

5.5 Fluid Analyses

The RFT chambers from this well gave no pressurized fluid samples. The atmospheric RFT sample from 2580 m RKB was analysed and the results are listed in table 5.9. This sample contained both oil and water/mud filtrate.

During the production test, monophasic reservoir fluid samples were taken at the wellhead. The PVT analyses performed on one of the wellhead sample are presented in tables 5.10 and 5.11.

Formation Pressures

DEPTH <u>(mRKB)</u>	HYDROSTATIC MUD PRESSURE	CORRECTED FORMATION PRESSURE	
	<u>(psia)</u>	<u>(psia)</u>	<u>(bar)</u>
Run 3A (HP-gauge)			
2577.5	6278.9	5635.2	388.53
2579.0	6284.2	5636.6	388.63
2580.5	6287.2	5637.9	388.72
2581.5	6289.0	5638.7	388.77
2584.5	6295.9	5641.6	388.97
2585.5	6297.2	5642.6	389.04
2593.0	6314.4	5651.5	389.66
2594.5	6319.0	5655.8	389.95
2599.0	6329.5	5661.3	390.33
2602.5	6336.7	5665.4	390.61
2609.5	6354.3	5675.9	391.34
2622.0	6385.5	5694.8	392.64
2660.0	6465.4	5748.1	396.32
2688.0	6536.0	5788.2	399.08
2699.5	6559.9	5805.1	400.25
2717.0	6600.6	5830.8	402.02
2747.0	6671.2	5872.8	404.91

RUN 3B (HP-gauge)

2580.0 Segregated sample for PVT analysis

Table 5.4, HP gauge Formation pressures, 34/4-6

Date	7.86	Auth	JB	Appr	PS
Drawn	TRK	Ref			

Formation Pressures



DEPTH	HYDROSTATIC MUD PRESSURE	CORRECTED FORMATION PRESSURE	
<u>(mRKB)</u>	<u>(psia)</u>	<u>(psia)</u>	<u>(bar)</u>

RUN 3C (HP-gauge)

2584.5 Unsuccessful sampling due to plugging

RUN 3D (HP-gauge)

2583.0	6297.3	5640.9	388.93
2583.5	6299.1	Tight	-
2584.0	6301.1	5641.6	388.97
2585.0	6304.1	5642.7	389.05
2585.5	6305.8	5643.5	389.10
2583.9*	6302.1	5642.0	389.00

* Sample, 2 3/4 gallon chamber flowline plugged,
1 gallon chamber 3 l of oil.

Table 5.4, HP gauge Formation pressures, 34/4-6

Date 7.86	Auth JB	Appr PS
Drawn by HKK	Ref	

Testing



	Lower zone	Upper zone	
Perforations, mRKB	2592 - 2595	2577 - 2585	
Event	Clean up flow	Initial flow	Main flow
Date	11/3	13/3	13/3-14/3
Time, hr:min	10:00-10:03	12:30-12:40	16:27-05:40
Choke, mm	6.4	9.5	12.7
Flow rate, Sm ³ /d	110 (cushion)	740 (cushion)	1206 (oil)
Cummulative prod. Sm ³	0.4	5.15	561
Bottom Hole* Pressure, Bar	313.47	371.42	359.62
Wellhead Pressure, Bar	16.3	107.6	153.6
Remarks			

* Depth reference, bottom hole pressure:
 - Lower zone 2629.3 mRKB
 - Upper zone 2546.9 mRKB

Table 5.5 Flow Data, 34/4-6

Date 7/86	Auth GAJ	Appr
Draw by	Ref	

Testing



Clean Up Flow and Build up, (Production from Lower zone)

<u>Date</u>	<u>Time</u>	<u>Bottom Hole Pressure</u> (Bar)	
1986			
11/3	10:00	392.88	Open well on 6.4 mm Fixed choke
	10:01	318.80	
	10:03	313.47	
	10:04		Shut the well in
	10:04	332.74	
	10:05	363.22	
	10:06	376.26	
	10:07	377.40	
	10:08	384.64	
	10:09	386.39	
	10:10	387.53	
	10:12	389.02	
	10:14	390.03	
	10:20	391.88	
	10:25	392.78	
	10:30	393.43	
	10:45	394.43	
	11:00	395.06	
	12:00	395.47	
	14:00	396.35	
	16:00	396.60	
	18:00	396.73	

