

Norsk Hydro

TABLE B-8: DAILY MUD PROPERTIES : RHEOLOGY FOR WE 25/11-17

Hole section: WATER BASED SYSTEM

Date	Depth [m]		Mud Type	Funnel Visc [sec]	Dens [sg]	Mudtmp Out [DegC]	Fann Readings								Rheo Test [DegC]	FV [mPas]	YP [Pa]	Gel0 [Pa]	Gel10 [Pa]
	MD	TVD					600	300	200	100	60	30	6	3					
28-feb-1993	0	0	SPUD MUD	0.0	0.00	0.0									0.0	0.0	0.0	0.0	0.0
28-feb-1993 23:59	0	0	SPUD MUD	0.0	0.00	0.0									0.0	0.0	0.0	0.0	0.0
01-mar-1993	190	190	SPUD MUD	150.0	1.05	0.0									0.0	0.0	0.0	0.0	0.0

Hole section: 36" WATER BASED SYSTEM

Date	Depth [m]		Mud Type	Funnel Visc [sec]	Dens [sg]	Mudtmp Out [DegC]	Fann Readings								Rheo Test [DegC]	FV [mPas]	YP [Pa]	Gel0 [Pa]	Gel10 [Pa]
	MD	TVD					600	300	200	100	60	30	6	3					
02-mar-1993 23:00	237	237	SPUD MUD	150.0	1.05	0.0									0.0	0.0	0.0	0.0	0.0

Hole section: 12 1/4" WATER BASED SYSTEM

Date	Depth [m]		Mud Type	Funnel Visc [sec]	Dens [sg]	Mudtmp Out [DegC]	Fann Readings								Rheo Test [DegC]	FV [mPas]	YP [Pa]	Gel0 [Pa]	Gel10 [Pa]
	MD	TVD					600	300	200	100	60	30	6	3					
03-mar-1993 23:59	578	578	SPUD MUD	150.0	1.05	0.0									0.0	0.0	0.0	0.0	0.0
04-mar-1993 23:59	1413	1413	SPUD MUD	150.0	1.05	0.0									0.0	0.0	0.0	0.0	0.0
05-mar-1993 23:59	1413	1413	SPUD MUD	150.0	1.05	0.0									0.0	0.0	0.0	0.0	0.0
06-mar-1993 23:59	1413	1413	SPUD MUD	150.0	1.05	0.0									0.0	0.0	0.0	0.0	0.0

Hole section: 8 1/2" WATER BASED SYSTEM

Date	Depth [m]		Mud Type	Funnel Visc [sec]	Dens [sg]	Mudtmp Out [DegC]	Fann Readings								Rheo Test [DegC]	FV [mPas]	YP [Pa]	Gel0 [Pa]	Gel10 [Pa]
	MD	TVD					600	300	200	100	60	30	6	3					
07-mar-1993 23:59	1465	1465	KCL/POLYME	53.0	1.20	16.1	40	27	20	14			3	2	50.0	13.0	6.7	2.0	3.0
08-mar-1993 19:00	1625	1625	KCL/POLYME	65.0	1.25	20.0	51	33	26	17			3	2	50.0	18.0	7.2	2.0	3.0
09-mar-1993 19:00	1654	1654	KCL/POLYME	65.0	1.28	20.0	65	43	34	23			5	3	50.0	22.0	10.1	4.0	6.0
10-mar-1993 22:00	1700	1700	KCL/POLYME	60.0	1.28	17.0	54	35	27	18			3	2	50.0	19.0	7.7	3.0	5.0
11-mar-1993 23:00	1750	1750	KCL/POLYME	60.0	1.28	18.0	52	34	26	17			4	3	50.0	18.0	7.7	3.0	4.0
12-mar-1993 23:59	1947	1947	KCL/POLYME	54.0	1.28	25.0	53	34	24	15			3	2	50.0	19.0	7.2	3.0	4.0
13-mar-1993 23:00	2037	2037	KCL/POLYME	50.0	1.28	20.0	44	28	20	12			2	2	50.0	16.0	5.8	2.0	3.0
14-mar-1993 18:45	2187	2187	KCL/POLYME	48.0	1.28	31.0	47	30	22	13			3	2	50.0	17.0	6.2	2.0	4.0
15-mar-1993 23:00	2248	2248	KCL/POLYME	51.0	1.28	30.0	48	30	22	13			3	2	50.0	18.0	5.8	2.0	4.0
16-mar-1993 23:00	2256	2256	KCL/POLYME	51.0	1.28	30.0	48	30	22	13			3	2	50.0	18.0	5.8	2.0	4.0

