

4.2 DRILLING FLUID SUMMARY

DISCUSSION BY INTERVAL

9 7/8" Pilot Hole with the 36" and 12 1/4" Hole openings

Operations

The 9 7/8" pilot hole was drilled to 1095 meters, a 36" hole opener was run to 465 meters before the 30" conductor was run to 444,5 meters and cemented. The hole was drilled with seawater and 8 m³ flocculated bentonite sweep every single. After the 30" conductor was run to 444,5 meters and cemented, the pilot hole was opened to 1140 meters with a 12 1/4" bit. The 12 1/4" hole was drilled with seawater and 5 m³ flocculated bentonite sweeps every single.

The BOP and riser were run and tested.

Mud Treatment

100 kg/m³ Bentonite was pre-hydrated, diluted back to 65 - 72 kg/m³ with seawater and flocculated with lime prior to pumping.

Volumes, Chemical Consumption's and Costs

1400 m³ was built during the section, losses were 1251 m³, and 149 m³ was transferred to the next section. The cost/m³ was 294,00 NOK.

	Consumption	Cost (NOK)
Barite	61 MT	46.970,00
Bentonite	146 MT	322.660,00
FLR-XL	25 sx	15.743,75
FLR	2 sx	1.259,50
Gluteraldehyde	1 DM	4.286,00
Lime	67 sx	2.345,00
Soda Ash	10 sx	640,00
IDVIS	4 sx	8.533,40
Red Tracer	1 sx	9.129,00
SECTION COST		411.566,00
PROGRAMMED		304.508,00
DIFFERENCE		107.058,65

8 1/2" Hole Section drilled with KCl/IDBOND Fluids System

Operations

The cement was tagged at 1118 meters and KCl/IDBOND drilling fluid at 1.45 SG was displaced into the hole while cutting and slipping the drill line. The casing shoe, the rat hole and 3 meters of new formation were drilled before a leak off test to 1.75 SG equivalent mud weight was performed.

The 8 1/2" section was drilled in one bit run to 1773 meters, with an average rate of penetration at 12 meter per hour. The 7" liner could subsequently be run and cemented with the shoe at 1732 meters. During cement operations 48 m³ of drilling fluid was lost to the formation.

Mud Treatment

The initial volume was made with the following concentrations:

Gluteraldehyde	0,33	kg/m ³
KCl	53	kg/m ³
Bentonite	10	kg/m ³
IDBOND P	0	kg/m ³
IDF FLR	2,9	kg/m ³
IDF FLR XL	5,7	kg/m ³
IDFLO	2,9	kg/m ³
IDVIS	0,25	kg/m ³

The rheology kept low until the mud was displaced into the hole to avoid losses off cold un-sheared mud at the shakers. After displacing the mud into the hole, 2,1 kg/m³ IDBOND P was added to the system and the rheology increased with additions off IDF FLR and IDVIS.

The rheology, fluid loss, and KCl concentrations were maintained during the section with additions off IDVIS, IDF FLR, IDF FLR XL, and KCl. For maintenance IDBOND P additions of 0,75 kg per meter drilled had to be performed in order to keep the level of inhibition required for shale stabilisation.

The table below gives typical fluid properties during the section drilling:

Fluid Density	1.45	SG
Plastic viscosity	26-28	cP
Yield point	18-23	lb/100ft ²
10 sec gel	2 - 5	lb/100ft ²
10 min gel	3-25	lb/100ft ²
pH	8,5-9,5	
KCl	45-55	kg/m ³
LGS	0-3.5	%
CEC equivalent	10-54	kg/m ³

Solids Control

The shakers were initially fitted with the following screens:

Shaker #	Shaker 2	Shaker #	Shaker #	
1		3	4	
50	50	50	38	Mesh
38	38	38	38	Mesh
38	24	24	24	Mesh

After 40 meters drilled the screens were changed to the following and maintained during the section:

Shaker #	Shaker 2	Shaker #	Shaker #	
1		3	4	
50	70	84	110	Mesh
38	70	84	110	Mesh
38	70	84	110	Mesh

Volumes, Chemical Consumption's and Costs

In this section 149 m³ was received from the last section, 378 m³ was the volume built, 374 m³ was the volume lost, and 153 m³ was transferred to the next section. The cost /m³ was NOK 901,25.

Product Name	Consumption	Cost
Barite	288 MT	221.760,00
Gluteraldehyde	1 DM	4.286,00
IDBOND-P	27 sx	22.119,75
IDF FLR	52 sx	32.747,00
IDF FLR XL	100 sx	62.975,00
IDFLO	65 sx	12.187,50
IDVIS	12 sx	25.600,00
KCl	20 MT	51.400,00
KCl Brine	58,05 m ³	33.418,00
Lime	5 sx	175,00
Soda Ash	2 sx	128,00
Mica Coarse	21 sx	2.010,75
Mica Fine	20 sx	1.915,00
Nutshell Coarse	27 sx	2.335,50
Nutshell Fine	22 sx	1.903,00
SECTION TOTAL		474.960,92
PROGRAMMED		239.493,00
DIFFERENCE		235.468,92

Of the 58.05 m³ KCl brine charged, 24.65 m³ costing NOK 14.190,51 were lost during the transfer from the boat to the rig.

6" Hole Section drilled with Sized Salt Fluids System

Operation

A 6" bit was run tagging the cement at 1685 meters. The KCl mud in the hole was displaced to a Sized Salt solids free fluids system with a density 1.25 SG. The float equipment and 1 meter of formation was then drilled to 1734 meters, where the leak off test performed indicated a formation strength equivalent to 1.57 sg mud weight.

After this initial drilling, coring operations initiated with the first run from 1736 meters to 1744.8 meters. The second core was cut from 1744.8 meters to 1764 meters and the third run from 1764 meters to 1774 meters.

Subsequently drilling continued to TD at 1950 meters. Whilst tripping out of the hole the drill string got stuck at 1770 meters. The pipe could be freed by firing the jars. No circulation was possible as the TOTCO had become stuck in the drill pipe.

Prior to the wireline logging, a wiper trip had to be performed. No problems were encountered when pulling out of the hole. Wireline work was then carried out lasting 4 days.

Mud Treatment

The initial drilling fluid volume of 245 m³ had the following composition:

Sodium Chloride Brine (1.20 SG)	230.00	m ³
THICKSAL PLUS	15.25	kg/m ³
BRINEWATE A	113.90	kg/m ³
pH-Buffer	1.53	kg/m ³

The polymer THICKSAL PLUS controlled the rheology and filtration. BRINEWATE A is a Sized Sodium Chloride Salt, used as a weighting agent as well as an aid for fluid loss reduction as it together with the polymer creates an impermeable filter cake against the open hole formation. The pH Buffer was used to control the alkalinity of the drilling fluid.

During the drilling of the cement an adverse effect on the polymer as large globules was observed at the shakers, though there were virtually no change in the brine properties. The fluid system was treated with sodium-bicarbonate and PTS 300 to drop the alkalinity from pH 10.8 to 9. Additional BRINEWATE A were used whilst tripping to slug the drill string.

The centrifuges aided in controlling mud weight at 1.25 SG. This however led to foaming of the drilling fluid. Foam could be controlled with IDF Defoamer. Eventually additions of fresh water instead of the decanters were used to control the mud weight. A constant density could be maintained by using a total of 6 m³.

Apart from the above no further treatment of the mud was necessary. At TD, a 10 m³ hi-vis pill was pumped to ensure a clean hole before pulling out to run wireline logs. The pill consisted of active mud with 8 kg/m³ THICKSAL PLUS.

At section TD the final product concentrations of the drilling fluid were:

Product Name	Concentration	
THICKSAL PLUS	15.52	kg/m ³
BRINEWATE A	150.00	kg/m ³
pH Buffer	1,43	kg/m ³
Sodium Bicarbonate	1,32	kg/m ³
PTS 300	1,32	kg/m ³

Solids Control

Shaker 1#	Shaker 2#	Shaker 3#	Shaker 4#
24	70	84	84
38	70	84	84
50	70	84	84

The centrifuge was run for 9 hours as an attempt to control the mud weight at 1.25 SG. The increased density was due to the number of slugs pumped prior to tripping.