(Gauge: Flopetrol # 83875 @ 2629.3 m RKB)

Table 5.6 Bottom Hole Pressure, Lower Zone, 34/4-6

Date	7/86	Auth	JMH	Appr	PS
Draw by		Ref			

Testing

Initial Flow and Build Up, (Production from Upper zone)

<u>Date</u>	<u>Time</u>	<u>Bottom Hole Pressure</u> (Bar)
13/3	12:28	383.55
	12:30	Well opened on 9.5 mm Fixed choke
	12:32	371.27 (initial flow)
	12:36	371.42
	12:40	385.14 Well shut in
	12:44	385.83
	12:48	385.96
	12:52	386.04
	13:00	386.12
	13:16	386.18
	13:32	386.22
	13:44	386.23
	14:00	386.25
	14:32	386.28
	15:00	386.28
	15:32	386.28
	16:16	386.27

Table 5.7 Bottom Hole Pressure, Upper Zone, 34/4-6

Date	7/86	Auth	GaJ	Appr
Draw by		Ref		

Testing

Main flow and Build up (Production from Upper zone)

<u>Date</u>	<u>Time</u>	<u>Bottom Hole Pressure</u> (Bar)	
13/3	16:27	Opened well on 17.5 mm Fix choke	
	16:28	356.38 (Main flow)	
	16:40	355.71	
	17:04	353.64	
	17:06	Switched to 12.7 mm Adj. Choke	
	17:08	367.82	
	17:12	367.76	
	17:15	Switched to 12.7 mm Fixed Choke	
	17:16	364.86	
	18:00	364.08	
	20:00	363.22	
	22:00	361.63	
	14/3	00:00	361.38
		03:00	360.30
05:36		359.62	
05:40		Shut the well in at the LPR-N-valve	
05:40		374.63	
05:44		376.05	
05:48		376.53	
05:52		376.87	
05:56		377.12	
06:00		377.35	
06:08		377.70	
06:20		378.13	
06:40		378.64	
06:44		378.17	
06:48	378.73		
06:52	378.90		
07:00	379.08		
07:08	379.21		

Table 5.7 Bottom Hole Pressure, Upper Zone, 34/4-6

Date	7/86	Auth	GaJ	Appr
Draw by		Ref		

Testing



Main flow and Build up (Production from Upper zone)

<u>Date</u>	<u>Time</u>	<u>Bottom Hole Pressure</u> (Bar)
	07:32	379.55
	08:00	379.86
	09:00	380.36
	10:00	380.71
	12:00	381.23
	18:00	382.16
15/3	00:00	382.92
	12:00	383.37
16/3	00:00	383.70
	12:00	383.93
17/3	00:00	384.09
	12:00	384.21
	21:36	384.28

Gauge: Sperry Sun # 433 at 2546.9 mRKB

Table 5.7 Bottom Hole Pressure, Upper Zone, 34/4-6

Date	7/86	Auth	GaJ	Appr
Draw by		Ref		

Testing



Main Flow and Build up (Lower zone is observation zone)

<u>Date</u>	<u>Time</u>	<u>Bottom Hole Pressure</u> (Bar)
13/3	16:26	396.37
	16:27	Open well on 44/64 Fixed choke from the Upper zone
	16:28	395.89
	16:30	395.48
	17:00	395.09
	18:00	395.30
	20:00	395.12
	23:00	394.89
14/3	02:00	394.77
	05:40	394.54
	05:40	Shut in the well at the LPR-N-valve
	05:41	394.61
	05:43	394.78
	06:00	395.05
	06:29	395.25
	06:31	395.08
	06:40	395.19
	07:00	395.26
	08:00	395.32
	10:00	395.10
	12:00	394.93
	18:00	394.72
15/3	00:00	394.57
	12:00	394.34
16/3	00:00	394.16
	12:00	393.96
17/3	00:00	393.85
	12:10	393.71
	21:40	393.65

(Gauge: Flopetrol # 83875 @ 2629.3 mRKB)

