

FMT LOG RUN NO.1A										
Test No.	Depth m MD RKB	Depth m TVD RKB	Hydro-static before kPa	QDYNE Formation pressure kPa	Hydro-static after kPa	Flowing pressure kPa	Fill time sec.	Temp °C	Good seal Y/N	Remarks
1	3022.00	2654.40	41987	30990	41913	21916			Y	Tight (aborted)
2	3022.30	2654.60	41952	29218	41879	23380			Y	Tight (aborted)
3	3029.60	2659.90	41999	40065	41963	31838	14.1		Y	
4	3034.20	2663.30	42039	40076	41976	30239	5.5		Y	
5	3039.50	2667.20	42057	40088		40079	0.5		Y	Segregated sample
6	3050.60	2675.40	42074	39188	42048	39096	5.7		Y	Pressure unstable
7	3112.90	2723.10	43019	38442	42954	38252	5.6		Y	
8	3113.90	2723.90	42984	40339	42941	38115	6.7		Y	Pressure unstable
9	3118.80	2727.80	43025	40124	42978	37954	6.7		Y	Pressure unstable
10	3146.00	2749.50	43376	38638	43301	37980	6.7		Y	Pressure still increasing
11	3270.50	2849.30	45103	39136	45031	38918	3.0		Y	Pressure still increasing
12	3452.60	2996.60	47511	42844	47452	42169	3.8		Y	Supercharged?
13	3456.50	2999.60	47517	42861	47467	42811	3.4		Y	
14	3462.00	3004.20	47561	42887	47517	42837	3.0		Y	
15	3469.00	3009.90	47631	42916	47595	42903	2.2		Y	
16	3481.20	3019.80	47785	42971	47754	42977	3.2		Y	
17	3473.00	3013.10	47636	42934	47579	41857	2.7		Y	
18	3486.50	3024.00	47810	42996	47783	42980	3.2		Y	
19	3489.00	3026.00	47811	43009	47776	42726	6.2		Y	
20	3491.60	3028.10	47821	43016	47793	42971	2.2		Y	

Table 3.3.1

FMT-RESULTS, RUN 1A										
Test No.	Depth m MD RKB	Depth m TVD RKB	Hydro-static before kPa	QDYNE Formation pressure kPa	Hydro-static after kPa	Flowing pressure kPa	Fill time sec.	Temp °C	Good seal Y/N	Remarks
21	3505.60	3039.30	48014	43083	47971	43034	6.2		Y	
22	3510.10	3042.90	48058	43107	48022	43081	6.0		Y	
23	3534.50	3062.60	48406	43224	48402	43150	11.0		Y	
24	3537.30	3064.80	48430	43239	48427	43212	12.0		Y	
25	3563.80	3086.10	48782	43367	48779	43307	12.5		Y	
26	3567.50	3089.00	48815	43382	48781	43337	16.5		Y	
27	3570.00	3091.00	48832	43394	48798	42487	14.2		Y	
28	3581.50	3100.30	48986	43445	48939	42772	16.7		Y	
29	3583.20	3101.60	48980	41410	48935	35566	16.7		Y	
30	3596.00	3111.90	49152	41429	49091	39767	16.7		Y	Pressure still increasing
31	3603.50	3117.80	49208	43625	49168	41211	16.5		Y	
32	3622.10	3132.70	49462	43785	49440	41006	17.7		Y	
33	3626.20	3135.90	49486	43809	49461	38416	17.2		Y	
34	3642.00	3148.50	49697	43933	49677	43180	17.0		Y	
35	3650.50	3155.20	49802	44005	49772	42247	12.7		Y	
36	3655.00	3158.80	49846	44057	49796	39884	17.0		Y	
37	3663.60	3165.60	49918		49894	29034	17.9		Y	Tight
38	3674.00	3173.90	50108	44189	50078	42364	15.7		Y	
39	3686.60	3183.90	50276	44273	50288	39863	17.5		Y	
40	3698.00	3193.00	50441	44374	50394	40285	16.0		Y	

