

**FINAL WELL REPORT
WELL 15/3-7
PL 025/PL 187**

Restricted

Doc. no.
02C94*0101
Date
2002-02-27



Rev. no. 60 of 101
0

Table 4.7.1 MDT pressure measurements

FORMATION PRESSURE MDT			Run 2A				DATE: 12.08.01-13.08.01					
<i>WELL: 15/3-7 Run 2A</i>												
Test no.	Depth m MD	Depth m TVD	Formation Pressure (Bar)	Formation Pressure ref. RT (g/cc)	Last-read Build-up (bar)	Hydro-static Pressure before (bar)	Hydro-static Pressure after (bar)	Gauge	Temp. (°C)	Drawdown mob. (md/cp)	Pretest volume (cc)	Remarks
1	4610.0	4609.4			790.07	902.50	902.99	2	133.7	27.2	20	Not stabilized
2	4612.0	4611.4			775.34	902.77	902.64	2	134.6	0.3	20	Tight
3	4614.0	4613.4			790.78	902.99	902.99	2	135.2	0.6	5.6	Tight
4	4616.5	4615.9	789.89	1.744		903.48	903.37	2	135.4	0.6	20	Good
5	4609.7	4609.1	788.97	1.745		902.15	902.01	2	137.4	3.7	10	Good
6	4611.7	4611.1			790.18	902.44	902.33	2	137.8	4.9	10	Supercharged
7	4612.7	4612.1			789.96	902.52	902.42	2	138.2	1.3	10	Supercharged
8	4614.3	4613.7			789.04	902.74	902.66	2	138.7	0.1	8	Tight
9	4617.5	4616.9	790.01	1.744		903.37	903.25	2	139.0	0.3	10	Poor
10	4618.3	4617.7	789.97	1.744		903.17	903.09	2	139.5	0.3	10	Poor
11	4618.5	4617.9			790.19	903.73	903.46	2	138.8	0.1	10	Supercharged
12	4647.5	4646.8			790.12	909.89	909.70	2		0.3	7.5	Supercharged
13	4648.5	4647.8			782.00	909.68	909.64	2		0.1	2.6	Tight
14	4661.0	4660.3			672.04	912.52	912.39	1	141.5		2.4	Tight
15	4661.0	4660.3			668.89	912.47	912.44	2	141.4		20	Tight
16	4744.0	4743.3			702.19	929.51	929.20	1	143.4		5.6	Tight
17	4745.7	4745.0			706.45	929.53	929.37	1	144.8		3.6	Tight

**FINAL WELL REPORT
WELL 15/3-7
PL 025/PL 187**

Restricted

Doc. no.
02C94*0101

Date
2002-02-27



Rev. no. 61 of 101
0

FORMATION PRESSURE MDT				Run 2A			DATE: 12.08.01-13.08.01					
<i>WELL: 15/3-7 Run 2A</i>												
Test no.	Depth m MD	Depth m TVD	Formation Pressure (Bar)	Formation Pressure ref. RT (g/cc)	Last-read Build-up (bar)	Hydro-static Pressure before (bar)	Hydro-static Pressure after (bar)	Gauge	Temp. (°C)	Drawdown mob. (md/cp)	Pretest volume (cc)	Remarks
18	4755.1	4754.4			673.69	931.41	931.50	1	145.5		3.5	Tight
19	4767.1	4766.4			667.68	933.88	933.76	1	146.2		3.5	Tight
20	4770.7	4770.0			764.77	934.44	934.29	1	147.0		5.2	Tight
21	4773.0	4772.3			707.41	934.86	934.75	1	148.1		5.4	Tight

**FINAL WELL REPORT
WELL 15/3-7
PL 025/PL 187**

Restricted

Doc. no.
02C94*0101
Date
2002-02-27



Rev. no. 62 of 101
0

Table 4.7.1 MDT pressure measurements (continuation)

FORMATION PRESSURE MDT				Run 2B			DATE: 13.08.01-17.08.01						
<i>WELL: 15/3-7</i>													
Test no.	Depth m MD	Depth m TVD	Formation Pressure (Bar)	Formation Pressure ref. RT (g/cc)	Last-read Build-up (bar)	Hydrostatic Pressure before (bar)	Hydrostatic Pressure after (bar)	Gauge	Temp. (°C)	Drawdown mob. (md/cp)	Pretest volume (cc)	Remarks	
1	4073.8	4073.5			532.00	797.85	797.63	1	122.0		2	Tight	
2	4075.0	4074.7			617.00	798.01	797.54	1	122.3		2.3	Tight	
3	4147.0	4146.7			586.00	813.75	813.56	1	123.3		2.5	Tight	
4	4214.8	4214.5	788.24	1.91	788.24	827.23	826.45	1	125.0	0.3	3.9	Poor	
5	4217.1	4216.8	788.22	1.91	788.22	826.93	826.80	1	126.4	364	20	Good	
6	4224.0	4223.7	788.75	1.90	788.75	828.26	828.03	1	127.1	0.6	20	Poor	
7	4226.2	4225.9	788.75	1.90	788.75	828.50	828.42	1	127.4	35.3	20	Poor	
8	4227.3	4227.0	788.82	1.90	788.82	828.65	828.55	1	127.7	7.4	20	Poor	
9	4238.0	4237.7			585.52	830.89	830.80	1	127.5		3.6	Tight	
10	4261.0	4260.7			583.46	835.74	835.64	1	128.8		3.6	Tight	
11	4271.5	4271.2			675.80	837.85	837.74	1	128.7		1.3	Tight	
12	4284.8	4284.5			656.70	840.45	840.36	1	129.2		0.8	Tight	
13	4289.0	4288.7				841.21	841.09	1	130.0		0.3	Tight	
14	4295.3	4295.0			795.94	842.39	841.96	1	130.3	2.4	20	Tight	
15	4329.4	4329.0			804.72	849.28	848.89	1	130.9	0.6	8.9	Tight	
16	4333.0	4332.6	804.01	1.89	804.01	849.64	849.49	1	131.4	12.6	20	Poor	
17	4336.5	4336.1			571.85	850.24	850.13	1	131.7	0.9	4.6	Tight	

