1.4.3 Drilling fluids

Table 1-3 Drilling fluids summary.

Section	Section depth (mMD RKB)	Maximum mud weight (sg)	Mud type
36”	452	1.03	Seawater / high visc. sweeps
26” hole	599	1.03	Seawater / high visc. sweeps
12 ¼”	1050	1.25	Formpro mud
8 ½”	2895	1.30	Formpro mud

Table 4-8 MDT pretest with dual packer

Test No	DEPTH		Hydrostatic Before	Hydrostatic After	Formation pressure	Temp.	Mobility	Comments
	m MD	m TVD MSL	bar	bar	bar	degr C	md/cP	
1	1075.8	1020.2	136.00	136.00	108.68	23.7	14.9	Good test
2	1090.5	1033.7	137.70	137.50	110.20	24	4.8	Good test
3	1098.2	1040.6	138.64	138.50	110.97	24	7.5	Good test
4	1104.0	1045.9	139.26	139.27	111.61	24.7	0.8	Good test
5	1146.8	1085.0	144.49	144.42	115.79	25	26.8	Good test
6	1172.2	1108.6	147.49	147.45	118.30	25.6	2	Good test
7	1176.0	1112.1	147.95	147.95	118.62	26	2.5	Good test
8	1369.1	1300.8	172.37	172.28	139.64	28.4	13.3	Good test
9	1376.0	1307.7	173.25	173.22	140.36	29.8	8.9	Good test
10	1384.7	1316.4	174.33	174.27	141.23	30.6	24.3	Good test
11	1421.0	1352.7	178.96	178.89		31.5	0	tight
12	1446.2	1377.8	182.24	182.17	147.59	32.3	10	Good test
13	1526.0	1457.5	192.49	192.44	155.83	33.8	10.3	Good test
14	1532.9	1464.4	193.37	193.31	156.53	37.6	23.4	Good test
15	1561.7	1493.1	197.08	196.98	159.49	37.3	11.1	Good test
16	1567.7	1499.0	197.83	197.73	160.12	37.5	11.1	Good test
17	1622.3	1553.4	204.77	207.73		37.3		tight
18	1622.3	1553.4	204.87					tight
19	1624.8	1555.9	205.11	205.03	166.80	38.9	1.2	tight
20	1629.4	1560.5	205.72					tight
21	1633.8	1564.9	206.22	206.18	167.20	38.9	7.4	Good test
22	1636.6	1567.7	206.61	206.54	168.01	39.2	0	unstable pressure
23	1639.1	1570.2	206.90	206.84	167.82	39.4	2.2	Good test
24	1642.3	1573.3	207.38	207.27	168.13	39.5	1.1	Good test,almost stable
25	1646.7	1577.7	207.94	207.85	168.59	39.5	2.5	Good test, almost stable
26	1918.9	1849.1	242.71	242.60		51.1		tight
27	1924.9	1855.1	243.52	243.37		51		tight
28	1925.2	1855.4	243.52	243.35		51		tight
29	1935.7	1865.9	244.86			50.8		tight
30	1936.0	1866.2	244.90			51.1		tight
31	1939.1	1869.3	245.27	245.19				tight
32	1947.6	1877.8	246.41	246.33		50.6		tight
33	1960.6	1890.8	248.07			51		tight
34	1924.9	1855.1	243.55	243.49		51		tight, repeat
35	1935.7	1865.9	245.40			51.7		tight, repeat
36	1967.7	1897.9	248.99			51.6		tight
37	1976.5	1906.7	250.13	250.07		53.7		tight
38	1979.9	1910.1	250.53			53		tight

Table 4-9 MDT fluid Scanning and mini DST

No	DEPTHS			Formation pressure		Comments
	m MD	m TVD RT	m TVD MSL	bar	(ref. RT) g/cc	
Run 2	1633.8	1587.877	1564.877	167.259	1.074	Mini DST
Run 3	1642.1	1596.146	1573.146			Aborted mini DST due to tight formation
Run 4	1631	1585.088	1562.088			Pressure buildup after scanning
Run 4	1625	1579.11	1556.11	166.972	1.078	Pressure buildup after scanning
Run 4	1639.3	1593.356	1570.356			Pressure BU
Run 4	1622.3	1576.42	1553.42	166.89	1.079	Pressure buildup after scanning

4.9 Reservoir Fluid sampling.

Gas, water and oil samples were collected. The hydrocarbon samples collected was intended for PVT end geochemical analysis. No big volume samples were collected.

Table 4-10 MDT samples collected

Depth m MD	Samples collected	Sample content	Remarks
	Run 1A Single probe		
1633.3	2 3/4 Gallon+3*MPSR	Oil/mud filtrate formation water	High drawdown
1532.9	1Gallon+3*MPSR	Formation water	I Gallon did not open
	Run 1B Dual packer		
1633.8	1 Gallon 3*MPSR	Oil	Cable stuck after station
	Run 1C Dual packer		
1642.1	1 Gallon 3*MPSR	Water	
1631	2*MPSR	Oil	High drawdown
1625	1*MPSR	Gas	

The quality hydrocarbon samples collected with dual packer had good quality. The oil sample taken with single probe in MDT run had poor quality due to the high drawdown.

The water samples had some contamination of mud filtrate.
The sample at 1532.6 m had 8 % contamination, while the sample at 1642.1 m contained 22 % mudfiltrate.