See also the report 'DAILY MUD PROPERTIES : OTHER PARAMETERS'

Norsk Hydro

TABLE B-8: DAILY MUD PROPERTIES : RHEOLOGY FOR WE 25/11-17

Hole section: 8 1/2" WATER BASED SYSTEM

Date	Depth [m]		Mud Type	Funnel Visc [sec]	Dens [sg]	Mudtmp Out [DegC]	Fann Readings								Rheo Test [DegC]	FV [mPas]	YP [Pa]	Gel0 [Pa]	Gel10 [Pa]
	MD	TVD					600	300	200	100	60	30	6	3					
17-mar-1993 23:00	2256	2256	KCL/POLYME	51.0	1.28	0.0	48	30	22	13			3	2	50.0	18.0	5.8	2.0	4.0
18-mar-1993 23:00	2256	2256	KCL/POLYME	51.0	1.28	0.0	48	30	22	13			3	2	50.0	18.0	5.8	2.0	4.0
19-mar-1993 23:59	2256	2256	KCL/POLYME	51.0	1.28	0.0									50.0	18.0	5.8	2.0	4.0
20-mar-1993 23:59	2256	2256	KCL/POLYME	51.0	1.28	0.0									50.0	18.0	5.8	2.0	4.0
21-mar-1993 23:59	2256	2256	KCL/POLYME	51.0	1.28	0.0									50.0	18.0	5.8	2.0	4.0
22-mar-1993 23:59	2256	2256	KCL/POLYME	51.0	1.28	0.0									50.0	18.0	5.8	2.0	4.0

See also the report 'DAILY MUD PROPERTIES : OTHER PARAMETERS'

Date: 1993

TABLE B-9: DAILY MUD PROPERTIES : OTHER FOR WELL 15 1-17

Hole section: WATER BASED SYSTEM

Date	Depth (m)		Mud Type	Dens (sg)	Filtrate		Filt. cake		HPHT Press/Temp (psi/DegC)	pH	Alcalinity			Inhib Chem (Kg/m3)	K+ (mg/l)	CL- (mg/l)	Ca++ (mg/l)	Mg++ (mg/l)	Tot hard (mg)	Percentage			CEC (Kg/m3)	ASG (sg)	LGS (Kg/m3)
	MD	TVD			API (ml)	HPHT (ml)	API (mm)	HPHT (mm)			Ca	Mg	SO4							Solid (%)	Oil (%)	Sand (%)			
28-feb-1993			SPUD MUD	0.00	0.0	0.0	0	0	0/0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0
28-feb-1993	23:59	0	SPUD MUD	0.00	0.0	0.0	0	0	0/0	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0
01-mar-1993		190	SPUD MUD	1.05	0.0	0.0	0	0	0/0	10.0	0.0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0

Hole section: 36" WATER BASED SYSTEM

Date	Depth (m)		Mud Type	Dens (sg)	Filtrate		Filt. cake		HPHT Press/Temp (psi/DegC)	pH	Alcalinity			Inhib Chem (Kg/m3)	K+ (mg/l)	CL- (mg/l)	Ca++ (mg/l)	Mg++ (mg/l)	Tot hard (mg)	Percentage			CEC (Kg/m3)	ASG (sg)	LGS (Kg/m3)
	MD	TVD			API (ml)	HPHT (ml)	API (mm)	HPHT (mm)			Ca	Mg	SO4							Solid (%)	Oil (%)	Sand (%)			
02-mar-1993	23:00	237	SPUD MUD	1.05	0.0	0.0	0	0	0/0	10.0	0.0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0