**FINAL WELL REPORT
WELL 15/3-7
PL 025/PL 187**

Restricted

Doc. no.
02C94*0101
Date
2002-02-27



Rev. no. 63 of 101
0

FORMATION PRESSURE MDT				Run 2B			DATE: 13.08.01-17.08.01						
<i>WELL: 15/3-7</i>													
Test no.	Depth m MD	Depth m TVD	Formation Pressure (Bar)	Formation Pressure ref. RT (g/cc)	Last-read Build-up (bar)	Hydrostatic Pressure before (bar)	Hydrostatic Pressure after (bar)	Gauge	Temp. (°C)	Drawdown mob. (md/cp)	Pretest volume (cc)	Remarks	
18	4340.1	4339.7			805.07	850.87	850.51	1	132.2	2.2	20	Tight	
19	4343.5	4343.1	805.10	1.89	805.10	851.29	851.17	1	132.3	3.1	20	Poor	
20	4353.9	4353.5			719.85	853.47	853.35	1	132.4		1.1	Tight	
21	4358.5	4358.1	806.55	1.89	806.55	854.37	854.26	1	132.5	47.3	20	Poor	
22	4370.5	4370.1	808.86	1.89	808.86	856.84	856.56	1	132.8	8.1	20	Poor	
23	4382.5	4382.1	809.06	1.88	808.06	859.19	859.07	1	133.1	13.9	20	Poor	
24	4403.9	4403.5			658.17	863.65	863.57	1	133.3		2	Tight	
25	4408.0	4407.6			676.00	864.28	864.14	1	0.0		20	Tight	
26	4609.8	4609.2			796.50	903.55		1	136.2		20	Lost seal	
27	4609.8	4609.2			790.45	902.86	902.66	1	138.0		20	Lost seal	
28	4611.1	4610.5	790.10	1.75	790.10	902.66	902.38	1	138.4	2.3	20	Poor	
29	4616.5	4615.9			791.98	903.83	903.75	1	141.1		20	Lost seal	
30	4617.0	4616.4	790.39	1.75	790.39	903.73	903.58	1	141.0	2	20	Poor	
31	4618.0	4617.4			790.08	903.57	903.38	1	140.6	1.3	20	Tight	
32	4648.1	4647.5				910.20	910.13	1	140.9		5	Tight	
33	4744.3	4743.6			790.70	929.20	928.76	1	147.6		10	Tight	
34	4755.1	4754.4				931.00	931.00	1	148.2		20	Lost seal	
35	4755.1	4754.4				931.00	931.00	1	148.4		3.3	Tight	
36	4755.6	4754.9				930.99	930.95	1	148.7		20	Lost seal	
37	4761.0	4760.3				932.08		1	148.9		20	Lost seal	

**FINAL WELL REPORT
WELL 15/3-7
PL 025/PL 187**

Restricted

Doc. no.
02C94*0101
Date
2002-02-27



Rev. no. 64 of 101
0

FORMATION PRESSURE MDT				Run 2B			DATE: 13.08.01-17.08.01						
<i>WELL: 15/3-7</i>													
Test no.	Depth m MD	Depth m TVD	Formation Pressure (Bar)	Formation Pressure ref. RT (g/cc)	Last-read Build-up (bar)	Hydrostatic Pressure before (bar)	Hydrostatic Pressure after (bar)	Gauge	Temp. (°C)	Drawdown mob. (md/cp)	Pretest volume (cc)	Remarks	
38	4763.0	4762.3				932.10	932.10	1	149.3		20	Lost seal	
39	4744.0	4743.3				927.90		1			3.7	Poor	
40	4226.0	4225.7				825.69	825.97	1	134.6		20	Tight	
41	4224.0	4223.7			788.49	825.63		1		100.2	20	Tight	
42	4217.1	4216.8				824.05	824.04	1	131.9		20	Tight	
43	4216.9	4216.6				824.05		1		1.5	20	Tight	
44	4217.3	4217.0				824.12	824.15	1	130.9		20	Tight	
45	4217.1	4216.8				824.09	823.99	1	131.1		20	Tight	
46	4224.0	4223.7	788.53	1.90	788.53	825.66		1	130.9	67	20	Tight	
47	4224.0	4223.7						1			20	Good, sampling hc	
48	4609.1	4608.5				901.96	901.88	1	138.4	12	20	Tight	
49	4609.6	4609.0				901.83		1	139.1	6	20	Tight	
50	4610.1	4609.5				901.69		1	139.4		20	Lost seal	
51	4610.1	4609.5				901.66		1	139.8		20	Poor, sampling water	

**FINAL WELL REPORT
WELL 15/3-7
PL 025/PL 187**

Restricted

Doc. no.
02C94*0101
Date
2002-02-27



Rev. no. 65 of 101
0

Table 4.7.3 Sampling overview

Depth m MD RKB	Sample Size	Chamber Code & Serial No.	Shut-in pressure bar	Opening pressure bar	Shut-in temp deg. C	Pump Vol. Litres	Avg. Pump Draw down bar	Mobility md/cp	Sampling			Transferred to bottles	Comments
									Date	Start	Stop		
4224.0m HC sample	250 cc	SPMC-002 MS1#3	789+343	Empty	130.4	140.0	1.0	67.3	14.08.01	04:20	04:22	-	
	250 cc	SPMC-155 MS1#2	789+343	827.0	130.3	143.0	1.0	67.3	14.08.01	04:33	04:34	9844-MA	
	250 cc	SPMC-154 MS1#6	789+343	826.0	130.3	147.0	1.0	67.3	14.08.01	04:45	04:45	9838-MA	
	450 cc	MPSR-790 MS2#5	789+343	250.0	130.2	151.0	1.0	67.3	14.08.01	04:55	04:57	PT-15016	
	450 cc	MPSR-1043 MS2#6	789+343	270.0	130.2	155.0	1.0	67.3	14.08.01	05:14	05:16	PT-15027	
	1 gal	MRSC-GA- 203 SC1	789+343	250.0	130.1	160.0	1.0	67.3	14.08.01	05:25	05:37	TS-3128 TS-3119 X-10020 X-10038 X-10308 X-10024 X-10006	20cc drained for analysis Oil/condensate, density 0.826 g/cc STO
4610.1m water sample	450 cc	MPSR-754 MS1#1	790+343	0.0	141.5	18.0	59.0	6.0	14.08.01	10:33	10:40	-	Containing mud filtrate only, drained into 1l plastic bottle, 30 ppm H2S measured
	450 cc	MPSR-85 MS2#1	790+343	Empty	141.1	62.0	32.0	6.0	14.08.01	16:10	16:11	-	
	450 cc	MPSR-710 MS1#4	790+343	0.0	141.1	62.5	32.0	6.0	14.08.01	16:50	17:01	x-10263	20cc drained for analysis

**FINAL WELL REPORT
WELL 15/3-7
PL 025/PL 187**

Restricted

Doc. no.
02C94*0101
Date
2002-02-27



Rev. no. 66 of 101
0

Depth m MD RKB	Sample Size	Chamber Code & Serial No.	Shut-in pressure bar	Opening pressure bar	Shut-in temp deg. C	Pump Vol. Litres	Avg. Pump Draw down bar	Mobility md/cp	Sampling			Transferred to bottles	Comments
									Date	Start	Stop		
	450 cc	MPSR-783 MS2#4	790+343	Empty	141.4	89.5	34.0	6.0	14.08.01	20:46	20:47	-	Had to reboot and stop pumping, approx. 63 l pumped before stop
	250 cc	SPMC-147 MS2#2	790+343	923.0	141.4	93.0	34.0	6.0	14.08.20 01	20:59	21:00	9831-MA	

Comments: Low shock used on all samples. Pump relief valve not functioning, on all samples.