DRILLING FLUIDS PROGRAM

Well: 7222/6-1
Field: Obesum
Rig: Polar Pioneer

HOLE SIZE	HOLE MD TVD	CASING/LINER SIZE	CASING/LINER MD TVD	MUD TYPE	MW [SG]	LGS [KG/m³]	10 sec. [Pa]	10 min. [Pa]	YP (Pa)	Fann 3 rpm	O / W ratio	PV [mPa]	API FL [ml]	HTHP FL [ml]	MBT [KG/m³]	pH	KCOOH [KG/m³]	Glyc. [%]	ES	Funnel Visc. [%]	Usage Volume [m³]
9 7/8" PILOT	599			Seawater	1.03															>100	0
				This section was drilled with sea water only with returns to seabed. Hivis sweeps based on Bentonite was mixed as contingency in case of bad hole cleaning/packoff. 1.50 SG Formpro mud/K-Formiate brine was kept at rig as kill mud.																	
36"	456 456	**30"**	452 452	Seawater CaCl2 brine	1.03 - 1.35											8 - 9				>100	**76**
				This section was drilled with sea water with returns to seabed. 54 m3 hivis sweeps based on Bentonite was kept as contingency in case of bad hole cleaning/packoff. The open hole was displaced to 1,35 SG CaCl2/polymer fluid. 1.50 SG Formpro mud or/K-Formiate brine was kept at rig as kill mud. As a result of having problems with "fish eyes" in the mud while drilling the top hole on the previous well (Askeladd Beta 7120/8-4) the concentration was reduced fro 24 kg/m3 to 7.5 kg /m3. Initially a small mix of 10 m3 was mixed to check for the practicability of mixing Di-Trol polymers at the concentration of 10 kg/m3. This was accomplished without generating much "fish eyes". The mix foamed rather much, however. It was speculated if this was a contributing factor to why the polymers seemed to dissolve poorly in the saturated CaCl2 brine. It was started mixing Di-Trol from PP-tanks in a reserve pit of 40 m3 CaCl2 brine. It was soon obvious that polymers were packed up into fairly solid lumps at the bottom of the hopper, near the venturi. This is a common problem, but seemed to be a lot more than usual, believed to be related to the high salt content in the brine. Due to this it was decided to use Trol FL for filterloss instead of Di-Trol. The same problem with clogging up the hopper was experienced, but it was nevertheless decided to continue mixing Trol FL. Foaming did not seem to be any problem when mixing the polymers. To minimise the chance of fish eyes plugging the strainers the CaCl2/Polymer mud was extensively circulated with the mixing pumps. There were no problems when pumping the displacement mud.																	
26"	604 602	**20"**	599 599	Seawater Bentonite CaCl2 brine	1.03 - 1.35											8 - 9				>100	**155**
				This section was drilled with sea water with returns to seabed. Prior to starting drilling, the following mud was prepared in the pit room: 235 m3 CaCl2/Polymer displacement mud and 54 m3 Hi-Vis Bentonite mud. The displacement mud was mixed with 4kg/m3 Trol-FL, 3kgDitrol and 1.5kg/m3 Mag Ox. After circulating the hole clean with 2 x 27m3 hi-vis pill, started to displace to CaCl2 displacement fluid. It was decided to displace 1.6 x hole volume, approx 101m3. The displacement mud seemed to effectively stabilise the hole, there were no problem to run the 20" casing to TD.																	
12 1/4"	1057 1026	**9 5/8"**	1050 1050	FORMPRO	1.25 - 1.26	111 - 120	5 - 6	6 - 8	7.5 - 9	5 - 6		14 - 17	3.3 - 3.6		21 - 28	8.4 - 9.5	315 - 335				**77**
				The drilling fluid used in the section was 1.36 SG Formpro WBM from previous well (Askeladden Beta) diluted to 1.25 SG. The Formpro mud performed well. Hole cleaning was good. Properties were held within or in the lower part of spec. On previous wells in the same area there had been experienced problems with high ECD's. This was not a problem in this section. There were no problems with foaming in this section. As prevention for this Defoamer was added to the premixes. Also, all mixing of mud chemicals were done in the premixes before being transferred to the active pit. This prevented air being drawn into the circulating mud from the hopper. In the previous wells with the same mud system the addition of Defoamer did not begin before the air entrappment had had become a problem. Overall, the practise of adding Defoamer into every premix seemed to reduce the total amount of defoamer that was needed. Because of the non-dumping policy in this area there is a lot of focus on trying to minimise the volume of mud that is built. In the beginning additions to the Active mud were partly made of used mud from previous project. Mud usage: 11 m3 to slop, 41 m3 lost on cuttings and 25 m3 left behind casing.																	
8 1/2"	2895 2848			FORMPRO	1.30 - 1.32	13 - 110	3.5 - 5	5 - 7	10 - 16	5 - 8		14 - 22	2 - 3.2		3 - 28	8 - 9.6	383 - 545				**130**
				In the program for this well, this section was planned to be drilled with 1.35 SG Formpro mud. However, this was changed as a result of the extended leak-off test. It was then decided to drill with 1.30 SG. The 8 ½" section was largely made up freshly to minimise Sulphate levels rather than using the mud from the 12 ¼" section. The Formpro mud performed well in this section. The filter loss was kept low at a maximum of 3.2 ml. Also 30 mt CaCO3 was added to bridge off permeable sand sections. The hole condition was remarkable good, even after a full week of WOW. There was much focus on minimising Sulphate polluting for logging purposes. The maximum limit was set to 200 mg/l. However, when a concentration, as measured by Petrotech, at 260 mg/l. was reported dilution rates were increased, bringing it down to around 220 mg/l. Mud usage including the P&A section: 119 m3 to slop and 11 m3 left in hole. 102 m3 via shakers to slurry - not to be reported as usage on this well.																	