Hole section: 12 1/4" WATER BASED SYSTEM

Date	Depth (m)		Mud Type	Dens (sg)	Filtrate		Filt. cake		HPHT Press/Temp (psi/DegC)	pH	Alcalinity			Inhib Chem (Kg/m3)	K+ (mg/l)	CL- (mg/l)	Ca++ (mg/l)	Mg++ (mg/l)	Tot hard (mg)	Percentage			CEC (Kg/m3)	ASG (sg)	LGS (Kg/m3)
	MD	TVD			API (ml)	HPHT (ml)	API (mm)	HPHT (mm)			Ca	Mg	SO4							Solid (%)	Oil (%)	Sand (%)			
03-mar-1993	23:59	578	SPUD MUD	1.05	0.0	0.0	0	0	0/0	10.0	0.0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0
04-mar-1993		1413	SPUD MUD	1.05	0.0	0.0	0	0	0/0	10.0	0.0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0
05-mar-1993		1413	SPUD MUD	1.05	0.0	0.0	0	0	0/0	10.0	0.0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0
06-mar-1993	23:59	1413	SPUD MUD	1.05	0.0	0.0	0	0	0/0	10.0	0.0	0.0	0.0	0	0	0	0	0	0	0.0	0.0	0.0	0	0.0	0

Hole section: 8 1/2" WATER BASED SYSTEM

Date	Depth (m)		Mud Type	Dens (sg)	Filtrate		Filt. cake		HPHT Press/Temp (psi/DegC)	pH	Alcalinity			Inhib Chem (Kg/m3)	K+ (mg/l)	CL- (mg/l)	Ca++ (mg/l)	Mg++ (mg/l)	Tot hard (mg)	Percentage			CEC (Kg/m3)	ASG (sg)	LGS (Kg/m3)
	MD	TVD			API (ml)	HPHT (ml)	API (mm)	HPHT (mm)			Ca	Mg	SO4							Solid (%)	Oil (%)	Sand (%)			
07-mar-1993	23:59	1465	KCL/POLYME	1.20	3.8	6.8	2	0	34/100	9.5	0.4	0.6	0.4	57970	61000	900	156	1160	11.0	0.0	0.0	14	0.0	0	
08-mar-1993	19:00	1625	KCL/POLYME	1.20	3.4	6.0	1	0	34/100	9.5	0.4	0.6	0.4	64300	84000	880	120	900	14.0	0.0	0.0	14	0.0	0	
09-mar-1993	19:00	1654	KCL/POLYME	1.20	3.4	6.0	1	0	34/100	9.5	0.4	0.6	0.4	64300	79000	580	92	680	6.8	0.0	0.0	14	0.0	0	
10-mar-1993	22:00	1700	KCL/POLYME	1.20	3.4	6.0	1	0	34/100	9.4	0.4	0.6	0.4	65880	80000	400	72	520	6.8	0.0	0.0	14	0.0	0	
11-mar-1993	23:00	1750	KCL/POLYME	1.20	2.3	6.6	1	0	34/100	9.4	0.2	0.0	0.4	122	64300	80000	380	72	500	6.9	0.0	0.0	22	0.0	0
12-mar-1993	23:59	1947	KCL/POLYME	1.20	2.4	8.6	1	0	34/100	9.5	0.2	0.0	0.4	110	57970	82000	520	132	740	7.0	0.0	0.0	25	0.0	0
13-mar-1993	23:00	2037	KCL/POLYME	1.20	2.4	7.0	1	0	34/100	9.5	0.2	0.0	0.4	120	63240	79000	640	136	800	7.2	0.0	0.0	29	0.0	0
14-mar-1993	18:45	2187	KCL/POLYME	1.20	2.4	7.0	1	0	34/100	9.5	0.2	0.0	0.4	112	62140	78000	300	136	520	7.2	0.0	0.0	30	0.0	0
15-mar-1993	23:00	2248	KCL/POLYME	1.20	2.4	9.2	1	0	34/100	9.5	0.2	0.0	0.4	112	59030	88000	280	96	440	6.9	0.0	0.0	30	0.0	0
16-mar-1993	23:00	2256	KCL/POLYME	1.20	2.2	9.2	1	0	34/100	9.5	0.1	0.0	0.5	112	59030	88000	280	96	440	6.9	0.0	0.0	30	0.0	0
17-mar-1993	23:00	2256	KCL/POLYME	1.20	2.2	9.2	1	0	34/150	9.5	0.1	0.0	0.5	112	59000	88000	280	96	440	14.6	0.0	0.0	30	0.0	0
18-mar-1993	23:00	2256	KCL/POLYME	1.20	2.2	9.2	1	0	34/150	9.5	0.1	0.0	0.5	112	59000	88000	280	96	440	14.6	0.0	0.0	30	0.0	0
19-mar-1993	23:59	2256	KCL/POLYME	1.20	2.2	9.2	1	0	34/150	9.5	0.1	0.0	0.5	112	59000	88000	280	96	440	14.6	0.0	0.0	30	0.0	0
20-mar-1993	23:59	2256	KCL/POLYME	1.20	2.2	9.2	1	0	34/150	9.5	0.1	0.0	0.5	112	59000	88000	280	96	440	14.6	0.0	0.0	30	0.0	0
21-mar-1993	23:59	2256	KCL/POLYME	1.20	2.2	9.2	1	0	34/150	9.5	0.1	0.0	0.5	112	59000	88000	280	96	440	14.6	0.0	0.0	30	0.0	0
22-mar-1993	23:59	2256	KCL/POLYME	1.28	2.2	9.2	1	0	34/150	9.5	0.1	0.0	0.5	112	59000	88000	280	96	440	14.6	0.0	0.0	30	0.0	0