**FINAL WELL REPORT
WELL 15/3-7
PL 025/PL 187**

Restricted
Doc. no.
02C94*0101
Date
2002-02-27



Rev. no. 87 of 101
0

5.8.6 Drilling fluid program

Well: 15/3-7 Field: PL025/PL187, Gudrun Rig: West Alpha																					
DRILLING FLUIDS PROGRAMME																					
HOLE		CASING		MUD TYPE	MW [g/cm ³]	LSS [kg/m ³]	10 sec. Gel [Pa]	10 min. Gel [Pa]	Fann 3 rpm	O/W ratio	PV [mPa]	API FL [ml]	HTHP FL [ml]	MSR [kg/m ³]	pH	FCI [kg/m ³]	Glycol [wt%]	ESI [Sec]	Funnel Visc. [Sec]	Usage Volume [m ³]	
SIZE	TVD MD	SIZE	TVD MD																		
36"	188 188	20"	187 187	Spec. no. 7 SW Bentonite	1.03															> 100	141
Comments: Sea water will be used in combination with Bentonite high viscous pills. CMC EHV will be an incision as contingency. This well will be displaced to 1.35 sg Bentonite mud prior to running conductor. A minimum of 600 m ³ of 1.20 sg oil mud will be ready in the casing pits prior to drilling top hole section.																					
28"	946 946	20"	940 940	Spec. no. 7 SW/Bent Kill mud	1.03 1.20															> 100 >60	1142
Comments: Sea water will be used in combination with Bentonite high viscous pills. CMC EHV will be an incision as contingency. Displace to 1.20 sg Bentonite mud - by using diluted Kill mud - prior to running 20" casing.																					
17 1/2"	2740 2740	13 3/8"	2735 2735	Spec. no. 18 KCE Polymer: Gelsol	1.25 1.37	34-128	4.0-6.5	5.0-10.0	9-12		15-23	2.3-3.4		21-45	7.5-7.8	125-149	3.5-4.5				1402
Comments: High viscous Bentonite mud from previous section - and seawater - should be used to fill cement shoe, prior to displacement. Mud weight will gradually be increased from 1.20 sg to 1.40 sg at approx. 2000 m MD.																					
12 1/4"	3996 3996	9 7/8"	3990 3990	Spec. no. 48 CBM	1.40 1.55	< 173	6.0-7.0	8.0-13.0	8.0-12.0	68/34	20-38		1.8-3.0							615-1245	428
Comments: Used CBM will be shipped out and treated before start drilling. New volume will be used in conjunction with used mud to achieve desired properties. Mud weight will be increased as slope as drilling commences.																					
8 1/2"	4818 4818	7"		Spec. no. 48 CBM	1.98-2.03	75-152	4.0-9.0	7.0-13.0	8.0-10.0	84/16	49-76		1.8-2.8							920-1375	359
Comments: After HT the mud weight will be increased to 2.00 sg CBM - by displacing the well - before drilling ahead to TD.																					

Petroleum Geochemistry Data Report

Gas, Oil and Mud from Well 15/3-7



Applied Petroleum Technology AS
P. O. Box 123
2027 Kjeller
Norway

Address: Applied Petroleum Technology AS P.O.Box 123 2027 Kjeller Telephone: +47 63 80 60 00 Telefax: +47 63 80 11 38	
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Authors

Per Erling Johansen
Ingrid Anne Munz
Ragnhild Nøst
Sylviane Sieglé
Bine Nyjordet

	Name	Date	Signature
Reviewed by	Nigel Mills	2002-03-04	
Approved by	Tore Haaland	2002-03-04	

CONTENTS

Summary.....	2
Table 2. GC of Whole Oil (parameters).....	3
Table 3. GC of saturated compounds (parameters).....	3
Table 4. GCMS SIR of saturated compounds (parameters).....	4
Table 5. GCMS SIR of aromatic compounds (parameters).....	5
Table 6. Extraction, Asphaltene precipitation and Iatroscan data.....	6
Table 7. Density and topping.....	6
Table 8. Gas Composition.....	7
Table 9. Gas Isotopes.....	7
Table 10. Isotopes of fractions, d13C (‰ PDB).....	7
Table 11. GC of Whole Oil (peak area).....	8
Table 12. GC of Whole Oil (amounts in ng/g).....	10
Table 13. GC of saturated compounds (peak area).....	12
Table 14. GC of saturated compounds (amounts in ng/g).....	13
Table 15. GC of aromatic compounds (peak area).....	14
Table 16. GCMS SIR of saturated compounds (peak height).....	15
Table 17. GCMS SIR of saturated compounds (amounts in ng/g).....	18
Table 18. GCMS SIR of aromatic compounds (peak height).....	21
Experimental Procedures.....	23
GC Chromatograms Whole Oil.....	26
GC Chromatograms Whole Oil, detailed.....	27
GC Chromatograms Whole Oil, screening.....	29
GC Chromatograms Saturated Hydrocarbons.....	32
GC Chromatograms Aromatic Hydrocarbons.....	34
GC-MS Chromatograms Saturated Hydrocarbons.....	36
GC-MS Chromatograms Aromatic Hydrocarbons.....	44

Summary

This report is a data report on work performed under the Statoil project number APT02-14. One test gas, one oil, four mud samples and one base oil were included in this study.

The numbers of different sample types and of analyses performed are shown below:

Table 1: Summary, sample types and analyses performed

Analysis	Gas	Oil	Mud/base oil	Total
Composition of test gas	1			1
Isotopic analysis of test gas	1			1
Topping		1		1
Asphaltene precipitation		1	1	2
Iatroscan analysis		1	1	2
MPLC group separation		1	1	2
Carbon isotopes, fractions		1*4		1*4
GC of whole oil or extract		1	5	6
GC of saturates + int. std.		1	1	2
GC of aromatics		1	1	2
GCMS of saturates + int. std.		1		1
GCMS of aromatics		1		1

Table 2. GC of Whole Oil (parameters)

Well	Sample type	Sample name	Lower Depth	APT ID	A	B	X	W	C	I	F	H	U	R	S
15/3-7	Oil	MDT2B	4224	13120	0.68	1.70	1.18	6.99	0.89	1.80	0.81	25.79	2.01	3.71	82.13

- A: Benz/n-C₆
- B: Tol/n-C₇
- X: m+p-Xyl/n-C₈
- W: Benz*10/CyC₆
- C: (n-C₆+n-C₇)/(CyC₆+MCyC₆)
- I: (2-MC₆+3-MC₆)/(c1,3-DMCyC₅+t1,3-DMCyC₅+t1,2-DMCyC₅)
- F: n-C₇/MCyC₆
- H: n-C₇*100/(CyC₆+2-MC₆+3-MC₆+c1,3-DMCyC₅+t1,3-DMCyC₅+t1,2-DMCyC₅+n-C₇+MCyC₆)
- U: CyC₆/MCyC₅
- R: n-C₇/2-MC₆
- S: n-C₆/2,2-DMC₄

Table 3. GC of saturated compounds (parameters)

Well	Sample type	Sample name	Lower Depth	APT ID	Pr/n-C17	Ph/n-C18	(Pr/n-C17)/(Ph/n-C18)	Pr/Ph	n-C17/(n-C17C27)
15/3-7	Oil	MDT2B	4224	13120	0.45	0.40	1.14	1.37	0.81



