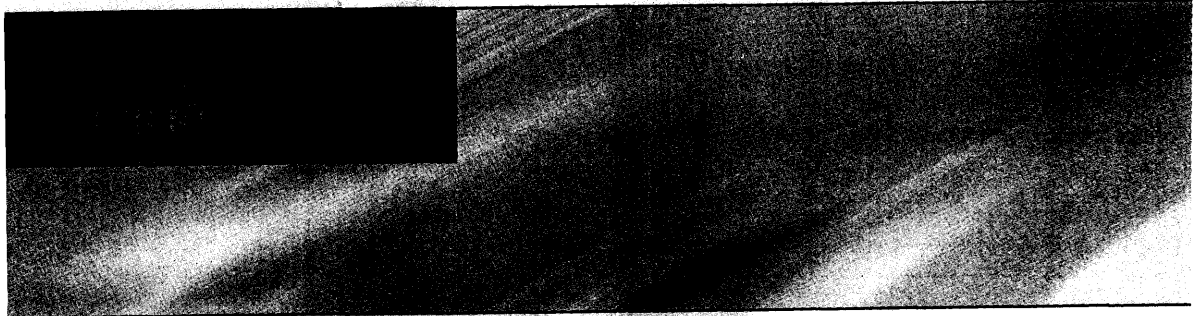


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**Vitrinite Reflectance Analyses Well 6406/2-7
Offshore Norway**

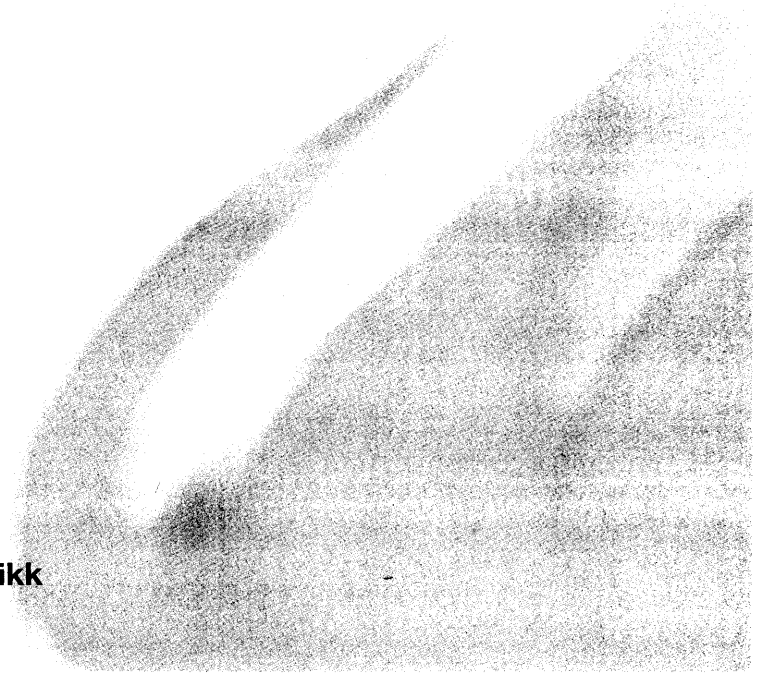
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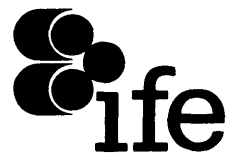
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Address KJELLER HALDEN Telephone N-2027 Kjeller, Norway N-1751 Halden, Norway Telex +47 63 80 60 00 +47 69 21 22 00 Telefax 76 361 isotp n 76 335 energ n +47 63 81 11 68 +47 69 21 22 01		Availability In Confidence	
Report type F	Report number IFE/KR/F-2000/092	Date 2000-06-23	
	Report title Vitrinite Reflectance Analyses Well 6406/2-7 Offshore Norway	Date of last revision	
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Summary	Distribution Norsk Hydro (5) T. Bjørnstad T. Pedersen K. Aasgaard File (3)		
Keywords:			
	Name	Date	Signature
Prepared by	Kristine Aasgaard	2000-06-23	<i>Kristine Aasgaard</i>
Reviewed by	Tom Pedersen	2000-06-23	<i>Tom Pedersen</i>
Approved by	Tor Bjørnstad	2000-06-23	<i>Tor Bjørnstad</i>

1 Introduction

This report gives the result of routine vitrinite reflectance analyses of 37 samples from well 6406/2-7 offshore Norway.