Table 3.3.2

FMT-RESULTS, RUN 1A-1G										
Test No.	Depth m MD RKB	Depth m TVD RKB	Hydro-static before kPa	QDYNE Formation pressure kPa	Hydro-static after kPa	Flowing pressure kPa	Fill time sec.	Temp °C	Good seal Y/N	Remarks
41	3709.50	3202.10	50566	44452	50517	37407	14.7		Y	
42	3726.00	3215.40	50790	44593	50743	39535	0		Y	
43	3770.00	3251.10	51436	44975	51386	41289	17.7		Y	
44	3798.80	3274.70	51883	45208	51837	42362	17.7		Y	
45	3812.00	3285.60	52082	45323	52031	41693	17.4		Y	
46	3864.00	3328.90	52931	44080	52877	38852	14.9		Y	Tight
47	3863.40	3328.40	52875	45828	52844	40272	16.3		Y	
48	3456.50	2999.7	47504	42876		42826	0		Y	Run 1B Segregated sample
49	3112.90	2723.10	42947	38745		35171	7.2		Y	Run 1B
50	3642.00	3148.5	49858	43919	49689	25642	17.7		Y	Run 1C
51	3642.5	3148.9	49779	44016	49733	42795	16.7		Y	Run 1C
52	3643.00	3149.30	49698	43956			17.0		Y	Run 1C Segregated sample
53	3567.50	3089.00							Y	Run 1D Segregated sample
54	3812.00	3285.60							Y	Run 1E Segregated sample
55	3112.90	2723.10	42941	-	42917				Y	Run 1G Tight
56	3113.3	2723.5	42928	0	42880				Y	Run 1G Tight
57	3112.7	2723.0	42910	0	42865				Y	Run 1G Tight
58	3112.9	2723.2	42884	0	42910				Y	Run 1G Tight
59	3118.5	2726.6	42954	40168	42926	21346	17.7		Y	Run 1G
60	3118.9	2728.0	42950	40173	42914	26455	16.7		Y	Run 1G
61	3113.9	2724.0	42871	0	42839	20737	17.0		Y	Run 1G Tight
62	3039.40	2667.10	41948	39968	41923	39959	2.2		Y	Run 1G Segregated sample

Table 3.3.3

**FMT SAMPLING WELL 34/10-38S**

Run no.	1A	1B	1C	1D	1E	1G
Depth m MD RKB	3039.4	3456,5	3643,0	3567,5	3812.0	3039.4
<b>22.7 litre chamber</b>						
Opening pressure, bar	210	193	90	178	14	159
Flowing pressure, bar	400.3	305	422	369	-	279
Oil volume, litre	-	10	14	12.3	0	0.7?
Condensate/filtrate, liter	2.5	-	-	-	0	-
Water volume, liter	0	-	3,5	0	16	0.6
Mud filtrate, liter	-	-	-	-	3	2.7
Gas volume, litre	1458	1260	334	820	9	1235
Oil density, g/cm <sup>3</sup> (1)	0.780	0.830	0.837	0.858	-	0.795
H <sub>2</sub> S, ppm	@ 8.7 °C	@ 7 °C	@ 9.8 °C	@ 12 °C		@ 8.1 °C
CO <sub>2</sub> , %	0	0	15	0		0.1
	1.0	1.0	-	1.0		0.6
<b>4 litre chamber</b>						
Opening pressure, bar	172	179	124	179	0 <sup>(2)</sup>	159
Flowing pressure, bar	-	304	256	365	-	325
FMT chamber no.:	195XA 152653	1956XA 152652	1956XA 152655	1956XA 152663	1956XA 152656	1956XA 152655

(1) Densities measured with MWS's Densimeter DMA 35

Table 3.3.4

(2) 4 litre chambers emptied offshore. Contained 3 l water/filtrate and 5 l gas.

### 3.4 Well Testing

One commingled test (DST 1A and 1B) was performed in well 34/10-38S in the Statfjord Formation.

DST 1A, perforated interval 3637.0-3646.0 m MD RKB:

The main objective with DST 1A was to determine the type of movable fluids in a zone below the oil/water contact where oil shows on cuttings, low hydrocarbon saturation from the log interpretation and oil in the FMT sample taken at 3643 indicated presence of oil (residual or movable?). Secondary objectives were to collect representative fluid samples (water or hydrocarbons) and to obtain data for determination of reservoir properties. All test objectives were fulfilled.

The Statfjord Formation was perforated from 3637.0 to 3646.0 m MD RKB and the well flowed formation water with a rate of 23 Sm<sup>3</sup>/d. Production data are listed in table 3.4.1.

DST 1B, perforated interval 3637.0-3646.0, 3561.0-3570.0 m MD RKB:

The main objective with DST 1B was to collect representative fluid samples from the oil bearing Statfjord Formation. Secondary objectives were to obtain data for determination of reservoir properties and to detect possible reservoir boundaries. All test objectives were fulfilled.

In addition to the zone tested in DST 1A (3637.0-3646.0), the Statfjord Formation was perforated from 3561.0-3570.0 m MD RKB and the well flowed oil with an oil rate of 858 Sm<sup>3</sup>/d through a 36/64" choke. Production data from the flow period are listed in table 3.4.1.