Table 4. GCMS SIR of saturated compounds (parameters)

Well	Sample type	Sample name	Lower Depth	APT ID	%23:3	%28αβ	%30D	%27Ts	%22S	%29Ts	%20S	%ββ	%27dβS	%C27	%C29
15/3-7	Oil	MDT2B	4224	13120	10.80	7.93	19.69	81.37	59.67	22.20	58.07	60.61	71.98	34.68	37.02

Table 4. continued, GCMS SIR of saturated compounds (parameters)

Well	Sample type	Sample name	Lower Depth	APT ID	28/29	%24:4/23:3
15/3-7	Oil	MDT2B	4224	13120	0.73	0.62

- %23:3** $23:3/(23:3+30\alpha\beta)*100$
- %28αβ** $28\alpha\beta/(28\alpha\beta+30\alpha\beta)*100$
- %30D** $30D/(30D+30\alpha\beta)*100$
- %28Ts** $27Ts/(27Ts/27Tm)*100$
- %22S** $(32\alpha\beta S/(32\alpha\beta S+32\alpha\beta R))*100$
- %29Ts** $(29Ts/29Ts+30\alpha\beta)*100$
- %20S** $(29\alpha\alpha S/29\alpha\alpha S+29\alpha\alpha R)*100$
- %ββ** $(29\beta\beta(R+S)/(29\beta\beta(R+S)+29\alpha\alpha(R+S))*100$
- %27dβS** $27d\beta S/(27d\beta S+27\alpha\alpha(R+S))*100$
- %C27** $(27\beta\beta(R+S)/(27\beta\beta(R+S)+28\beta\beta(R+S)+29\beta\beta(R+S))*100$
- %C29** $(29\beta\beta(R+S)/(27\beta\beta(R+S)+28\beta\beta(R+S)+29\beta\beta(R+S))*100$
- 28/29** $(28\alpha\alpha(R+S)+28\beta\beta(R+S))/(29\alpha\alpha(R+S)+29\beta\beta(R+S))$
- 24:4/23:3** $24:4/23:3$

Table 5. GCMS SIR of aromatic compounds (parameters)

Well	Sample type	Sample name	Lower Depth	APT ID	AROM2	Crack1	Crack2	MA1	MA2	MA3	MA4	MA5	MA6	MA7	MA8
15/3-7	Oil	MDT2B	4224	13120	0.739	0.835	0.656	0.656	0.511	4.561	0.356	1.136	3.068	2.325	0.196

Table 5. continued, GCMS SIR of aromatic compounds (parameters)

Well	Sample type	Sample name	Lower Depth	APT ID	MA9	MA10
15/3-7	Oil	MDT2B	4224	13120	22.228	0.685

AROM2: $(C_{20}TA+C_{21}TA+SC_{26}TA+RC_{26}TA+SC_{27}TA+SC_{28}TA+RC_{27}TA+RC_{28}TA)/(C_{20}TA+C_{21}TA+SC_{26}TA+RC_{26}TA+SC_{27}TA+SC_{28}TA+RC_{27}TA+RC_{28}TA+C_{21}MA+C_{22}MA+\beta SC_{27}MA+\beta RC_{27}MA+\beta RC_{27}DMA+\alpha SC_{27}MA+\beta SC_{28}MA+\beta SC_{28}DMA+\alpha RC_{27}DMA+\alpha SC_{27}DMA+\alpha RC_{27}MA+\alpha SC_{28}MA+\alpha SC_{29}MA+\alpha RC_{29}MA)$

Crack1: $(C_{20}TA)/(C_{20}TA+RC_{28}TA)$

Crack2: $(C_{20}TA+C_{21}TA)/(C_{20}TA+C_{21}TA+SC_{26}TA+RC_{26}TA+SC_{27}TA+SC_{28}TA+RC_{27}TA+RC_{28}TA)$

MA1: $(C_{20}TA+C_{21}TA)/(C_{20}TA+C_{21}TA+SC_{26}TA+RC_{26}TA+SC_{27}TA+SC_{28}TA+RC_{27}TA+RC_{28}TA)$

MA2: $(C_{21}MA+C_{22}MA)/(C_{21}MA+C_{22}MA+\beta SC_{27}MA+\beta RC_{27}MA+\beta RC_{27}DMA+\alpha SC_{27}MA+\beta SC_{28}MA+\beta SC_{28}DMA+\alpha RC_{27}DMA+\alpha SC_{27}DMA+\alpha RC_{27}MA+\alpha SC_{28}MA+\alpha SC_{29}MA+\alpha RC_{29}MA)$

MA3: 4-MDBT/1-MDBT

MA4: $(2-MP+3-MP)/(1-MP+2-MP+3-MP+9-MP)$

MA5: 2-MN/1-MN

MA6: $(2,6-DMN+2,7-DMN)/1,5-DMN$

MA7: 4-MDBT/DBT

MA8: DBT/P

MA9: 3-MP/Retene

MA10: $RC_{28}TA/(RC_{28}TA+\alpha RC_{28}MA+\beta RC_{29}MA+\beta RC_{29}DMA)$

Table 6. Extraction, Asphaltene precipitation and Iatroscan data

Well	Sample type	Sample name	Lower Depth	APT ID	SAT (wt% of EOM/Oil)	ARO (wt% of EOM/Oil)	POL (wt% of EOM/Oil)	ASP (wt% of EOM/Oil)	HC (wt% of EOM/Oil)
15/3-7	Oil	MDT2B	4224	13120	63.4	34.1	2.5	0.0	97.5
EDC99	Mud			13397	99.6	0.0	0.4	0.0	99.6

Table 7. Density and topping

Well	Sample type	Sample name	Lower Depth	APT ID	Density (g/cm ³)	°API	Topped oil
15/3-7	Oil	MDT2B	4224	13120			78.8

Table 8. Gas Composition

Well	Sample type	Sample name	Lower Depth	APT ID	C1%	C2%	C3%	iC4%	nC4%	iC5%	nC5%	CO2%	Sum C1-C5	Wetness	iC4/nC4	ppm
15/3-7	Gas	MDT2B	4224	13054	58.8	10.0	7.0	0.9	2.8	0.7	1.0	18.9	81.2	26.0	0.32	

Table 9. Gas Isotopes

Well	Sample type	Sample name	Lower Depth	APT ID	C1 $\delta^{13}C$	C2 $\delta^{13}C$	C3 $\delta^{13}C$	iC4 $\delta^{13}C$	nC4 $\delta^{13}C$	iC5 $\delta^{13}C$	nC5 $\delta^{13}C$	CO2 $\delta^{13}C$	C1 δD	CO2 $\delta^{18}O$
15/3-7	Gas	MDT2B	4224	13054	-50.9	-34.9	-29.5	-30.8	-28.5			2.4		-12.3

Table 10. Isotopes of fractions, $\delta^{13}C$ (‰ PDB)