Volumes, Chemical Consumption`s and Cost

The following volume summary can be made for the 6" section:

Received from previous section:	153 m ³
Built during the 6" Section:	260 m ³
Lost during drilling and logging:	71 m ³
Dumped after the section drilling (KCl-Fluid):	153 m ³

The cost/m³ for this section was NOK 2.576,45. The following consumption of products were recorded whilst drilling the 6" interval.

Product Name	Consumption	Cost (NOK)
NaCl Brine	230 m ³	109.383,40
THICKSAL PLUS	168 sx	237.535,20
BRINEWATE A	48 MT	274.080,00
pH Buffer	15 sx	33.750,00
IDF Defoamer	23 DRUMS	10.304,00
Sod.Bicarbonate	12 sx	1.014,00
PTS 300	12 sx	3.810,00
SECTION TOTAL		669.876,60 NOK
PROGRAMMED		409.592,00 NOK
DIFFERENCE		260.284,60 NOK

Testing, plug and Abandon

After logging, BP decided to plug and abandon the well without carrying out the testing program. The 227 m³ of NaCl brine received for the testing purposes were dumped.

On bottom with open end drill pipe the well was circulated until an even density of 1.25 SG had been secured. In order to counteract high alkalinity Dowell treated the drilling fluid with PTS 300 and Sodium Bicarbonate. After placing four cement plugs the mud engineers could be released. After the cement.

Product Name	Consumption	Cost (NOK)
NaCl Brine	227 m ³	107.956,66
Sod.Bicarbonate	10 sx	845,00
PTS 300	10 sx	3.175,00
Red Tracer	1 sx	9.129,00
SECTION COST		121.105,66

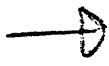
Table 2.12 6407/8-2 FMT Pressure Summary.

Test No	Run No	Depth m md RKB	Depth m tvd RKB	Mud Hydr. Before (psi)	Mud Hydr. After (psi)	Form. Pressure (psi)	Pre Test Mob. md/cp	Remarks
1	2A	1735.1	1735.1	3125	3126	2515.2	2139	
2	2A	1737.0	1737.0	3129	3129	2515.8	4877	
3	2A	1738.5	1738.5	3132	3132	2517.3	52.24	
4	2A	1741.0	1741.0	3137	3137	2519.8	31.48	
5	2A	1742.5	1742.5	3139	3139	2520.8	11.36	
6	2A	1744.5	1744.5	3141	3141	2524.5	10.56	
7	2A	1744.3	1744.3	3140	3138	2522.3	195.2	10 l sample taken
8	2A	1753.0	1753.0	3155	3155	-	-	Tight test
9	2A	1756.0	1756.0	3161	3160	2539.5	8.08	
10	2A	1759.0	1759.0	3166	3166	2543.7	22.56	
11	2A	1762.0	1762.0	3171	3171	2548.2	13.32	
12	2A	1768.0	1768.0	3181	3181	2556.4	15.2	
13	2A	1772.0	1772.0	3189	3189	2562.2	10.96	
14	2A	1778.5	1778.5	3200	3200	2572.2	2.84	
15	2A	1788.0	1788.0	3217	-	-	-	Seal Failure
16	2A	1787.0	1787.0	3215	3215	2583.6	25.2	
17	2A	1815.0	1815.0	3264	3264	2623.8	13.76	
18	2A	1823.0	1823.0	3279	3279	2635.4	80.80	
19	2A	1855.0	1855.0	3335	3335	2682.0	10.32	
20	2A	1865.0	1865.0	3353	3353	2696.5	36.72	
21	2A	1882.0	1882.0	3383	-	-	-	Seal Failure
22	2A	1881.5	1881.5	3383	-	-	-	Seal Failure
23	2A	1904.0	1904.0	3423	3423	2752.5	31.36	
24	2A	1734.0	1734.0	3120	3120	2514.5	9519	
25	2A	1735.0	1735.0	3123	3123	2515.3	6619	
26	2A	1736.0	1736.0	3125	3125	2515.0	7198	
27	2A	1736.0	1736.0	3125	3125	2515.0	-	Reset to verify pressure
28	2A	1737.0	1737.0	3126	3126	2515.9	185.3	
29	2A	1738.0	1738.0	3128	3128	2517.0	90.48	
30	2A	1739.1	1739.1	3130	-	-	-	Tight Test
31	2A	1741.0	1741.0	3133	3133	2519.5	228.0	
32	2A	1742.0	1742.0	3135	3135	2520.4	76.88	
33	2A	1743.0	1743.0	3137	3137	2521.4	452.8	
34	2A	1744.0	1744.0	3139	3139	2523.0	1271	
35	2A	1744.5	1744.5	3140	3140	2524.4	9.92	
36	2A	1734.5	1734.5	3122	3122	2513.3	14646	
37	2A	1735.5	1735.5	3123	3123	2514.7	6854	
38	2A	1733.5	1733.5	3120	3120	2514.2	15275	
1	2B	1772.0	1772.0	3192	3189	2564.4	18.80	Segregated Sample
1	2C	1734.0	1734.0	3120	3120	2515.6	3571	Segregated Sample
2	2C	1733.5	1733.5	3120	-	-	-	Seal Failure
3	2C	1733.6	1733.6	3120	-	-	-	Seal Failure
4	2C	1734.4	1734.4	3122	-	-	-	Seal Failure
5	2C	1735.4	1735.4	3124	3124	2516.4	2792	
6	2C	1734.5	1734.5	3121	3121	2515.6	2655	
1	2D	1741.5	1741.5	3139	-	2522.1	-	Too tight for sampling
2	2D	1741.0	1741.0	3138	-	2520.8	-	Lost seal w/pumping
3	2D	1741.3	1741.3	3136	-	2521.0	-	Seal Failure
4	2D	1740.7	1740.7	3136	-	2520.1	-	Lost seal w/pumping
5	2D	1741.3	1741.3	3136	-	2520.7	-	Lost seal w/pumping
6	2D	1740.3	1740.3	3135	-	-	-	Tight Test
7	2D	1740.4	1740.4	3135	-	-	-	Tight Test
8	2D	1740.5	1740.5	3135	-	-	-	Tight Test
9	2D	1740.6	1740.6	3135	-	2520.5	-	Too tight for sampling
10	2D	1741.2	1741.2	3136	-	-	-	Seal Failure
1	2E	1741.0	1741.0	3141	-	2523.5	-	Segregated Sample
1	2F	1738.5	1738.5	3131	3130	2519.4	-	Segregated Sample

FMT Sampling

Table 2.13 is a summary of FMT samples taken in well 6407/8-2.

Table 2.13 6407/8-2 FMT Sample Summary.							
Run	Depth m md rkb	Fluid Type	Tank size (litres)	Volume litres (litres)	Fluid res /temp ohmm /°C	Tank Ser. No.	Remarks
2A	1744.3	water	10	9.35	0.12/18	n/a	
2A	1744.3	water	4	3.2	0.15/18	n/a	Chamber failed. Uncertain when it was opened.
2B	1772.0	water	10	9.1	0.048/17	n/a	
2B	1772.0	water	4	n/a	n/a	152656	Tank sent onshore for analysis
2C	1734.0	gas	10	1427	n/a	n/a	0.2 litres condensate and 0.15 litres sediments
2C	1734.0	gas	4	n/a	n/a	331651	Tank sent onshore. No analysis performed. Sample preserved.
2D	1741.5	-	-	-	-	-	No sample recovered
2E	1741.0	water	10	1.5	0.045/17	n/a	Thin oil film on top
2E	1741.0	water	4	0.4	0.048/17	n/a	0.2 litre oil/water emulsion & foam
2F	1738.5	oil	10	5.7	n/a		Opening Pressure of 1500 psi. 691 litres of gas bleed off. No water observed.
2F	1738.5	oil	4	n/a	n/a	152662	Chamber opened unintentionally at same time as 10 l tank Tank sent onshore for analysis