2 Material

The material was provided from the client as 37 cuttings samples. Information on stratigraphy in well 6406/2-7 was not provided from the client.

3 Analytical techniques

3.1 Preparation

The cuttings samples were treated with hydrochloric and hydrofluoric acid prior to further preparation. The aim was to avoid soft and expanding mineral phases in order to ensure good polishing quality. The sample material resulting from the acid treatment was embedded in an epoxy resin to make briquettes, ground flat and polished using 0.25 micron diamond paste and magnesium oxide as the two final steps.

3.2 Analysis

The analytical equipment being used was a Zeiss MPM 03 photometer microscope equipped with an Epiplan-Neofluar 40/0.90 oil objective. The sensitive measuring spot was kept constant for all measurements at about 2.5 micron in diameter. The measurements were made through a green band pass filter (546 nm) and in oil immersion (refractive index 1.515 at 18°C). The readings were made without a polarizer and using a stationary stage. This procedure is called measurement of random reflectance (%Rm). The photometer is calibrated daily against a standard of known reflectance (%Rm=0.588) and routinely (daily) checked against two other standards of significant different reflectances (%Rm=0.879 and 1.696). A deviation from these values of less than ± 0.01 and ± 0.02 respectively is considered as acceptable. The calibration is routinely checked

during the course of measurements at least every hour, and a deviation of less than ± 0.005 is considered as acceptable.

For each sample at least 20 points were measured if possible, and quality ratings are given to various important aspects which may affect the measurements. These aspects are abundance of vitrinite, uncertainties in the identification of indigenous vitrinite, type of vitrinite, particle size, particle surface quality and abundance of pyrite.

3.3 Presentation of results

The raw data from the measurements are presented in appendix for each sample both as tabulated data and histograms. A true vitrinite population is selected among the readings based on observations made during the measurements, and arithmetic mean values and standard deviation are calculated for this population and other populations. A quality rating is given to the true population. The results are listed in table 1. Figure 1 shows a vitrinite reflectance versus depth plot.

4 Results

Hydrocarbon staining was a problem in many samples (see table 1), and 4 samples were flushed with dichloromethane to allow measurements at all. Except from a barren interval (4614-4974m) it was possible to establish a fairly reliable vitrinite reflectance towards depth trend for well 6406/2-7.