Well	Sample type	Sample name	Lower Depth	APT ID	Oil/EOM	Sat	Aro	Pol	Asp
15/3-7	Oil	MDT2B	4224	13120	-28.3	-28.8	-27.7	-27.6	

Table 11. GC of Whole Oil (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	IS 2,2,4-TMC5	n-C3	i-C4	n-C4	i-C5	n-C5	2,2-DMC4	CyC5	2,3-DMC4	2-MC5	3-MC5	n-C6
15/3-7	Oil	MDT2B	4224	13120	1.73e4	2.05e3	1.08e3	5.82e3	5.80e3	1.19e4	2.55e2	1.89e3	1.03e3	8.79e3	5.63e3	2.09e4

Table 11. continued, GC of Whole Oil (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	2,2-DMC5	MCyC5	2,4-DMC5	2,2,3-TMC4	Benz	3,3-DMC5	CyC6	2-MC6	2,3-DMC5	1,1-DMCyC5	3-MC6	c-1,3-DMCyC5
15/3-7	Oil	MDT2B	4224	13120	4.02e2	1.01e4	1.14e3	6.48e1	1.43e4	3.62e2	2.04e4	7.67e3	2.95e3	1.94e3	9.19e3	2.65e3

Table 11. continued, GC of Whole Oil (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	t-1,3-DMCyC5	3-EC5	t-1,2-DMCyC5	n-C7	c-1,2-DMCyC5	MCyC6	1,1,3-TMCyC5	ECyC5	2,5-DMC6	2,2,3-TMC5/2,4-DMC6	c,t-1,2,4-TMCyC5	3,3-DMC6
15/3-7	Oil	MDT2B	4224	13120	2.49e3	7.15e2	4.22e3	2.84e4	0.00e0	3.52e4	2.23e3	1.62e3	1.16e3	1.85e3	1.73e3	5.15e2



Table 11. continued, GC of Whole Oil (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	t,c-1,2,3-TMCyC5	2,3,4-TMC5	Tol	2,3-DMC6	2-MC7	4-MC7	3-MC7	c-1,3-DMCyC6	t-1,4-DMCyC6	1,1-DMCyC6	t-1,2-DMCyC6	n-C8
15/3-7	Oil	MDT2B	4224	13120	1.65e3	4.88e2	4.85e4	2.67e3	1.02e4	3.32e3	6.49e3	6.65e3	2.67e3	1.50e3	2.70e3	2.93e4

Table 11. continued, GC of Whole Oil (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	E-CyC6	i-C9	E-Benz	m-Xyl	p-Xyl	4-MC8	2-MC8	3-MC8	o-Xyl	n-C9	i-C10	n-C10
15/3-7	Oil	MDT2B	4224	13120	1.13e4	3.26e3	8.56e3	2.57e4	8.95e3	3.73e3	4.74e3	5.40e3	1.52e4	2.72e4	4.88e3	2.36e4

Table 11. continued, GC of Whole Oil (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	i-C11	n-C11	n-C12	i-C13	i-C14	n-C13	i-C15	n-C14	i-C16	n-C15	n-C16	i-C18
15/3-7	Oil	MDT2B	4224	13120	4.41e3	2.07e4	1.83e4	3.24e3	2.92e3	1.63e4	3.36e3	1.48e4	6.06e3	1.39e4	1.13e4	2.54e3

Table 11. continued, GC of Whole Oil (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	n-C17	i-C19	n-C18	i-C20	n-C19	n-C20	n-C21	n-C22	n-C23	n-C24	n-C25
15/3-7	Oil	MDT2B	4224	13120	1.02e4	4.36e3	8.86e3	3.41e3	8.82e3	7.72e3	7.36e3	6.71e3	5.71e3	4.37e3	2.95e3



Table 12. GC of Whole Oil (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	IS 2,2,4-TMC5	n-C3	i-C4	n-C4	i-C5	n-C5	2,2-DMC4	CyC5	2,3-DMC4	2-MC5	3-MC5	n-C6
15/3-7	Oil	MDT2B	4224	13120	7.14e6	8.72e5	4.53e5	2.44e6	2.42e6	4.97e6	1.06e5	7.64e5	4.27e5	3.64e6	2.33e6	8.69e6

Table 12. continued, GC of Whole Oil (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	2,2-DMC5	MCyC5	2,4-DMC5	2,2,3-TMC4	Benz	3,3-DMC5	CyC6	2-MC6	2,3-DMC5	1,1-DMCyC5	3-MC6	c-1,3-DMCyC5
15/3-7	Oil	MDT2B	4224	13120	1.66e5	4.11e6	4.72e5	2.68e4	5.37e6	1.49e5	8.27e6	3.17e6	1.22e6	7.87e5	3.80e6	1.07e6

Table 12. continued, GC of Whole Oil (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	t-1,3-DMCyC5	3-EC5	t-1,2-DMCyC5	n-C7	c-1,2-DMCyC5	MCyC6	1,1,3-TMCyC5	ECyC5	2,5-DMC6	2,2,3-TMC5/2,4-DMC6	c,t-1,2,4-TMCyC5	3,3-DMC6
15/3-7	Oil	MDT2B	4224	13120	1.01e6	2.95e5	1.71e6	1.18e7	0.00e0	1.43e7	9.05e5	6.55e5	4.79e5	7.61e5	7.01e5	2.12e5



Table 12. continued, GC of Whole Oil (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	t,c-1,2,3-TMCyC5	2,3,4-TMC5	Tol	2,3-DMC6	2-MC7	4-MC7	3-MC7	c-1,3-DMCyC6	t-1,4-DMCyC6	1,1-DMCyC6	t-1,2-DMCyC6	n-C8
15/3-7	Oil	MDT2B	4224	13120	6.69e5	2.01e5	1.84e7	1.10e6	4.19e6	1.37e6	2.68e6	2.69e6	1.08e6	6.07e5	1.09e6	1.21e7

Table 12. continued, GC of Whole Oil (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	E-CyC6	i-C9	E-Benz	m-Xyl	p-Xyl	4-MC8	2-MC8	3-MC8	o-Xyl	n-C9	i-C10	n-C10
15/3-7	Oil	MDT2B	4224	13120	4.56e6	1.34e6	3.28e6	9.86e6	3.43e6	1.53e6	1.95e6	2.22e6	5.82e6	1.12e7	2.00e6	9.71e6

Table 12. continued, GC of Whole Oil (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	i-C11	n-C11	n-C12	i-C13	i-C14	n-C13	i-C15	n-C14	i-C16	n-C15	n-C16	i-C18
15/3-7	Oil	MDT2B	4224	13120	1.81e6	8.48e6	7.50e6	1.33e6	1.19e6	6.67e6	1.37e6	6.04e6	2.47e6	5.67e6	4.61e6	1.04e6

Table 12. continued, GC of Whole Oil (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	n-C17	i-C19	n-C18	i-C20	n-C19	n-C20	n-C21	n-C22	n-C23	n-C24	n-C25
15/3-7	Oil	MDT2B	4224	13120	4.16e6	1.78e6	3.62e6	1.39e6	3.60e6	3.15e6	3.00e6	2.74e6	2.32e6	1.78e6	1.20e6