See also the report 'DAILY MUD PROPERTIES : RHEOLOGY PARAMETERS'

TABLE B-10: MUD ADDITIVE CONSUMPTION ON WELL 25/11-17

Section Size	Product/Additive	Total Amount Planned	Total Amount Used	Unit	Difference		Difference in cost	
					Amount	%	%	[kNOK]
36"	BARITE		10000.0	kg				
	BENTONITE		42000.0	kg				
	LIME		180.0	kg				
	SODA ASH		225.0	kg				
12 1/4"	BARITE		29000.0	kg				
	BENTONITE		8000.0	kg				
	GLUTARALDEHYDE		75.0	l				
	IDVIS		100.0	kg				
	LIME		860.0	kg				
	PTS300		225.0	kg				
	SODA ASH		375.0	kg				
8 1/2"	BARITE		62000.0	kg				
	BICARBONATE		500.0	kg				
	CEPAC LO/LV		1050.0	kg				
	CEPAC REG		1500.0	kg				
	DEFOAMER		75.0	l				
	GLUTARALDEHYDE		400.0	l				
	IDBOND P		975.0	kg				
	IDFLO, HIGH TEMPERATURE, -> 15		4250.0	kg				
	IDVIS		75.0	kg				
	KCL		16475.0	kg				
	KCL BRINE		123000.0	l				
	LIME		200.0	kg				
	SODA ASH		225.0	kg				

**PETROLEUM
GEOCHEMICAL
EVALUATION OF
THE 25/11-17 WELL**

BA-93 -1592-11

**Interval 1995m-2015m,
Norwegian North Sea**

*Report No. 7327/Ic
Project No. Ic/21412*

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JUNE 1993



*Petroleum Geochemical Evaluation of the 25/11-17 Well***CONTENTS**

Chapters	Page
1 SUMMARY	1
2 INTRODUCTION	2
3 RESULTS AND INTERPRETATION	3
3.1 THERMAL MATURITY	3
3.2 HYDROCARBON SOURCE POTENTIAL	3
3.3 SOLVENT EXTRACTION AND HYDROCARBON FRACTIONATION DATA	4
3.4 STABLE CARBON ISOTOPE RATIOS	4
4 REFERENCES	7

Tables

1	Maturity and kerogen composition data
2	Summary of chemical analysis data
3	Organic carbon and Rock-Eval pyrolysis data
4	Stable carbon isotope ratios