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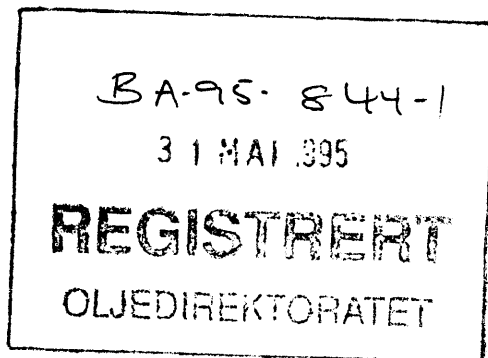
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*Geochemical Analysis
of Cuttings,
Hydrocarbon Fluids
and Gas From
6407/8-2, Norway*

SST/209/95

**by M.P. Dee
Subsurface Technology**



Exploration Technology Provision, Sunbury
May 1995

TABLE 1.1
LITHOLOGY AND STRATIGRAPHY

COUNTRY: NORWAY

WELL: 6407/8-2

DEPTH (m)	DEPTHRANGE (m)	FORMATION	AGE	LITHOLOGY	PICKED LITHOLOGY	SAMPLE TYPE
1200				SLTST-lt gy sandy	SLTST	SEDCUT
1250				SST-lt gy slty	SST	SEDCUT
1300				SLTST-lt gy sndy	SLTST	SEDCUT
1350				SLTST-lt gy sndy	SLTST	SEDCUT
1401				SLTST-lt gy sndy	SLTST	SEDCUT
1452				SLTST-lt gy sndy	SLTST	SEDCUT
1500				SLTST-lt gy sndy	SLTST	SEDCUT
1551				SLTST-lt gy sndy	SLTST	SEDCUT
1599				SLTST-lt gy sndy	SLTST	SEDCUT
1650				SLTST-lt gy sndy	SLTST	SEDCUT
1701				SLTST-lt gy sndy	SLTST	SEDCUT
1704				SLTST-lt gy sndy 100%	SLTST	SEDCUT
1707				SLTST-lt gy sndy 100%	SLTST	SEDCUT
1710				SLTST-lt-m gy sndy 85%;SLTST-dk gy sndy 15%	SLTST-lt gy	SEDCUT
1710.1				SLTST-lt gy sndy 85%;SLTST-dk gy sndy 15%	SLTST-dk gy	SEDCUT
1713				SLTST-dk gy sndy 70%;SLTST-lt-m gy sndy 30%	SLTST-dk gy	SEDCUT
1713.1				SLTST-dk gy sndy 70%;SLTST-lt-m gy sndy 30%	SLTST-lt gy	SEDCUT
1716				SLTST-dk gy sndy 70%;SLTST-lt-m gy sndy 30%	SLTST-dk gy	SEDCUT
1716.1				SLTST-dk gy sndy 70%;SLTST-lt-m gy sndy 30%	SLTST-lt gy	SEDCUT
1719				SLTST-dk gy/bn sndy 60%;SLTST-lt-m gy 40%	SLTST-dk gy	SEDCUT
1719.1				SLTST-dk gy/bn sndy 60%;SLTST-lt-m gy 40%	SLTST-lt gy	SEDCUT
1722				SLTST-dk bn shaley 80%;SLTST-lt gy 10%;SST-10%	SLTST-dk bn	SEDCUT
1722.1				SLTST-dk bn shaley 80%;SLTST-lt gy 10%;SST-10%	SLTST-lt gy	SEDCUT
1725				SLTST-dk bn shaley 80%;SLTST-lt gy 10%;SST-10%	SLTST-dk bn	SEDCUT
1725.1				SLTST-dk bn shaley 80%;SLTST-lt gy 10%;SST-10%	SLTST-lt gy	SEDCUT
1728				SLTST-dk bn shaley 80%;SLTST-lt gy 10%;SST-10%	SLTST-dk bn	SEDCUT
1731				SLTST-dk bn shaley 80%;SLTST-lt gy 10%;SST-10%	SLTST-dk bn	SEDCUT
1740				SST-lt gy sndy 100%;COAL-bn Tr	SST	SEDCUT

TABLE 1.2
LITHOLOGY AND STRATIGRAPHY

COUNTRY: NORWAY

WELL: 6407/8-2

DEPTH (m)	DEPTHRANGE (m)	FORMATION	AGE	LITHOLOGY	PICKED LITHOLOGY	SAMPLE TYPE
1743				SST-lt gy 90%;COAL-dk bn 10%	SST	SEDCUT
1746				SST-lt gy 95%;COAL-dk bn 5%	SST	SEDCUT
1749				SLTST-lt gy sndy 100%	SLTST	SEDCUT
1752				SST-lt gy 90%;COAL-dk bn 10%	SST	SEDCUT
1755				SST-lt gy 90%;COAL-dk bn 10%	SST	SEDCUT
1761				COAL-dk bn(friable,dull)/bk(solid,vitreous) 30%;SST-lt gy 70%	SST	SEDCUT
1761.1				COAL-dk bn(friable,dull)/bk(solid,vitreous) 30%;SST-lt gy 70%	LIGNITE	SEDCUT
1761.2				COAL-dk bn(friable,dull)/bk(solid,vitreous) 30%;SST-lt gy 70%	COAL	SEDCUT
1764				COAL-dk bn(friable,dull)/bk(solid,vitreous) 30%;SST-lt gy 70%	SST	SEDCUT
1764.1				COAL-dk bn(friable,dull)/bk(solid,vitreous) 30%;SST-lt gy 70%	LIGNITE	SEDCUT
1764.2				COAL-dk bn(friable,dull)/bk(solid,vitreous) 30%;SST-lt gy 70%	COAL	SEDCUT
1767				COAL-dk bn/bk 15%;SST-lt gy 85%	COAL	SEDCUT
1770				COAL-dk bn/bk 15%;SST-lt gy 85%	COAL	SEDCUT
1779				COAL-dk bn/bk 15%;SST-lt gy 85%	COAL	SEDCUT
1782				COAL-dk bn/bk 15%;SST-lt gy 85%	SST	SEDCUT
1782.1				COAL-dk bn/bk 15%;SST-lt gy 85%	LIGNITE	SEDCUT
1782.2				COAL-dk bn/bk 15%;SST-lt gy 85%	COAL	SEDCUT
1785				COAL-dk bn/bk 15%;SST-lt gy 85%	COAL	SEDCUT
1791				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1794				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	SST	SEDCUT
1794.1				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1797				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1800				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1803				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1806				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1809				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1812				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1815				COAL- 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT

TABLE 1.3
LITHOLOGY AND STRATIGRAPHY

COUNTRY: NORWAY

WELL: 6407/8-2

DEPTH (m)	DEPTHRANGE (m)	FORMATION	AGE	LITHOLOGY	PICKED LITHOLOGY	SAMPLE TYPE
1899				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT
1950				COAL-bk 15%;SST-lt gy 65%;QTZ-20%	COAL	SEDCUT

TABLE 2.1
OPTICAL SOURCE ROCK MATURITY INDICATORS

COUNTRY: NORWAY
WELL: 6407/8-2

DEPTH	FORMATION	SPORE COLOR	VITRINITE (%Ro)	NO. of READINGS	COMMENTS
1200			0.26	20	L;V PAR+W PAR 60% I PAR 40%;BS TR BW L;NO FL
1250			0.28	20	TR;V PAR+W PAR 80% I PAR 20%;BS VERY LT BW L;SP Y-Y/O TR
1300			0.31	20	VERY L;V PAR+W PAR 90% I PAR 10%;BS LT BW MOD;SP Y-Y/O TR
1350			0.33	20	L;V PAR+W PAR 100% I PAR TR;BS LT BW+BBL MOD/RI;SP Y-Y/O TR
1401			0.35	20	VERY L;V PAR+W PAR 80% I PAR 20%;BS LT BW MOD;SP Y-Y/O VERY L
1452			0.33	20	L;I PAR 60% V PAR+W PAR 40%;BS MOD BW+BBL MOD/RI;SP Y/O L
1500			0.34	20	L;I PAR 70% V PAR 30%;BS LT/MOD BW+BBL MOD;SP Y/O L
1551			0.45	3	VERY L;I PAR 100% V PAR TR;BS LT BW L/MOD;SP Y-Y/O TR
1599			0.36	20	L-MOD;I PAR 100% V PAR TR;BS LT BW MOD;SP Y-Y/O L ALG Y TR
1650			0.39	20	L-MOD;I PAR 100% V PAR+W PAR TR;BS LT/MOD BW+BBL L;SP Y+Y/O L ALG Y
1701			0.41	20	MOD;I PAR 100% V PAR+W PAR TR;BS LT/MOD BW MOD;SP Y+Y/O TR
1704					
1707					
1710					
1710.1					
1713					
1713.1					
1716					
1716.1					
1719					
1719.1					
1722					
1722.1					
1725					
1725.1					
1728					
1731					
1740					