Table 13. GC of saturated compounds (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	n-C10	n-C11	n-C12	i-C13	i-C14	n-C13	i-C15	n-C14	i-C16	n-C15	n-C16	i-C18
15/3-7	Oil	MDT2B	4224	13120	5.06e5	4.74e5	4.42e5	8.19e4	7.87e4	4.29e5	7.69e4	4.03e5	1.39e5	3.77e5	3.39e5	9.22e4
EDC99	Mud			13397	0.00e0	3.53e3	1.30e4	7.87e3	0.00e0	6.27e4	0.00e0	1.81e5	7.11e4	9.60e4	1.35e4	0.00e0

Table 13. continued, GC of saturated compounds (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	n-C17	Pr	n-C18	Ph	n-C19	n-C20	n-C21	n-C22	n-C23	n-C24	n-C25	n-C26
15/3-7	Oil	MDT2B	4224	13120	3.02e5	1.36e5	2.50e5	9.91e4	2.27e5	2.01e5	1.68e5	1.51e5	1.36e5	1.24e5	1.03e5	8.36e4
EDC99	Mud			13397	1.91e3	0.00e0	4.12e2	0.00e0	1.64e2	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0

Table 13. continued, GC of saturated compounds (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	n-C27	n-C28	n-C29	n-C30	n-C31	n-C32	n-C33	n-C34	n-C35	n-C36
15/3-7	Oil	MDT2B	4224	13120	7.17e4	5.54e4	4.28e4	3.14e4	2.26e4	1.52e4	9.41e3	8.12e3	3.98e3	2.41e3
EDC99	Mud			13397	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0

Table 14. GC of saturated compounds (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	n-C10	n-C11	n-C12	i-C13	i-C14	n-C13	i-C15	n-C14	i-C16	n-C15	n-C16	i-C18
15/3-7	Oil	MDT2B	4224	13120	1.25e7	1.17e7	1.09e7	2.02e6	1.95e6	1.06e7	1.90e6	9.97e6	3.44e6	9.32e6	8.37e6	2.28e6
EDC99	Mud			13397	0.00e0	5.16e5	1.90e6	1.15e6	0.00e0	9.17e6	0.00e0	2.64e7	1.04e7	1.40e7	1.97e6	0.00e0

Table 14. continued, GC of saturated compounds (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	n-C17	Pr	n-C18	Ph	n-C19	n-C20	n-C21	n-C22	n-C23	n-C24	n-C25	n-C26
15/3-7	Oil	MDT2B	4224	13120	7.47e6	3.36e6	6.19e6	2.45e6	5.62e6	4.98e6	4.16e6	3.73e6	3.37e6	3.07e6	2.55e6	2.07e6
EDC99	Mud			13397	2.79e5	0.00e0	6.03e4	0.00e0	2.40e4	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0

Table 14. continued, GC of saturated compounds (amounts in ng/g)

Well	Sample type	Sample name	Lower Depth	APT ID	n-C27	n-C28	n-C29	n-C30	n-C31	n-C32	n-C33	n-C34	n-C35	n-C36
15/3-7	Oil	MDT2B	4224	13120	1.77e6	1.37e6	1.06e6	7.75e5	5.58e5	3.75e5	2.32e5	2.01e5	9.82e4	5.96e4
EDC99	Mud			13397	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0	0.00e0

Table 15. GC of aromatic compounds (peak area)

Well	Sample type	Sample name	Lower Depth	APT ID	2-MN	1-MN	P	3-MP	2-MP	9-MP	1-MP
15/3-7	Oil	MDT2B	4224	13120	57573	60010	9201	6333	6847	11605	9835



Table 16. GCMS SIR of saturated compounds (peak height)

m/e							177										191			
Well	Sample type	Sample name	Lower Depth	APT ID	25nor28αβ	25nor30αβ	20/3	21/3	23/3	24/3	25/3R	25/3S	24/4	26/3R	26/3S	28/3R				
15/3-7	Oil	MDT2B	4224	13120	7.13e5	0.00e0	1.15e6	1.48e6	1.93e6	1.88e6	8.00e5	8.01e5	1.20e6	8.15e5	7.04e5	6.74e5				

Table 16. continued, GCMS SIR of saturated compounds (peak height)

m/e							191									
Well	Sample type	Sample name	Lower Depth	APT ID	28/3S	29/3R	29/3S	27Ts	27Tm	30/3R	30/3S	28αβ	25nor30αβ	29αβ	29Ts	30d
15/3-7	Oil	MDT2B	4224	13120	7.44e5	1.14e6	1.11e6	6.31e6	1.45e6	9.72e5	7.63e5	1.37e6	0.00e0	4.48e6	4.55e6	3.91e6

Table 16. continued, GCMS SIR of saturated compounds (peak height)

M/e							191									
Well	Sample type	Sample name	Lower Depth	APT ID	29βα	30O	30αβ	30βα	31αβS	31αβR	30G	32αβS	32αβR	33αβS	33αβR	34αβS
15/3-7	Oil	MDT2B	4224	13120	5.90e5	0.00e0	1.59e7	1.70e6	6.05e6	4.49e6	1.10e6	5.00e6	3.38e6	3.37e6	2.14e6	1.85e6



Table 16. continued, GCMS SIR of saturated compounds (peak height)

m/e				191			217									
Well	Sample type	Sample name	Lower Depth	APT ID	34 α β R	35 α β S	35 α β R	21 $\alpha\alpha$	21 $\beta\beta$	22 $\alpha\alpha$	22 $\beta\beta$	27dbS	27dbR	27daR	27daS	28dbS#1
15/3-7	Oil	MDT2B	4224	13120	1.23e6	1.70e6	1.20e6	2.68e6	3.03e6	2.44e6	1.46e6	8.40e6	4.90e6	2.12e6	2.61e6	3.68e6

Table 16. continued, GCMS SIR of saturated compounds (peak height)

m/e				217												
Well	Sample type	Sample name	Lower Depth	APT ID	28dbS#2	28dbR#1	28dbR#2	28daR	27 $\alpha\alpha$ S	27 $\beta\beta$ R+29dbS	27 $\beta\beta$ S	28daS	27 $\alpha\alpha$ R	29dbR	29daR	28 $\alpha\alpha$ S
15/3-7	Oil	MDT2B	4224	13120	3.75e6	2.06e6	2.53e6	1.60e6	1.76e6	6.06e6	2.41e6	1.27e6	1.51e6	4.03e6	2.18e6	5.79e5

Table 16. continued, GCMS SIR of saturated compounds (peak height)

m/e				217								218				
Well	Sample type	Sample name	Lower Depth	APT ID	29daS	28 $\beta\beta$ R	28 $\beta\beta$ S	28 $\alpha\alpha$ R	29 $\alpha\alpha$ S	29 $\beta\beta$ R	29 $\beta\beta$ S	29 $\alpha\alpha$ R	30 $\alpha\alpha$ S	30 $\beta\beta$ R	30 $\beta\beta$ S	30 $\alpha\alpha$ R
15/3-7	Oil	MDT2B	4224	13120	2.09e6	1.96e6	2.92e6	8.52e5	1.99e6	2.77e6	2.49e6	1.43e6	8.68e5	1.03e6	6.52e5	4.35e5