**PRODUCTION DATA**

DST No.	IA	1B
Formation	Statfjord	Statfjord
Perforated interval, m MD RKB	3637.0-3646.0	3637.0-3646.0, 3561.0-3570.0
Perforated interval, m TVD MSL	3121.5 - 3128.6	3121.5 - 3128.6, 3060.8-3068.0
<b>PRODUCTION DATA</b>		
Choke size 1/64"	64	36
Oil flow rate, Sm <sup>3</sup> /day	0	858
Gas flow rate, Sm <sup>3</sup> /Sm <sup>3</sup>	0	199056
GOR, Sm <sup>3</sup> /Sm <sup>3</sup>	-	232
Water flow rate, Sm <sup>3</sup> /day	23	0
Bottomhole flowing pressure at 3528.7 m MD RKB /3034.9 m TVD MSL, kPa	30594	39965
Bottomhole flowing temperature, °C	113.2	115.4
Flowing wellhead pressure, kPa	290	17430
Flowing wellhead temperature, °C	12.1	72.2
CO <sub>2</sub> , %	3.3	1.3
H <sub>2</sub> S, ppm	0	0
Oil density, kg/m <sup>3</sup>	-	846 @ 15°C
Gas gravity (air=1)	-	0.807
Formation water salinity, mg/l	38389	-
Formation water salinity, mg/l eq. NaCl	36483	-
Formation water density, kg/m <sup>3</sup>	1027 @ 20 °C	-
Formation water resistivity, ohmm	0.195 @ 20 °C	-

Table 3.4.1

### 3.5 FMT Summary

The complete FMT survey consists of run 1A o 1G.

The pressure points for gradients were obtained during run 1A. Data from the pressure survey are listed in table 3.3.1, 3.3.2 and 3.3.3. Six segregated FMT samples were collected in the Jurassic. Table 3.3.4 summarises the results from FTM fluid sampling.

Two segregated gas PVT samples were collected at 3039.4 m MD RKB in the Brent Group for analysis and comparison with Brent reservoir fluid from the well 34/10-17 (one back up sample since it was not planned to test the Brent sand).

One oil sample in the upper and one in the lower part of the oil bearing Statfjord Fm. were collected for studies of gravitational differences in fluid composition with depth. Samples were also collected in the Statfjord Fm. water zone at 3643 m and 3812 m respectively.

The hydrocarbons recovered in the sample at 3643 m is most likely residual oil being mobilised by oilbased mudfiltrat invading the formation. DST 1A teste the interval 3637.0 - 3646.0 m MD RKB and only formation water was recovered.

All samples were transferred offshore to Proserv 600 cc PVT bottles. A needle valve on the FMT chamber from run 1A (3039.4 m MD RKB) leaked during transferring and this sample is therefore considered as non-representative.

Due to poor reservoir quality only three representative pressure measurements were obtained within the Brent Group. A best fit gradient through these pressure points gives a gas gradient of  $0.326 \text{ g/cm}^3$ .

The FMT data indicate an oil gradient ranging from  $0.56$  to  $0.61 \text{ g/cm}^3$  (the oil gradient is slightly curved) i the Statfjord Formation down to the water contact at 300.5 m TVD MSL (3585.6 m MD RKB).

From approximately 3080.5 m TVD MSL a water gradient of  $1.047 \text{ g/cm}^3$  has been established. Due to poor reservoir quality no conclusive fluid gradient was established within the Cook Formation.

Anchor Drilling Fluids											Anchor Drilling Fluids	
<b>MUD VOLUME DISTRIBUTION SUMMARY</b>												
WELL: 34/10-38S											AREA: NORTH SEA	RIG: DEEPSEA BERGEN
Hole size	Hole From-to	Hole Length	Mud Built	Volume Received	Dumped	Lost to Formation	Lost on surface equipment	Mud left between csg/csg plus left in hole	cuttings volume drilled	Mud transf. to next section	Mud type used for interval	
inch	m	m	m3		m3	m3	m3	m3	m3	m3		
36	160 - 225	65	356	203	266	0	0	0	42,7	293	BENTONITE/CMC EHV	
26	225 - 670	445	227	354	401	0	0	0	152,4	473	BENTONITE/CMC EHV	
17 1/2	670 - 2075	1405	599	-236	303	45	405	83	218,0	0	ANCO 2000	
8 1/2	2075 - 3940	1865	191	279	25	0	64	0	68,3	381	SAFEMUL PE/SE	
TEST			595	-355	152	10	120	139		200	BENTONITE/LIGHTHIN	
<b>TOTALS</b>												
Volume Received:			245	m3	Total mud left/lost downhole:			277	m3			
Mud built:			1968	m3	Total mud to sea:			1736	m3			
Mud dumped:			1147	m3	Total cuttings volume drilled:			481,42	m3			
Mud lost to formation:			55	m3								
Mud lost over solids control equipment:			589	m3	<b>COMMENTS:</b> 36" SECTION: Returns to seabed.							
Mud left between csg/csg plus left in hole:			222	m3	26" SECTION: Returns to seabed.							
Final volume:			200	m3	17 1/2" SECTION: 83 m3 left behind casing. Received Anco 2000 mud from Conoco, transferred 236 m3 to well 6506/12-10.							
					8 1/2" SECTION: 25 m3 was dumped to sloptank, not to sea. Received 279 m3 and backloaded 355 m3 safemul PE/SE							
					TEST SECTION: Of 152 m3 dumped was 87 m3 dumped to slop( Oil contaminated), the rest was dumped to sea. Transferred 200 m3 Bentonite/Lighthin to well 34/10-39S							