TABLE 2.2
OPTICAL SOURCE ROCK MATURITY INDICATORS

COUNTRY: NORWAY

WELL: 6407/8-2

DEPTH	FORMATION	SPORE COLOR	VITRINITE (%Ro)	NO. of READINGS	COMMENTS
1743					
1746					
1749			0.29	20	L;V(in LIG) 100% I (in LIG) TR;NO BS;NO FL [POSSIBLY ADDITIVE]
1752					
1755					
1761					
1761.1					
1761.2					
1764					
1764.1					
1764.2					
1767					
1770					
1779					
1782					
1782.1					
1782.2					
1785					
1791					
1794					
1794.1					
1797					
1800			0.34	20	ABD;V (in COAL)ST+PAR 70% I(in COAL)+PAR 30%;BS STR SP Y-Y/O MOD
1803					
1806					
1809					
1812					
1815			0.41	20	RI;V(in COAL)+W TR I(in COAL)+PAR 100%;BS MOD/STR BW MOD;SP Y-Y/O

TABLE 2.3
OPTICAL SOURCE ROCK MATURITY INDICATORS

COUNTRY: NORWAY
WELL: 6407/8-2

DEPTH	FORMATION	SPORE COLOR	VITRINITE (%Ro)	NO. of READINGS	COMMENTS
1899			0.33	20	MOD;I PAR+in COAL 90% VW+in COAL 10%;BS MOD BW MOD;SP Y TR RES Y TR
1950			0.38	20	MOD;I PAR 90% V PAR+W 10%;BS VAR 0-MOD BW L;SP Y-Y/O TR RES Y-Y/O TR

TABLE 3.1
SOURCE ROCK QUALITY INDICATORS

COUNTRY: NORWAY

WELL: 6407/8-2

DEPTH (m)	DEPTHRANGE (m)	FORMATION	PICKED LITHOLOGY	P1 (kg/t)	P1 (mg/gC)	P2 (kg/t)	TOC (%)	TMAX °C	HI	GOGI	CARB (%)	S (%)
1200			SLTST									
1250			SST									
1300			SLTST									
1350			SLTST									
1401			SLTST									
1452			SLTST									
1500			SLTST									
1551			SLTST									
1599			SLTST									
1650			SLTST									
1701			SLTST									
1704			SLTST	0.4	48.8	0.5	0.9	418	63		5.1	0.8
1707			SLTST	0.1	13.1	0.6	0.8		67		6.0	1.0
1710			SLTST-lt gy	0.1	15.9	0.6	0.9		73		5.7	0.8
1710.1			SLTST-dk gy	2.1	54.0	11.1	3.9		288		5.3	2.1
1713			SLTST-dk gy	2.1	34.2	16.8	6.2		272		2.9	3.4
1713.1			SLTST-lt gy	0.4	45.6	0.7	0.8		91		6.7	0.7
1716			SLTST-dk gy	2.6	42.6	18.6	6.0		308	0.24	5.9	3.5
1716.1			SLTST-lt gy	0.4	50.6	0.8	0.8		96		6.1	1.2
1719			SLTST-dk gy	2.1	34.6	17.4	6.1		284		6.0	3.5
1719.1			SLTST-lt gy	0.2	23.8	0.6	0.8		75		8.4	0.9
1722			SLTST-dk bn	2.4	45.3	14.8	5.3		278		5.6	3.0
1722.1			SLTST-lt gy	2.0	279.2	0.7	0.7		94		13.1	1.0
1725			SLTST-dk bn	2.6	46.6	15.9	5.6		283		2.8	3.7
1725.1			SLTST-lt gy	0.3	31.5	0.6	0.9		66		8.7	1.3
1728			SLTST-dk bn	1.9	33.9	8.4	5.7		147		1.9	3.7
1731			SLTST-dk bn	3.3	57.6	16.3	5.7		286	0.24	3.3	3.8
1740			SST	2.6		2.3			0			

TABLE 3.2
SOURCE ROCK QUALITY INDICATORS

COUNTRY: NORWAY

WELL: 6407/8-2

DEPTH (m)	DEPTHRANGE (m)	FORMATION	PICKED LITHOLOGY	P1 (kg/t)	P1 (mg/gC)	P2 (kg/t)	TOC (%)	TMAX °C	HI	GOGI	CARBT (%)	S (%)
1743			SST	0.3		1.2			0			
1746			SST	0.4		1.0		439	0			
1749			SLTST									
1752			SST	1.0		1.2		451	0			
1755			SST	2.5		1.1			0			
1761			SST	0.8	145.3	1.5	0.5		285		68.0	0.2
1761.1			LIGNITE	31.6	62.0	114.8	51.0		225		17.8	0.7
1761.2			COAL	31.8	58.3	106.6	54.5		196		14.7	0.7
1764			SST	1.0		1.4			0			
1764.1			LIGNITE	27.0	45.6	100.0	59.2		169		16.5	1.0
1764.2			COAL	35.1	53.4	115.7	65.7		176		17.0	0.8
1767			COAL BULKED	28.3	60.6	89.6	46.7		192		19.8	1.4
1770			COAL BULKED	36.9	63.3	113.3	58.3		194	0.81	16.8	1.5
1779			COAL BULKED	25.5	41.8	113.4	61.0		186		16.3	0.7
1782			SST	2.2		1.3			0			
1782.1			LIGNITE	24.2	47.5	94.1	51.0		185		21.9	0.7
1782.2			COAL	30.1	60.1	96.8	50.1		193		24.9	0.7
1785			COAL BULKED	33.1	64.3	93.3	51.5		181		21.9	0.9
1791			COAL	27.7	55.0	109.1	50.4		216	0.55	15.6	1.3
1794			SST	0.4		0.9			0			
1794.1			COAL	29.3	49.2	108.3	59.6		182		14.8	1.3
1797			COAL	18.5	35.0	90.4	52.9		171		13.0	1.2
1800			COAL	25.5	54.6	85.9	46.7		184		10.3	1.1
1803			COAL	26.2	64.2	65.3	40.8		160		14.5	0.8
1806			COAL	35.3	84.9	64.0	41.6		154		15.1	1.1
1809			COAL	17.9	48.2	73.0	37.1		197		13.4	1.0
1812			COAL	17.4	50.6	53.3	34.4		155		13.2	0.9
1815			COAL	21.8	54.5	74.5	40.0		186		14.1	0.9

TABLE 4.1
PYROLYSIS - PGC DATA

COUNTRY: NORWAY
WELL: 6407/8-2

DEPTH (m)	FORMATION	TOC (%)	HI	GOGI	C1-C5 (%)	C6-C9 (%)	C10-C13 (%)	C14-C22 (%)	C23-C36 (%)
1200									
1250									
1300									
1350									
1401									
1452									
1500									
1551									
1599									
1650									
1701									
1704		0.9	63						
1707		0.8	67						
1710		0.9	73						
1710.1		3.9	288						
1713		6.2	272						
1713.1		0.8	91						
1716		6.0	308	0.24	19	16	19	28	17
1716.1		0.8	96						
1719		6.1	284						
1719.1		0.8	75						
1722		5.3	278						
1722.1		0.7	94						
1725		5.6	283						
1725.1		0.9	66						
1728		5.7	147						
1731		5.7	286	0.24	19	17	20	28	16
1740			0						