Figure

1	Spore colour indices against depth
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Appendices

1	Abbreviations used in analytical data sheets
2	Analytical procedures and techniques
3	Generalised correlation of hydrocarbon generation and selected maturity parameters



*Petroleum Geochemical Evaluation of the 25/11-17 Well***CHAPTER 2****Introduction**

This report presents the results of a geochemical evaluation of the interval 1995m to 2015m in the 25/11-17 well, Norwegian North Sea. The objectives of the analyses were to establish the level of thermal maturity, determine the hydrocarbon source potential of sediments within the interval, and to determine the stable carbon isotope ratios of saturate and aromatic fractions of extractable organic matter present in those sediments.

Five sidewall core samples over the interval 1930m to 2055m and 11 dried cuttings samples from the interval 1995m to 2020m arrived at Simon Petroleum Technology (SPT) North Wales laboratories on 13 May 1993. A sample of core number 8 arrived at the same time. The SPT Proposal No. 93/Ic/021 specified the analysis of 8 samples, but the programme was expanded to 10 samples by Norsk Hydro's fax of 18 May 1993 and, in accordance with that fax, core number 8 was not analysed. Analyses were conducted in accordance with NPD guidelines. The work was authorised under Norsk Hydro's purchase order number U&P 10782, dated 27 April 1993. Norsk Hydro provided SPT with the preliminary stratigraphic data for the well by fax on 11 June 1993 as used in this report.

Interim results were transmitted to Norsk Hydro by fax on 7 June and 9 June 1993. Our client contacts have been Tove Bockelie and Alistair Davies.

The total number of analyses performed are as follows:

Sample preparation	:	10
Lithological description	:	10
Total organic carbon	:	10
Rock-Eval pyrolysis	:	10
Kerogen preparation	:	10
Spore colour determinations	:	10
Solvent extraction	:	10
Hydrocarbon fractionation (Iatroscan)	:	10
Stable carbon isotope ratio determinations	:	6

SPT personnel involved in the analyses were:

C Darlington	-	Project advice
R Harding	-	Microscopy, geochemical interpretations and report preparation
M Wadsworth	-	Chemical laboratory supervision

COMPANY: NORSK HYDRO

WELL: 25/11-17

LOCATION: NORWEGIAN
NORTH SEA

DEPTH (m)	SCI	KEROGEN TYPE (%)				
		INERTINITE	VITRINITE (STRUC.)	AMORPHOUS (NON-FLUOR.)	AMORPHOUS (FLUOR.)	LIPTINITE (STRUC.)
1995	3.5 6.0R	5	5	40	40	10 (Sp,Di)
1997	3.5 6.5R	10	5	10	60	15 (Sp,Di)
2000	3.5 7.0R	5	Mnr	0	85	10 (Sp,Al,Di)
2002	4.0 7.0R	5	5	45	45	Mnr (Di,Al,Sp)
2005	2.5	5	Mnr	0	85	10 (Sp,Di)
2007	3.0	5	5	0	80	10 (Di,Sp)
2010	3.0	5	5	10	75	5 (Sp,Di)
2012	3.5	5	5	Mnr	80	10 (Sp,Di)
2012 (SWC)	3.5	50	5	5	35	5 (Sp,Di)
2015	3.5	5	Mnr	10	70	15 (Di,Sp)

All samples are ditch cuttings except where otherwise noted.