Table 1. Vitrinite reflectance data table well 6406/2-7

Analysis type:		Vitrinite reflectance							
Well:		6406/2-7							
Number of samples:		37							
Time period for analysis:		may 2000							
Analysis performed by:		K. Aasgaard, IFE							
Analysis ordered by:		Hydro							
IFE sample code	Depth (m)	Sample type	Lithology	Vitr. refl. (%Rm)	Stand. dev.	Number of readings	Sample description	Sample quality	Sample prep.
20000693	1410	DC	clyst/sst	0,22	0,02	5	-00-00	P	HF
20000694	1510	DC	clyst	0,25	0,04	22	00000+	G	HF
20000695	1610	DC	clyst/sst	0,27	0,04	21	000-0+	G/M	HF
20000696	1710	DC	clyst	0,27	0,05	23	00000+	G/M	HF
20000697	1810	DC	clyst/sst	0,24	0,05	10	-00-0+	P	HF
20000698	1910	DC	clyst	0,30	0,07	15	-00--+	Mst	HF
20000699	2010	DC	clyst	0,23	0,03	22	000--+	Mst	HF
20000700	2110	DC	clyst	0,31	0,05	12	-00-0+	Mst	HF
20000701	2210	DC	clyst	0,30	0,06	20	000-0+	M	HF
20000702	2310	DC	clyst	0,33	0,06	19	000--+	Mst	HF
20000703	2410	DC	sst/clyst	0,31	0,08	6	-±0-0	P	HF
20000704	2510	DC	clyst	0,35	0,05	14	-00--+	P/Mst	HF
20000705	2610	DC	clyst/sst	0,29	0,05	3	-±--+	Pst	HF
20000706	2710	DC	clyst	0,45	0,04	20	0000+	M/Gst	HF
20000707	2810	DC	sst/clyst	0,47	0,07	21	000-0+	Mst	HF
20000708	2910	DC	sst/clyst	0,47	0,06	21	000--+	Mst	HF
20000709	3010	DC	sst/clyst	0,48	0,06	24	000--+	Mst	HF
20000710	3110	DC	clyst	0,52	0,07	11	-±0-0	P	HF
20000711	3210	DC	clyst/sst	0,57	0,09	12	-±0-0+	P	HF
20000712	3310	DC	clyst/sst	0,53	0,09	16	-00-00	M	HF
20000713	3410	DC	clyst	0,56	0,07	23	000--+	Mst	HF
20000714	3510	DC	clyst	0,57	0,06	21	0000+	Mst	HF
20000715	3610	DC	clyst/sst	0,62	0,07	23	000--+	Mst	HF
20000716	3710	DC	clyst/sst	0,65	0,08	21	000-0+	M	HF
20000717	3810	DC	sst/clyst	0,74	0,03	10	-00--+	Mst	HF
20000718	3910	DC	clyst/sst	0,7	0,07	21	000-0+	Mst	HFDCM
20000719	4010	DC	clyst	0,81	0,08	20	00000+	M/Gst	HFDCM
20000720	4110	DC	sst/clyst	0,92	0,07	19	000--+	Mst	HF
20000721	4210	DC	clyst/sst	0,94	0,09	26	000--0	Mst	HFDCM
20000722	4310	DC	sst/clyst	1,04	0,07	16	-00--0	Mst	HF
20000723	4410	DC	clyst	1,02	0,14	26	0000+	M/Gst	HFDCM
20000724	4510	DC	clyst/sst	1,11	0,09	19	000--0	M/Pst	HF
20000725	4614	DC	sst	barren					HF
20000726	4713	DC	sst	barren/1,10		2		P	HF
20000727	4812	DC	sst	1,26?		1		P	HF
20000728	4902	DC	sst	barren					HF
20000729	4974	DC	sst	barren					HF

Legend to vitrinite reflectance data table

Lithology code		Sample quality		Sample preparation	
Sandstone	sst	G	good	HF	sample treated with hydrofluoric acid prior to analysis
Siltstone	slst	M	moderate		
Claystone	clyst	P	poor	bulk	sample treated as bulk rock
Shale	sh	st	hydrocarbon staining		
Limestone	lst				
Coal	coal				
Sample description and measurement evaluation (- o +)					Options
000000		1	Abundance of vitrinite		- o
123456		2	Identification of vitrinite		- o +
		3	Type of vitrinite		- o +
		4	Vitrinite fragment size		- o
		5	Vitrinite surface quality		- o
		6	Abundance of pyrite		o +
Options legend:		-	may give too low vitrinite reflectance sample value		
		o	reliable vitrinite reflectance sample value		
		+	may give too high vitrinite reflectance sample value		

**Data report on stable isotope composition of gas
samples from well 06/2**

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Address KJELLER HALDEN Telephone N-2027 Kjeller, Norway N-1751 Halden, Norway Telefax +47 63 80 60 00 +47 69 21 22 00 +47 63 81 63 56 +47 69 21 22 01		Availability In Confidence	
Report type	Report number IFE/KR/F-2000/020	Date 2000-02-01	
	Report title Datareport on stable isotope composition of gas samples from well 6406/2-7 (IFE ref. no. 3.1.019.00)	Date of last revision	
	Client Robertson Laboratories / Saga Petroleum	Revision number	
	Client reference Purchase order number 18067	Number of pages 2 Number of issues 11	
Summary Nine gas samples from Saga Petroleum well 6406/2-7, ranging in depth from 1520 m to 4974 m, are analysed for isotopic composition. The work is done in accordance with "The Norwegian Industry Guide to Organic Geochemical Analyses", third edition 1993		Distribution Robertson Laboratories (5) B. Andresen H. Johansen I. Johansen File (3)	
Keywords:			
	Name	Date	Signature
Prepared by	Bjørg Andresen Ingar Johansen	2000-02-01	<i>Bjørg Andresen</i>
Reviewed by	Harald Johansen	2000-02-01	<i>Harald Johansen</i>
Approved by	Bjørg Andresen	2000-02-01	<i>Bjørg Andresen</i>