TABLE 4.2
PYROLYSIS - PGC DATA

COUNTRY: NORWAY

WELL: 6407/8-2

DEPTH (m)	FORMATION	TOC (%)	HI	GOGI	C1-C5 (%)	C6-C9 (%)	C10-C13 (%)	C14-C22 (%)	C23-C36 (%)
1743			0						
1746			0						
1749									
1752			0						
1755			0						
1761		0.5	285						
1761.1		51.0	225						
1761.2		54.5	196						
1764			0						
1764.1		59.2	169						
1764.2		65.7	176						
1767		46.7	192						
1770		58.3	194	0.81	45	15	17	20	4
1779		61.0	186						
1782			0						
1782.1		51.0	185						
1782.2		50.1	193						
1785		51.5	181						
1791		50.4	216	0.55	35	12	16	22	14
1794			0						
1794.1		59.6	182						
1797		52.9	171						
1800		46.7	184						
1803		40.8	160						
1806		41.6	154						
1809		37.1	197						
1812		34.4	155						
1815		40.0	186						

SEDIMENT EXTRACT ANALYSIS

OUTCROP SUITE	
WELL	6407/8-2
DEPTH RANGE (m)	1446 - 1449
SAMPTYPE	EXT
LOCATION	
OILFIELD	
ASPHALTENES %wt	
SULPHUR %wt	
NITROGEN ppm	
NICKEL ppm	
VANADIUM ppm	
VISCOSITY cST @ 20°C	
n-ALKANE CPI	
PRISTANE/PHYTANE	
PRISTANE/nC17	
PHYTANE/nC18	
ALKANE INDEX	
R22	

TYPE ANALYSIS BY HPLC ON DE-ASPHALTENED RESIDUE >200°C	
SATURATES %wt	35.9
AROMATICS %wt	17.3
RESIDUE %wt	46.8
CARBON ISOTOPE RATIOS per mil	
TOTAL EXTRACT	
ASPHALTENE	
SATURATES	-28.5
AROMATICS	-27.8
RESIDUE	
KEROGEN	
STANDARD	NBS 22 -29.8

BIOMARKER RATIOS			
H1	S1	0.30	A1 0.32
H2	S2	0.34	A2 0.16
H3	S3	23:40:37	A3
H4	S4		A4
H5	S5		A5 0.46
H6	S6		A6 2.33
H7	S7	38	
H10	S8	15	M2 0.62
H11	S9		M3 0.46
H12	S10		M4
H13			MBP 7.4
H14			MDR 2.0
H15			
H16			
H17			

QUANTITATIVE ANALYSIS		
SATURATE FRACTION	QSNALK	ppm
	QSNC20	ppm
	QSC29ST	ppm
	QSC30HO	ppm
	QSC32HO	ppm
AROMATIC FRACTION	QAMONAR	ppm
	QATRIAR	ppm
	QAMEPH	ppm

CODING LISTINGS FOR BIOMARKERS CAN BE FOUND AT THE BACK OF THIS REPORT

TABLE 5.1

SEDIMENT EXTRACT ANALYSIS

OUTCROP SUITE	
WELL	6407/8-2
DEPTH RANGE (m)	1716
SAMPTYPE	EXT
LOCATION	
OILFIELD	
ASPHALTENES %wt	37.78
SULPHUR %wt	
NITROGEN ppm	
NICKEL ppm	
VANADIUM ppm	
VISCOSITY cST @ 20°C	
n-ALKANE CPI	0.98
PRISTANE/PHYTANE	0.94
PRISTANE/nC17	2.92
PHYTANE/nC18	3.09
ALKANE INDEX	58
R22	0.86

TYPE ANALYSIS BY HPLC ON DE-ASPHALTENED RESIDUE >200°C	
SATURATES %wt	12.1
AROMATICS %wt	66.5
RESIDUE %wt	21.4
CARBON ISOTOPE RATIOS per mil	
TOTAL EXTRACT	
ASPHALTENE	
SATURATES	-30.5
AROMATICS	-30.4
RESIDUE	
KEROGEN	
STANDARD	NBS 22 -29.8

BIOMARKER RATIOS			
H1	0.23	S1	0.14
H2	0.14	S2	0.36
H3	0.70	S3	35:30:34
H4	38.60	S4	26:36:38
H5	100:151:37	S5	16.0
H6	0.21	S6	
H7	0.31	S7	51
H10		S8	53
H11		S9	
H12		S10	
H13			
H14			MBP 2.9
H15			MDR 0.4
H16			
H17			

QUANTITATIVE ANALYSIS		
SATURATE FRACTION	QSNALK	ppm
	QSN20	ppm
	QSC29ST	ppm
	QSC30HO	ppm
	QSC32HO	ppm
AROMATIC FRACTION	QAMONAR	ppm
	QATRIAR	ppm
	QAMEPH	ppm

CODING LISTINGS FOR BIOMARKERS CAN BE FOUND AT THE BACK OF THIS REPORT

TABLE 5.2

SEDIMENT EXTRACT ANALYSIS

OUTCROP SUITE	
WELL	6407/8-2
DEPTH RANGE (m)	1725
SAMPTYPE	EXT
LOCATION	
OILFIELD	
ASPHALTENES %wt	28.90
SULPHUR %wt	
NITROGEN ppm	
NICKEL ppm	
VANADIUM ppm	
VISCOSITY cST @ 20°C	
n-ALKANE CPI	1.00
PRISTANE/PHYTANE	1.01
PRISTANE/nC17	3.45
PHYTANE/nC18	3.40
ALKANE INDEX	53
R22	0.85

TYPE ANALYSIS BY HPLC ON DE-ASPHALTENED RESIDUE >200°C	
SATURATES %wt	11.0
AROMATICS %wt	65.7
RESIDUE %wt	23.3
CARBON ISOTOPE RATIOS per mil	
TOTAL EXTRACT	-30.2
ASPHALTENE	
SATURATES	
AROMATICS	
RESIDUE	
KEROGEN	
STANDARD	NBS 22 -29.8

BIOMARKER RATIOS					
H1	0.20	S1	0.23	A1	0.06
H2	0.15	S2	0.34	A2	0.05
H3	0.73	S3	34:31:35	A3	0.28
H4	27.46	S4	26:34:40	A4	0.07
H5	100:145:35:22:9	S5	21.0	A5	0.59
H6	0.20	S6		A6	1.79
H7	0.25	S7	50	M2	0.53
H10		S8	55	M3	0.32
H11		S9		M4	
H12		S10			
H13				MBP	25.3
H14				MDR	0.6
H15					
H16					
H17					

QUANTITATIVE ANALYSIS		
SATURATE FRACTION	QSNALK	ppm
	QSNC20	ppm
	QSC29ST	ppm
	QSC30HO	ppm
	QSC32HO	ppm
AROMATIC FRACTION	QAMONAR	ppm
	QATRIAR	ppm
	QAMEPH	ppm

CODING LISTINGS FOR BIOMARKERS CAN BE FOUND AT THE BACK OF THIS REPORT

TABLE 5.3

SEDIMENT EXTRACT ANALYSIS

OUTCROP	
SUITE	
WELL	6407/8-2
DEPTH RANGE (m)	1770
SAMPTYPE	EXT
LOCATION	
OILFIELD	
ASPHALTENES %wt	42.65
SULPHUR %wt	
NITROGEN ppm	
NICKEL ppm	
VANADIUM ppm	
VISCOSITY cST @ 20°C	
n-ALKANE CPI	0.99
PRISTANE/PHYTANE	1.99
PRISTANE/nC17	1.55
PHYTANE/nC18	0.78
ALKANE INDEX	58
R22	0.90

