separate samples were sent to KSLA for the determination of other sulphur compounds.

Condensate samples, originating from the first stage of the TRC separator were collected in glass bottles and were sent to KSLA for the determination of polonium and total sulphur. The mercury content of the condensate was determined on the rig.

In Table I the analytical methods applied are summarized.

### 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 (0 °C, 1.013 bar).

#### Well 31/2-6

Perforated interval: 1150 - 1168 m (subsea level).

Date and time: 7/10/81, 05.00 h - 17.00 h.

The well was cleaned up before the actual production test was started.

#### 3.1. First flow period

Date and time: 7/10/81, 05.00 - 07.00 h.

Output separator: 12 MMSCF/d ( $340 \times 10^3 \text{ m}^3/\text{d}$ ).

<u>Gas phase</u>	<u>Content</u>	<u>Sampling time, h</u>
1. H <sub>2</sub> S	0.08 ml/m <sup>3</sup>	05.45
	0.06 ml/m <sup>3</sup>	06.15
	0.05 ml/m <sup>3</sup>	06.27
	0.06 ml/m <sup>3</sup>	06.50
2. Other sulphur compounds	< 0.1 ml/m <sup>3</sup>	07.00
3. CO <sub>2</sub>	1.0 % (v/v)	07.00
	1.0 % (v/v)	06.00
	1.0 % (v/v)	07.00
4. Hg	0.34 µg/m <sup>3</sup>	06.22 - 06.40
	0.68 µg/m <sup>3</sup>	06.45 - 06.55
5. H <sub>2</sub> O	Not determined Due to bad weather no weighing was possible	

3.2. Second flow period

Date and time: 17/10/81, 07.30 - 17.00 h

Output separator: 22 MMSCF/d ( $623 \times 10^3 \text{ m}^3/\text{d}$ )

<u>Gas phase</u>	<u>Content</u>	<u>Sampling time, h</u>
1. H <sub>2</sub> S	0.06 ml/m <sup>3</sup>	09.26
	0.06 ml/m <sup>3</sup>	09.37
	0.05 ml/m <sup>3</sup>	09.43
	0.06 ml/m <sup>3</sup>	10.59
	0.06 ml/m <sup>3</sup>	11.15
	0.06 ml/m <sup>3</sup>	11.30
	0.06 ml/m <sup>3</sup>	11.45
	0.05 ml/m <sup>3</sup>	12.10
	0.06 ml/m <sup>3</sup>	14.45
	0.06 ml/m <sup>3</sup>	15.00
	0.07 ml/m <sup>3</sup>	15.30
	0.06v ml/m <sup>3</sup>	16.00
	0.06 ml/m <sup>3</sup>	16.15
0.06 ml/m <sup>3</sup>	16.40	
2. Other sulphur compounds	< 0.1 ml/m <sup>3</sup>	09.00
3. CO <sub>2</sub>	1.0 % (v/v)	09.04
	1.0 % (v/v)	09.40
	1.0 % (v/v)	10.00
	1.0 % (v/v)	11.22
	1.0 % (v/v)	12.00
	1.0 % (v/v)	14.55
	1.0 % (v/v)	15.20
	1.0 % (v/v)	16.10
	1.0 % (v/v)	16.30

<u>Gas phase</u>	<u>Content</u>	<u>Sampling time, h</u>
4. Hg	0.25 $\mu\text{g}/\text{m}^3$	08.47 - 09.12
	0.17 $\mu\text{g}/\text{m}^3$	11.03 - 11.24
	0.15 $\mu\text{g}/\text{m}^3$	11.28 - 11.40
	0.21 $\mu\text{g}/\text{m}^3$	11.44 - 12.16
	0.13 $\mu\text{g}/\text{m}^3$	14.43 - 14.55
	0.11 $\mu\text{g}/\text{m}^3$	14.58 - 15.15
	0.09 $\mu\text{g}/\text{m}^3$	15.27 - 16.04
	0.10 $\mu\text{g}/\text{m}^3$	16.12 - 16.41
5. H <sub>2</sub> O	Not determined (see 1 <sup>st</sup> flow period)	
6. Rn	1.0 pCi/l*	08.45

<u>Condensate</u>	<u>Content</u>	<u>Sampling time, h</u>
1. Hg	< 0.01 mg/l	16.00
2. Total sulphur	96 mg/l	16.00
3. Po	0.03 pCi/ml*	16.00

\* 1 Curie, Ci =  $37 \times 10^9 \text{s}^{-1}$

Amsterdam, December 1981

(JB)/GHA



TABLE I

## SURVEY OF THE ANALYTICAL METHODS APPLIED

	Method
<u>1. Gas phase</u>  Hydrogen sulphide (H <sub>2</sub> S) Other sulphur compounds Carbondioxide (CO <sub>2</sub> ) Mercury (Hg)  Water (H <sub>2</sub> O) Radon-222 (Rn)	  Dräger tube No. CH 298 GLC with microcoulometric detection Dräger tube No. CH 25101 Flameless atomic absorption spectro- photometry Gravimetric analysis Radiochemical analysis
<u>2. Condensate</u>  Mercury (Hg)  Total sulphur Polonium-210 (Po)	  Flameless atomic absorption spectro- photometry. Microcoulometric analysis Radiochemical analysis

TABLE II  
FINAL RESULTS

		Gas well 3 1/2-6	
		<u>First flow</u>	<u>Second flow</u>
<u>Gas phase</u>			
1. H <sub>2</sub> S	ml/m <sup>3</sup>	0.06	0.06
2. Other sulphur compounds,	ml/m <sup>3</sup>	< 0.1	< 0.1
3. CO <sub>2</sub> ,	% (v/v)	1.0	1.0
4. Hg	μg/m <sup>3</sup>	0.50	0.11
5. H <sub>2</sub> O		Not determined	
6. Rn,	pCi/l*		1.0
<u>Condensate</u>			
1. Hg,	mg/l		< 0.1
2. Total sulphur,	mg/l		96
3. Po,	pCi/ml*		0.03

\* 1 Curie, Ci = 37 x 10<sup>9</sup> s<sup>-1</sup>