Table 16. continued, GCMS SIR of saturated compounds (peak height)

Well	Sample type	Sample name	Lower Depth	APT ID	218							
					27 β R	27 β S	28 β R	28 β S	29 β R	29 β S	30 β R	30 β S
15/3-7	Oil	MDT2B	4224	13120	4.16e6	3.51e6	2.77e6	3.49e6	4.22e6	3.96e6	1.11e6	9.73e5



Table 17. GCMS SIR of saturated compounds (amounts in ng/g)

m/e		177														
Well	Sample type	Sample name	Lower Depth	APT ID	25nor28αβ	25nor30αβ	20/3	21/3	23/3	24/3	25/3R	25/3S	24/4	26/3R	26/3S	28/3R
15/3-7	Oil	MDT2B	4224	13120	3.39e3	0.00e0	5.49e3	7.03e3	9.18e3	8.95e3	3.80e3	3.81e3	5.73e3	3.88e3	3.35e3	3.21e3

Table 17. continued, GCMS SIR of saturated compounds (amounts in ng/g)

m/e		191														
Well	Sample type	Sample name	Lower Depth	APT ID	28/3S	29/3R	29/3S	27Ts	27Tm	30/3R	30/3S	28αβ	25nor30αβ	29αβ	29Ts	30d
15/3-7	Oil	MDT2B	4224	13120	3.54e3	5.42e3	5.28e3	3.00e4	6.88e3	4.62e3	3.63e3	6.53e3	0.00e0	2.13e4	2.16e4	1.86e4

Table 17. continued, GCMS SIR of saturated compounds (amounts in ng/g)

m/e		191														
Well	Sample type	Sample name	Lower Depth	APT ID	29βα	30O	30αβ	30βα	31αβS	31αβR	30G	32αβS	32αβR	33αβS	33αβR	34αβS
15/3-7	Oil	MDT2B	4224	13120	2.81e3	0.00e0	7.58e4	8.08e3	2.88e4	2.13e4	5.23e3	2.38e4	1.61e4	1.60e4	1.02e4	8.82e3



Table 17. continued, GCMS SIR of saturated compounds (amounts in ng/g)

M/e		191						217								
Well	Sample type	Sample name	Lower Depth	APT ID	34 α β R	35 α β S	35 α β R	21 $\alpha\alpha$	21 $\beta\beta$	22 $\alpha\alpha$	22 $\beta\beta$	27dbS	27dbR	27daR	27daS	28dbS#1
15/3-7	Oil	MDT2B	4224	13120	5.84e3	8.09e3	5.70e3	1.28e4	1.44e4	1.16e4	6.94e3	4.00e4	2.33e4	1.01e4	1.24e4	1.75e4

Table 17. continued, GCMS SIR of saturated compounds (amounts in ng/g)

M/e		217														
Well	Sample type	Sample name	Lower Depth	APT ID	28dbS#2	28dbR#1	28dbR#2	28daR	27 $\alpha\alpha$ S	27 $\beta\beta$ R+29dbS	27 $\beta\beta$ S	28daS	27 $\alpha\alpha$ R	29dbR	29daR	28 $\alpha\alpha$ S
15/3-7	Oil	MDT2B	4224	13120	1.78e4	9.79e3	1.20e4	7.63e3	8.37e3	2.88e4	1.14e4	6.03e3	7.18e3	1.92e4	1.03e4	2.75e3

Table 17. continued, GCMS SIR of saturated compounds (amounts in ng/g)

M/e		217								218						
Well	Sample type	Sample name	Lower Depth	APT ID	29daS	28 $\beta\beta$ R	28 $\beta\beta$ S	28 $\alpha\alpha$ R	29 $\alpha\alpha$ S	29 $\beta\beta$ R	29 $\beta\beta$ S	29 $\alpha\alpha$ R	30 $\alpha\alpha$ S	30 $\beta\beta$ R	30 $\beta\beta$ S	30 $\alpha\alpha$ R
15/3-7	Oil	MDT2B	4224	13120	9.96e3	9.33e3	1.39e4	4.05e3	9.44e3	1.32e4	1.19e4	6.82e3	4.13e3	4.90e3	3.10e3	2.07e3

Table 17. continued, GCMS SIR of saturated compounds (amounts in ng/g)
 m/e 218

Well	Sample type	Sample name	Upper Depth	Lower Depth	APT ID	27βR	27βS	28βR	28βS	29βR	29βS	30βR	30βS
15/3-7	Oil	MDT2B		4224	13120	1.98e4	1.67e4	1.32e4	1.66e4	2.01e4	1.89e4	5.27e3	4.63e3

Table 18. GCMS SIR of aromatic compounds (peak height)

m/e				142				156								
Well	Sample type	Sample name	Lower Depth	APT ID	2-MN	1-MN	2-EN	1-EN	2,6-DMN	2,7-DMN	1,3- + 1,7-DMN	1,6-DMN	2,3- + 1,4-DMN	1,5-DMN	1,2-DMN	1,8-DMN
15/3-7	Oil	MDT2B	4224	13120	7.24e8	6.37e8	4.14e7	2.55e7	1.53e8	1.71e8	4.57e8	3.48e8	1.19e8	1.05e8	5.23e7	1.60e5

Table 18. continued, GCMS SIR of aromatic compounds (peak height)

m/e				170							178		192			
Well	Sample type	Sample name	Lower Depth	APT ID	1,3,7-TMN	1,3,6-TMN	1,3,5- + 1,4,6-TMN	2,3,6-TMN	1,2,7-TMN	1,6,7 + 1,2,6-TMN	1,2,4-TMN	1,2,5-TMN	P	3-MP	2-MP	9-MP
15/3-7	Oil	MDT2B	4224	13120	1.05e8	1.35e8	1.40e8	7.27e7	2.57e7	7.64e7	1.34e7	4.23e7	1.71e8	8.65e7	9.22e7	1.85e8

Table 18. continued, GCMS SIR of aromatic compounds (peak height)

m/e				192		206							219			
Well	Sample type	Sample name	Lower Depth	APT ID	1-MP	2-EP+9-EP+3,6-DMP	1-EP	2,6- + 2,7- + 3,5-DMP	1,3- + 2,10- + 3,9- + 3,10-DMP	1,6- + 2,5- + 2,9-DMP	1,7-DMP	2,3-DMP	1,9- + 4,9- + 4,10-DMP	1,8-DMP	1,2-DMP	Retene
15/3-7	Oil	MDT2B	4224	13120	1.38e8	1.44e7	2.32e7	1.34e7	1.39e8	6.36e7	6.22e7	1.56e7	4.96e7	1.90e7	9.58e6	3.89e6



Table 18. continued, GCMS SIR of aromatic compounds (peak height)