TYPE ANALYSIS BY HPLC ON DE-ASPHALTENED RESIDUE >200°C	
SATURATES %wt	4.2
AROMATICS %wt	92.7
RESIDUE %wt	3.1
CARBON ISOTOPE RATIOS per mil	
TOTAL EXTRACT	-26.7
ASPHALTENE	
SATURATES	
AROMATICS	
RESIDUE	
KEROGEN	
STANDARD	NBS 22 -29.8

BIOMARKER RATIOS			
H1	0.27	S1	0.43
H2	0.28	S2	0.46
H3	0.82	S3	38:09:53
H4	31.21	S4	33:24:43
H5	100:44:34:14:10:8	S5	25.0
H6	0.13	S6	
H7	0.48	S7	42
H10		S8	
H11	4.00	S9	
H12	4.00	S10	
H13	12.00		
H14	17.00		MBP 18.7
H15			MDR 3.2
H16	2.65		
H17	43.46		

QUANTITATIVE ANALYSIS		
SATURATE FRACTION	QSNALK	ppm
	QSN20	ppm
	QSC29ST	ppm
	QSC30HO	ppm
	QSC32HO	ppm
AROMATIC FRACTION	QAMONAR	ppm
	QATRIAR	ppm
	QAMEPH	ppm

CODING LISTINGS FOR BIOMARKERS CAN BE FOUND AT THE BACK OF THIS REPORT

TABLE 5.4

Analysis Name : [222] 114 SRA270495,3,2.

Multichrom

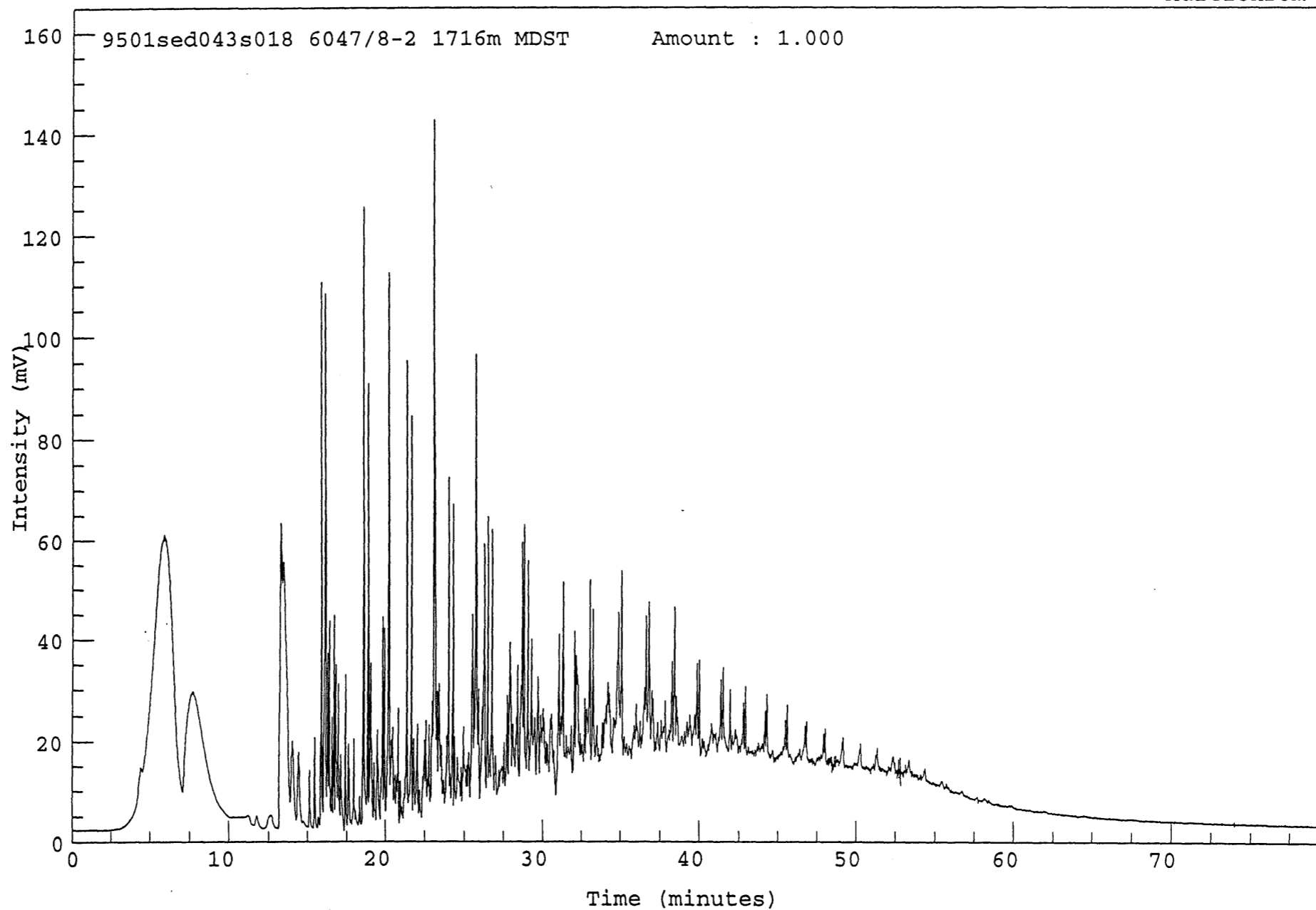


Figure 2.1

Acquired on 27-APR-1995 at 14:10

Reported on 1-MAY-1995 at 15:19

OIL ANALYSIS

WELL 6407/8-2
 SUITE
 TEST NUMBER
 DEPTH 1738.5
 DEPTH RANGE (m)
 SAMPTYPE CRU
 LOCATION
 OILFIELD
 API GRAVITY @ 15°C
 DENSITY @ 15°C 0.8190
 WAX %wt 4.5
 POUR POINT
 ASPHALTENES %wt 0.05
 SULPHUR %wt 0.09
 NITROGEN ppm 360
 NICKEL ppm <2
 VANADIUM ppm <2
 VISCOSITY cST @ 20°C 3.6
 n-ALKANE CPI 0.96
 PRISTANE/PHYTANE 1.73
 PRISTANE/nC17 0.84
 PHYTANE/nC18 0.48
 ALKANE INDEX 69
 R22 0.97

TYPE ANALYSIS BY HPLC ON DE-ASPHALTENED RESIDUE >200°C

SATURATES %wt 77.0
 AROMATICS %wt 21.9
 RESIDUE %wt 1.1

CARBON ISOTOPE RATIOS per mil

TOTAL OIL
 ASPHALTENE
 SATURATES -29.7
 AROMATICS -28.7
 RESIDUE
 STANDARD NBS 22 -29.8

LIGHT HYDROCARBONS

MCH %
 HER
 HXR

BIOMARKER RATIOS

H1 0.60	S1 0.71	A1 0.71
H2 0.48	S2 0.50	A2 0.60
H3 0.90	S3 48:14:38	A3 0.62
H4	S4 34:32:33	A4 0.34
H5 100:93:52:34:25:21	S5 46.0	A5 0.48
H6 0.56	S6	A6 1.13
H7 0.52	S7 56	M2 0.66
H10	S8	M3 0.66
H11 11.00	S9	M4 52.00
H12 11.00	S10	
H13 20.00		MBP 9.0
H14 18.00		MDR 4.6
H15		
H16		
H17 46.67		

QUANTITATIVE ANALYSIS

SATURATE FRACTION	QSNALK	ppm
	QSNC20	ppm
	QSC29ST	ppm
	QSC30HO	ppm
	QSC32HO	ppm
AROMATIC FRACTION	QAMONAR	ppm
	QATRIAR	ppm
	QAMEPH	ppm

CODING LISTINGS FOR BIOMARKERS CAN BE FOUND AT THE BACK OF THIS REPORT

Gas Analysis

Well Information

Sample	FMT 331651
Well	6407/8-2
Oilfield	
Sample Type	GAS
Country	NORWAY
Location	
Reservoir	
Formation	
Depth	

Carbon Isotope Data (o/oo)

CCH4	-50.7
CC2H6	-31.0
CC3H8	-28.3
CC4H10	-28.7
CCO2	

Gas Composition (Mol%)