1 Introduction

Nine gas samples from Saga Petroleum well 6406/2-7, ranging in depth from 1520 m to 4974 m, are analysed for isotopic composition. The gas composition is given by Robertson Laboratories. Two sample tubes are received of each sample.

A complete analysis of all components has not been possible due to low hydrocarbon concentration in some of the samples. The hydrogen isotope composition of methane and oxygen isotope composition of CO₂ is not determined due to low gas concentration.

2 Analytical procedures

Aliquots are sampled with a syringe and analysed on a VG Isochrom connected on line to a VG Optima Mass spectrometer. A HP 5890 II with a Poraplot Q column is used for the separation and helium is used as a carrier gas. The injections are performed in splitless mode. No hydrogen or oxygen isotopic composition is included in the analytical procedure.

Based on repeated analysis of a laboratory standard gas mixture, the reproducibility in the $\delta^{13}\text{C}$ value is better than 1.0 ‰ for methane and ethane and 0.5‰ for the higher hydrocarbons.

3 Results

The gas composition of the headspace gas is shown in Table 1 (determined by Robertson Laboratories), and the stable isotope composition is shown in Table 2. Some samples are analysed twice with both values given in Table 2.

When analysing the samples for stable isotopes it was clear that the gas concentration given by Robertson did not fit very well with the actual concentration in the samples. Most samples had a lower concentration, and in addition it was a difference between the two different tubes of each sample.

Table 1 Gas composition of samples from well 6406/2-7

Sample	Depth (m)	IFE no GEO	C ₁ ppm	C ₂ ppm	C ₃ ppm	iC ₄ ppm	nC ₄ ppm	C ₅₊ ppm
99034-12	1520	20000022	9209.9	21.4	10.9	6.7	1.8	10.7
99034-21	1610	20000023	31291.5	118	32.3	23.7	3.3	26.1
99034-25	1650	20000024	15697.2	61.0	33.6	16.2	3.8	30.3
99034-307	4480	20000025	910.1	101.9	22.1	1.6	1.8	3.6
99034-314	4550	20000026	737.1	34.7	6.3	0.4	0.8	1.8
99034-318	4587	20000027	1830.0	212.5	70.3	10.7	11.8	11.1
99034-320	4605	20000028	26437.3	3331.3	497.8	49.8	41.9	22.5
99034-327	4668	20000029	5566.5	654.9	139.4	10.3	23.7	12.4
99034-361	4974	20000030	1045.9	280.2	84.6	2.0	15.9	6.8

Table 2 Isotopic composition of gas samples from well 6406/2-7

Sample	Depth m	IFE no GEO	C ₁ $\delta^{13}\text{C}$ ‰ PDB	C ₂ $\delta^{13}\text{C}$ ‰ PDB	C ₃ $\delta^{13}\text{C}$ ‰ PDB	CO ₂ $\delta^{13}\text{C}$ ‰ PDB
99034-12	1520	20000022	-64.4	-	-	-14.4
99034-21	1610	20000023	-71.0	-	-	-18.7
99034-25	1650	20000024	-	-	-	-14.7
99034-307	4480	20000025	-33.9	-27.0	-	-18.8
99034-314	4550	20000026	-	-	-	-18.0
99034-318	4587	20000027	-38.1	-28.3	-	-16.7
99034-320	4605	20000028	-32.8	-27.2	-25.9	-17.3
			-32.7	-	-	-
99034-327	4668	20000029	-36.9	-27.4	-	-15.9
			-37.2	-27.5	-	-
99034-361	4974	20000030	-32.1	-29.2	-	-16.7