Well	Sample type	Sample name	Lower Depth	APT ID	184	198	253									
					DBT	4-MDBT	(3+2)-MDBT	1-MDBT	C21MA	C22MA	bSC27MA	bSC27DMA	bRC27MA+b RC27DMA	aSC27MA	bSC28MA+bS C28DMA+aR C27DMA	aSC27DMA
15/3-7	Oil	MDT2B	4224	13120	3.33e7	7.75e7	3.16e7	1.70e7	1.24e6	8.54e5	1.34e5	5.14e5	4.21e5	1.72e5	6.16e5	1.43e5

Table 18. continued, GCMS SIR of aromatic compounds (peak height)

Well	Sample type	Sample name	Lower Depth	APT ID	253						231					
					aRC27MA	aSC28MA	bRC28MA+b RC28DMA	bSC29MA+bS C29DMA	aSC29MA	aRC28MA+b RC29MA+bR C29DMA	aRC29MA	C20TA	C21TA	SC26TA	RC26TA+SC2 7TA	SC28TA
15/3-7	Oil	MDT2B	4224	13120	1.00e5	2.23e5	4.03e5	4.62e5	1.14e5	3.58e5	8.22e4	3.92e6	3.69e6	5.27e5	1.28e6	8.00e5

Table 18. continued, GCMS SIR of aromatic compounds (peak height)

Well	Sample type	Sample name	Lower Depth	APT ID	231	
					RC27TA	RC28TA
15/3-7	Oil	MDT2B	4224	13120	6.02e5	7.76e5

Experimental Procedures

All procedures follow NIGOGA, 4th Edition. Below are brief descriptions of procedures/analytical conditions.

GC analysis of gas components

Aliquots of 0.1 ml are sampled with a syringe for analysis on a Porabond Q column on a Carlo Erba HRGC 5300 equipped with a flame ionisation (FID) and a thermal conductivity (TCD) detector. The detection limit for the hydrocarbon gas components is 0.001 µl/ml, for CO₂ 0.05 µl/ml.

Stable isotope analysis of gas compounds

5-10 ml of the gas is sampled with a syringe and then separated into the different gas components by a Carlo Erba 4200 gas chromatograph. The hydrocarbon gas components are oxidised in separate CuO-ovens in order to prevent cross contamination. The combustion products CO₂ and H₂O are frozen into collection vessels and separated.

The combustion water is reduced with zinc metal in sealed quartz tubes to prepare hydrogen for isotopic analysis. The isotopic measurements are performed on a Finnigan MAT 251 and a Finnigan Delta mass spectrometer.

The analytical procedures are tested with a laboratory gas standard mixture. Based on repeated analysis of the gas standard, the reproducibility in the $\delta^{13}\text{C}$ value is better than 0.5 ‰ PDB for all components. The reproducibility in the δD value is likewise better than 10 ‰.

Topping

A rotavapor is used and ~ 1ml of oil is weighted accurately into a small round bottom flask. The oil is evaporated for 15 min at 90°C with the water pump turned to maximum. After the evaporation the oil is weighted again.

One aliquot of NSO-1 is run as a reference sample together with the topping series.

Deasphalting

The extract is evaporated almost to dryness before a small amount of dichloromethane (3 times the amount of EOM) is added. Then pentane is added in excess (40 times the volume of EOM and dichloromethane). The solution is stored for at least 12 hours in a dark place before the solution is filtered or centrifuged and the weight of the asphaltenes measured.

Iatroscan

An Iatroscan MK-5 (TLC/FID Analyser) instrument is used. 2 µl of extract or diluted oil is spotted on Chromarod S-III rods before elution in hexane (25 min), toluene (8 min) and dichloromethane with 7 % methanol (vol/vol). The solvent is allowed to evaporate before the rods are placed into the next elution chamber. Before running the rods in the analyser, the rods are heated for 90 sec. in a heating chamber at 60 °C.

MPLC

The MPLC is constructed as described by Radke et al. (1980). The system includes two HPLC pumps, sample injector, sample collector, RI-detector, UV-detector and two packed columns. The pre column is filled with Kieselgel 100, which is heated at 600 °C for 2 hours to

deactivate it. The main column is a LiChroprep Si60, which is heated at 120 °C for 2 hours to make it water free.

Approximately 30 mg of deasphalted oil or EOM diluted in 1 ml hexane is injected and separated into a saturated, an aromatic and a polar fraction.

Stable carbon isotope analysis of oil, EOM and kerogen

The samples are dissolved in a known amount of dichloromethane, and 1-2 mg of the sample (or as much as possible) is then transferred to a glass container. The solvent is evaporated in an oven at 50 °C. CuO and some silver wires are added to the containers, which are then sealed by melting in a vacuum. The samples are then combusted in an oven at 550 °C for 1 hour (Sofer, 1980). The combustion products CO₂ and H₂O are separated at -80°C before the isotopic ratio is determined on a Finnigan MAT 251 mass spectrometer.

A standard (NGS NSO-1, topped oil) is analysed for each 10th sample. The δ¹³C value obtained for this standard is -28.76 ‰ PDB. The variation in the isotopic values for the standard by repeated analysis over a period of five years is ± 0.13 ‰.

GC of whole oil

A HP5890 II instrument is used. The column is a HP PONA, length 50 m, i.d. 0.2 mm, film thickness 0.5 µm. 2,2,4-tri-methane-pentane is used as an internal standard.

Temperature programme

30 °C (10 min.) - 2 °C/min. - 60 °C (10 min.)- 2 °C/min - 240 °C (60 min.)

GC of saturated fraction

A HP5890 II instrument is used. The column is a CP-Sil-5 CB-MS, length 25 m, i.d. 0.25 mm, film thickness 0.25 µm., C20D42 is used as an internal standard.

Temperature programme

50 °C (1 min.) - 4 °C/min. - 310 °C (25 min.)

GC of aromatic fraction

A HP5890 instrument is used. The column is a CP-Sil-8 CB, length 50 m, i.d. 0.25 mm, film thickness 0.25 µm.

Temperature programme

50 °C (1 min.) - 4 °C/min. - 310 °C (25 min.)

GCMS of saturated fractions

A Micromass ProSpec high resolution instrument is used. The instrument is tuned to a resolution of 3000 and data is acquired in Selected Ion Recording (SIR) mode. The column used is a 60 m CP-Sil-5 CB-MS with an i.d. of 0.25 mm and a film thickness 0.25 µm. d4-27ααR is used as internal standard when quantitative results are requested.

Temperature programme

50 °C (1 min.) - 20 °C/min. - 120 °C - 2 °C/min - 320 °C (20 min.)

GCMS of aromatic fractions

A Micromass ProSpec high resolution instrument is used. The instrument is tuned to a resolution of 3000 and data is acquired in Selected Ion Recording (SIR) mode. The column used is a 60 m CP-Sil-5 CB-MS with an i.d. of 0.25 mm and a film thickness 0.25 μm .

Temperature programme

50 °C (1 min.) - 20 °C/min. - 120 °C - 2 °C/min - 320 °C (20 min.)