Dryness (C1/C1-C5)

Methane	48.1	Helium	
Ethane	12.7	Hydrogen	
Propane	12.5	Oxygen	
n-Butane	6.5	Nitrogen	17.0
Iso-Butane		Carbon Monoxide	
n-Pentane	3.2	Carbon Dioxide	0
i-Pentane		Hydrogen Sulphide	
Neopentane			
n-Hexane			
n-Heptane			

VITRINITE ABBREVIATIONS

ANS	- Anisotropic	B	- Bitumen
BAR	- Virtually Barren	BL	- Blebs
BS	- Bitumen Staining	BW	- Bitumen Wisps
CARB	- Carbargilite	CAV	- Caved
COR	- Corroded	CTGS	- Cuttings
DD	- Differentiation Difficult	DEC	- Decomposed
DMA	- Drilling Mud Additive	DOM	- Dominant
F	- Few	FL	- Fluorescence
FR	- Fragments	GN	- Gnarled
G	- Good	HAE	- Haematite
HI	- High	I	- Inertinite
IGN	- Igneous Traces	INST	- Interstitial
IRON	- Iron Oxides	L	- Low
LGN	- Lignite	LOW	- Low Reflectances
LT	- Light	MAT	- Maturity
M	- Mostly	MOD	- Moderate
NDP	- No Determination Possible	NTV	- No True Vitrinite
OBS	- Overall Bitumen Staining	OCC	- Occasional
OX	- Indications of Oxidation	P	- Poor
PAR	- Particles	PHY	- Phytoclast content
PL	- Plentiful or Plenty	POS	- Possibly
PY	- Pyrite	R	- Reworked
RES	- Resin	RI	- Rich
RM	- Reworked Material	RO	- Reflectance Measurement
S	- Some	SC	- Scruffy
SH	- Shale	SLT	- Siltstone
SML	- Small	SPE	- Specks
STC	- Structure	STR	- Strongly
SUB	- Subordinate	TB	- Turbo-drilled
TEL	- Telinitic	TR	- Trace
V	- Vitrinite	VAR	- Variable RO
VL	- Very Low Organic Content	VLT	- Very Light
VST	- Vitrinite Stringers	VW	- Vitrinite Wisps
W	- Wisps or Wispy	WH	- Wholly
*	- Allocthonous	=	- Equal Proportions
?	- Questionable		

SPORE FLUORESCENCE COLOURS UNDER ULTRAVIOLET LIGHT

G	- Green	Y	- Yellow
O	- Orange	R	- Red
LT	- Light	M	- Mid
D	- Deep	P	- Pale
ALG	- Algae	CAR	- Carbonate
HYD	- Hydrocarbon	RES	- Resin
RH	- Rhombs	SP	- Spores

MOLECULAR PARAMETER LIST

<u>BP CODE</u>	<u>PARAMETER</u>	<u>USE</u>
H1	C ₃₂ HOPANE 22S/(22S+22R)	M
H2	C ₃₁ HOPANE 22S/(22S+22R)	M
H3	C ₃₀ HOPANE/(C ₃₀ HOPANE+C ₃₀ MORETANE)	MS
H4	β β HOPANES PRESENT/ABSENT	M
H5	C ₃₀ :C ₃₁ :C ₃₂ :C ₃₃ :C ₃₄ :C ₃₅ HOPANE DISTRIBUTION	S
H6	C ₂₇ HOPANES T _S /(T _S +T _M)	MS
H7	C ₃₃ HOPANE 22S/(22S+22R)	M
H8	C ₃₄ HOPANE 22S/(22S+22R)	M
H9	C ₃₅ HOPANE 22S/(22S+22R)	M
H10	RESIN DITERPANES % RELATIVE TO C ₃₀ HOPANE (PEAK G)	S
H11	C ₂₃ EXT TRICYCLIC TERPANE % RELATIVE TO C ₃₀ HOPANE (PEAK G)	S
H12	C ₂₄ TETRACYCLIC TERPANE % RELATIVE TO C ₃₀ HOPANE (PEAK G)	S
H13	28,30 BISNORHOPANE (PEAK X) % RELATIVE TO C ₃₀ HOPANE (PEAK G)	S
H14	PENTACYCLANE II % RELATIVE TO C ₃₀ HOPANE (PEAK G)	S
H15	OLEANANE % RELATIVE TO C ₃₀ HOPANE (PEAK G)	S
H16	GAMMACERANE % RELATIVE TO (PEAK G)	S
H17	HOPANES C ₃₅ /(C ₃₄ +C ₃₅) %	S
S1	C ₂₉ ααα STERANES 20S/(20S+20R)	M
S2	C ₂₉ STERANES αββ/(αββ+ααα)	M
S3	STERANES ααα C ₂₇ :C ₂₈ :C ₂₉	S
S4	STERANES αββ C ₂₇ :C ₂₈ :C ₂₉	S
S5	βα DIASTERANES/(SAME+ααα+αββ STERANES) %	SM
S6	LOW MOLECULAR WEIGHT STERANES RELATIVE TO C ₂₉ STERANES	S
S7	STERANE INDEX C ₂₇ /(C ₂₇ +C ₂₉) % (FROM S3)	S
S8	4-ME C ₃₀ STERANE % RELATIVE TO C ₂₉ 20R ααα STERANE (PEAK 42)	S
S9	4-ME STERANES INDEX C ₂₈ /(C ₂₈ +C ₃₀) %	S
S10	BICADINANES PRESENT/ABSENT	S
A1	C ₂₈ 20R TRIAROM. STERANE/(SAME+C ₂₉ 20R MONOAROM. STERANE)	M
A2	SUM TRIAROM. STERANES/(SAME+SUM MONOAROM. STERANES)	M
A3	C ₂₀ TRIAROM. STERANE/(SAME+C ₂₈ 20R TRIAROM. STERANE)	M
A4	C ₂₀ +C ₂₁ TRIAROM. STERANE/(SAME+SUM C ₂₆ -C ₂₈ TRIAROM. STERANES)	M
A5	C ₂₆ 20S TRIAROM. STERANE/C ₂₈ 20S TRIAROM. STERANE	S
A6	C ₂₇ 20R TRIAROM. STERANE/C ₂₈ 20R TRIAROM. STERANE	S
M2	PHENANTHRENES (3ME+2ME)/(9ME+1ME)	M
M3	MPI [(3ME+2ME)/(PHENANTHRENE+9ME+1ME)] * 1.5	M
M4	SUM C ₂₇ -C ₃₅ HOPANES/(SAME+ SUM C ₂₇ -C ₂₉ STERANES) %	S
ALKIND	ALKANE INDEX n-C ₁₇ /(n-C ₁₇ +n-C ₂₇) %	S
R22	R22 INDEX (2 * n-C ₂₂)/(n-C ₂₁ +n-C ₂₃)	SM

NOTES:

- S=SOURCE PARAMETER, M=MATURITY PARAMETER.
- TRIAROM. STERANE=MONOMETHYL TRIAROMATIC STERANES
MONOAROM. STERANE=DIMETHYL MONOAROMATIC STERANES.