Di - Dinoflagellate cysts
Sp - Spores and pollen grains
Al - Algal debris

TABLE 1 Maturity and kerogen composition data



GENERAL DATA			CHEMICAL ANALYSIS DATA											
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	TOC % OF ROCK	PYROLYSIS					SOLVENT EXTRACTION/FRACTIONATION					
				Tmax °C	HI	OI	PI	POT.YLD. (ppm)	EXTR. (ppm)	HC (ppm)	EXTR. % OC	HC		ALK. %HC
												%OC	%EX	
1995	Ctgs	MDST, med gy+ mnr LST, wht	2.58	495	34	98	.02	890	500	110	1.9	4	22	52
1997	Ctgs	MDST, med gy+ 10% LST, lt brn	2.06	531	26	94	.07	540	6400	2785	31.1	135	44	30
2000	Ctgs	MDST, med gy+ tr LST, wht	1.97	426	124	102	.05	2450	2455	675	12.5	34	28	48
2002	Ctgs	MDST, med gy+ 10% LST, wht+ 10% SLTST, mod red-brn, calc	1.44	475	46	111	.07	660	4000	1190	27.8	83	30	35
2005	Ctgs	MDST, med gy+ 10% LST, wht+ 10% SLTST, mod red-brn, calc	1.66	428	218	56	.04	3620	1540	565	9.3	34	37	76
2007	Ctgs	MDST, med gy+ mnr LST, wht+ SLTST, mod red-brn	.98	433	148	133	.03	1450	875	255	8.9	26	29	73
2010	Ctgs	MDST, med gy+ 10% LST, wht+ 10% SLTST, dk yel-orng	.91	433	119	170	.07	1080	1355	825	14.9	91	61	80
2012	Ctgs	MDST, med gy+ 20% SLTST, v lt gy, calc	.60	426	113	175	.08	680	695	370	11.6	62	53	64
2012.0	Swc	SST, v lt gy	.23	475	900	374	.29	2070	320	230	14.0	100	72	85
2015	Ctgs	MDST, med gy+ 40% SST, lt gy	.74	429	155	88	.27	1150	585	410	7.9	56	71	81

SUMMARY OF CHEMICAL ANALYSIS DATA

TABLE : 2

GENERAL DATA			CHEMICAL ANALYSIS DATA								
SAMPLE DEPTH (Metres)	SAMPLE TYPE	ANALYSED LITHOLOGY	TOC % OF ROCK	PYROLYSIS							
				S1 (ppm)	S2 (ppm)	S3 (ppm)	HI	OI	PI	Tmax °C	S2/S3
1995	Ctgs	MDST, med gy+ mnr LST, wht	2.58	20	890	2540	34	98	.02	495	.35
1997	Ctgs	MDST, med gy+ 10% LST, lt brn	2.06	40	540	1940	26	94	.07	531	.28
2000	Ctgs	MDST, med gy+ tr LST, wht	1.97	130	2450	2000	124	102	.05	426	1.22
2002	Ctgs	MDST, med gy+ 10% LST, wht+ 10% SLTST, mod red-brn, calc	1.44	50	660	1600	46	111	.07	475	.41
2005	Ctgs	MDST, med gy+ 10% LST, wht+ 10% SLTST, mod red-brn, calc	1.66	170	3620	930	218	56	.04	428	3.89
2007	Ctgs	MDST, med gy+ mnr LST, wht+ SLTST, mod red-brn	.98	50	1450	1300	148	133	.03	433	1.12
2010	Ctgs	MDST, med gy+ 10% LST, wht+ 10% SLTST, dk yel-orng	.91	80	1080	1550	119	170	.07	433	.70
2012	Ctgs	MDST, med gy+ 20% SLTST, v lt gy, calc	.60	60	680	1050	113	175	.08	426	.65
2012.0	Swc	SST, v lt gy	.23	830	2070	860	900	374	.29	475	2.41
2015	Ctgs	MDST, med gy+ 40% SST, lt gy	.74	430	1150	650	155	88	.27	429	1.77

ORGANIC CARBON AND ROCK-EVAL PYROLYSIS DATA

TABLE : 3

COMPANY: NORSK HYDRO

WELL: 25/11-17

LOCATION: NORWEGIAN
NORTH SEA

Depth (m)	δC^{13} Saturates (‰)	δC^{13} Aromatics (‰)
1995	*	*
1997	*	-24.52
2000	*	*
2002	*	*
2005	-27.22	*
2007	*	*
2010	-26.81	-26.32
2012	*	*
2012 (SWC)	*	*
2015	-27.01	-26.88

Results are given in ‰ relative to the Pee-Dee Belemnite standard.

All samples are ditch cuttings except where otherwise noted.

* Insufficient recovery for carbon isotope analysis.

TABLE 4 Stable carbon isotope ratios