(5/6/89)

BIOMARKER IDENTIFICATION - PENTACYCLIC HYDROCARBONS

BP CODE	TENTATIVE ASSIGNMENT BASED ON MASS SPECTROMETRY (m/e 191)
I	9-DODECYLPERHYDROANTHRACENE [INTERNAL STANDARD]
T _s	18 α (H)-22,29,30-TRISNORNEOHOPANE
T _m	17 α (H)-22,29,30-TRISNORHOPANE
θ	17 α (H)-29,30-BISNORHOPANE
Q	17 β (H)-22,29,30-TRISNORHOPANE
W	17 α (H)-25,30-BISNORHOPANE
X	17 α (H),18 α (H),21 β (H)-28,30-BISNORHOPANE
Y	17 α (H)-25-NORHOPANE
D	17 α (H),21 β (H)-30-NORHOPANE
D2	18 α (H)-30-NORNEOHOPANE
π	17 α (H),15 α (Me)-27-NORHOPANE ("DIAHOPANE")
A	17 β (H),21 α (H)-30-NORMORETANE
B	18 α (H)-OLEANANE
G	17 α (H),21 β (H)-HOPANE
ϕ	17 α (H)-30NOR-29-METHYLHOPANE
H	17 β (H),21 β (H)-30-NORHOPANE
K	17 β (H),21 α (H)-MORETANE
N	(22S)-17 α (H),21 β (H)-30-METHYLHOPANE
O	(22R)-17 α (H),21 β (H)-30-METHYLHOPANE
S	GAMMACERANE
P	17 β (H),21 β (H)-HOPANE
R	17 β (H),21 α (H)-30-METHYLMORETANE
U	(22S)-17 α (H),21 β (H)-30-ETHYLHOPANE
V	(22R)-17 α (H),21 β (H)-30-ETHYLHOPANE
J	17 β (H),21 β (H)-METHYLHOPANE
α	(22S)-17 α (H),21 β (H)-30-n-PROPYLHOPANE
β	(22R)-17 α (H),21 β (H)-30-n-PROPYLHOPANE
L	17 β (H),21 β (H)-ETHYLHOPANE
γ	(22S)-17 α (H),21 β (H)-30-n-BUTYLHOPANE
δ	(22R)-17 α (H),21 β (H)-30-n-BUTYLHOPANE
ϵ	(22S)-17 α (H),21 β (H)-30-n-PENTYLHOPANE
ζ	(22R)-17 α (H),21 β (H)-30-n-PENTYLHOPANE

BIOMARKER IDENTIFICATION - STERANES

BP CODE	TENTATIVE ASSIGNMENT BASED ON MASS SPECTROMETRY (m/e 217)
10	(20S)-13 β (H),17 α (H)-DIACHOLESTANE
11	(20R)-13 β (H),17 α (H)-DIACHOLESTANE
13	(20S)-13 α (H),17 β (H)-DIACHOLESTANE
14	(20R)-13 α (H),17 β (H)-DIACHOLESTANE
15	(24S/R)-(20S)-13 β (H),17 α (H)-24-METHYLDIACHOLESTANE
16	(24S/R)-(20S)-13 β (H),17 α (H)-24-METHYLDIACHOLESTANE
18	(24S/R)-(20R)-13 β (H),17 α (H)-24-METHYLDIACHOLESTANE
19	(24R/S)-(20R)-13 β (H),17 α (H)-24-METHYLDIACHOLESTANE
20A	(24S/R)-(20S)-13 α (H),17 β (H)-24-METHYLDIACHOLESTANE
20B	(20S)-5 α (H),14 α (H),17 α (H)-CHOLESTANE
21A	(24R+S)-(20S)-13 β (H),17 α (H)-24-ETHYLDIACHOLESTANE
21B	(20R)-5 α (H),14 β (H),17 β (H)-ISOCHOLESTANE
22	(20S)-5 α (H),14 β (H),17 β (H)-ISOCHOLESTANE
25	(20R)-5 α (H),14 α (H),17 α (H)-CHOLESTANE
27	(24S+R)-(20R)-13 β (H),17 α (H)-24-ETHYLDIACHOLESTANE
29	(24S+R)-(20S)-13 α (H),17 β (H)-24-ETHYLDIACHOLESTANE
33A	(24S+R)-(20R)-5 α (H),14 β (H),17 β (H)-24-METHYLISOCHOLESTANE
33B	(24S+R)-(20R)-13 α (H),17 β (H)-24-ETHYLDIACHOLESTANE
34	(24S+R)-(20S)-5 α (H),14 β (H),17 β (H)-24-METHYLISOCHOLESTANE
36	(24S+R)-(20R)-5 α (H),14 α (H),17 α (H)-24-METHYLCHOLESTANE
39	(24S+R)-(20S)-5 α (H),14 α (H),17 α (H)-24-ETHYLCHOLESTANE
40	(24S+R)-(20S)-5 α (H),14 β (H),17 β (H)-24-ETHYLISOCHOLESTANE
41	(24S+R)-(20R)-5 α (H),14 β (H),17 β (H)-24-ETHYLISOCHOLESTANE
42	(24S+R)-(20R)-5 α (H),14 α (H),17 α (H)-24-ETHYLCHOLESTANE
46	(24S+R)-(20R)C ₃₀ STERANE

BIOMARKER IDENTIFICATION - AROMATIC STEROIDAL HYDROCARBONS (AROMATIC STERANES)

**BP CODE TENTATIVE ASSIGNMENT BASED ON MASS SPECTROMETRY
(m/e 253 mass fragmentogram)**

F22	C ₂₁ DIMETHYL MONOAROMATIC STERANE
F23	C ₂₂ DIMETHYL MONOAROMATIC STERANE
F2	C ₂₇ (20S)5 β (H)DIMETHYL MONOAROMATIC STERANE
F3	C ₂₇ (20R)5 β (H)DIMETHYL MONOAROMATIC STERANE
F4	C ₂₇ (20S)5 α (H)DIMETHYL MONOAROMATIC STERANE
F5	C ₂₈ (20S)5 β (H)DIMETHYL MONOAROMATIC STERANE
F6	C ₂₇ (20R)5 α (H)DIMETHYL MONOAROMATIC STERANE
F7	C ₂₈ (20S)5 α (H)DIMETHYL MONOAROMATIC STERANE
F8	C ₂₈ (20R)5 β (H)DIMETHYL MONOAROMATIC STERANE
F9	C ₂₉ (20S)5 β (H)DIMETHYL MONOAROMATIC STERANE
F10	C ₂₉ (20S)5 α (H)DIMETHYL MONOAROMATIC STERANE
F11	C ₂₈ (20R)5 α (H)DIMETHYL MONOAROMATIC STERANE
F12	C ₂₉ (20R)5 β (H)DIMETHYL MONOAROMATIC STERANE
F13	C ₂₉ (20R)5 α (H)DIMETHYL MONOAROMATIC STERANE
Ω	C ₂₀ H ₁₂ POLYAROMATIC HYDROCARBONS

(m/e 231 mass fragmentogram)

F14	C ₂₀ METHYL TRIAROMATIC STERANE
F15	C ₂₁ METHYL TRIAROMATIC STERANE
F16	C ₂₆ (20S)METHYL TRIAROMATIC STERANE
F17	C ₂₆ (20R)METHYL TRIAROMATIC STERANE
F18	C ₂₇ (20S)METHYL TRIAROMATIC STERANE
F19	C ₂₈ (20S)METHYL TRIAROMATIC STERANE
F20	C ₂₇ (20R)METHYL TRIAROMATIC STERANE
F21	C ₂₈ (20R)METHYL TRIAROMATIC STERANE

BIOMARKER IDENTIFICATION - NORHOPANES

**BP CODE TENTATIVE ASSIGNMENT BASED ON MASS SPECTROMETRY
(m/e 177)**

W	17 α (H)-25,30-BISNORHOPANE
Y	17 α (H)-25-NORHOPANE
D	17 α (H),21 β (H)-30-NORHOPANE
C1	(22S)-17 α (H)-25-NOR-30-METHYLHOPANE
G	17 α (H),21 β (H)HOPANE
C2	(22R)-17 α (H)-25-NOR-30-METHYLHOPANE
C3	(22S)-17 α (H)-25-NOR-30-ETHYLHOPANE
C4	(22R)-17 α (H)-25-NOR-30-ETHYLHOPANE
C5	(22S)-17 α (H)-25-NOR-30-n-PROPYLHOPANE
C6	(22R)-17 α (H)-25-NOR-30-n-PROPYLHOPANE
C7	(22S)-17 α (H)-25-NOR-30-n-BUTYLHOPANE
C8	(22R)-17 α (H)-25-NOR-30-n-BUTYLHOPANE
C9	(22S)-17 α (H)-25-NOR-30-n-PENTYLHOPANE
C10	(22R)-17 α (H)-25-NOR-30-n-PENTYLHOPANE