Table 5.8 Bottom Hole Pressure, Lower Zone, 34/4-6

Date	7/86	Auth GaJ	Appr
Draw by		Ref	

Fluid Analyses

SEGREGATED RFT-SAMPLE AT 2580. mRKB

Recovery data:

Opening pressure : 1 bar
Gas recovered : 0
Water/mud filtrate : 2050 cm³
Oil : 1580 cm³

Water (mud filtrate) analysis

Sodium (mg/l)	12620	Chloride (mg/l)	16650
Potassium (mg/l)	410	Sulphate (mg/l)	5160
Calcium (mg/l)	555	Bicarbonate (mg/l)	730
Magnesium (mg/l)	15	Carbonate (mg/l)	NIL
Barium (mg/l)	0.2	Hydroxide (mg/l)	NIL
Strontium (mg/l)	15		
Total iron (mg/l)	6.5		
Dissolved iron (mg/l)	4.2		

Resistivity (OHM-M at 15.6°C) : 0.234
pH : 7.7
Specific gravity : 1.027

Fig. 5.9 Analyses of RFT Sample 34/4-6

Date	7/86	Auth	JMH	Appr
Draw by		Ref		

Fluid Analyses



WELLHEAD SAMPLE

Sampling condition	:	153.7 bar and 43.4°C
Producing zone (mRKB)	:	2577.0 - 2585.0
Reservoir temperature (°C)	:	100
Reservoir pressure (bar)	:	388
Bubble point pressure (bar)	:	135.5
Oil formation volume factor (R_m^3 / S_m^3) ¹	:	1.32
Gas oil ratio (S_m^3 / S_m^3) ¹	:	91.3
Stock tank oil density (kg/m^3) ²	:	824.5
Reservoir fluid density (kg/m^3)	:	700
Reservoir fluid viscosity (mPa.s)	:	0.656

Subscripts:

- 1) Corrected for a four stage flash where the separator conditions were:

Stage no.	Sep. pressure (bar)	Sep. temperature (C°)
1	63	66
2	31	60
3	11	54
4	1	15

- 2) Stock tank oil density after four stage flash

Table 5.10 Analyses of Reservoir oil, 34/4-6

Date 7/86	Auth JMH	Appr
Draw by	Ret	

Fluid Analyses



WELLHEAD SAMPLE (continued)

Component	Wt %	Mol %
Nitrogen	0.48	1.86
Carbon Dioxide	0.06	0.16
Methane	3.86	26.22
Ethane	2.34	8.48
Propane	3.55	8.77
iso-Butane	0.72	1.34
n-Butane	2.82	5.29
iso-Pentane	1.13	1.71
n-Pentane	1.76	2.66
Hexanes	2.49	3.22
Heptanes	4.36	5.10
Octanes	4.89	5.02
Nonanes	3.35	3.05
Decanes plus	<u>68.19</u>	<u>27.12</u>
	100.00	100.00

Molecular weight C_{10+} : 274.2

Density C_{10+} (kg/m^3) : 871.6

- The composition is mathematically recombined from gas chromatographic analysis of stock tank oil and gas after single stage flash.
- Molecular weight and density of C_{10+} are measured values from true boiling point distillation of stock tank oil.

Table 5.11 Analyses of Reservoir oil 34/4-6

Date 7/86	Auth JMH	Appr PS
Draw by	Ref	

Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf / Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
851231	17-1/2	530.0	1.06										SPUD MUD
860101	36	530.0	1.06										SPUD MUD
860102	36	530.0	1.06										SPUD MUD
860103	36	530.0	1.06										SPUD MUD
860104	36	530.0	1.06										SPUD MUD
860105	36	530.0	1.06										SPUD MUD
860106	17-1/2	585.0	1.07	7	34	17/22	10.4						GEL MUD
860107	17-1/2	920.0	1.12	7	29	21/25	9.0	0.1/0.1	180	9000		5.0	GEL MUD
860108	26	920.0	1.12	7	30	22/24	9.0	0.1/0.1	180	9000		5.0	GEL MUD
860109	26	920.0	1.14	6	28	20/25	9.0	0.1/0.2	200	10000		6.0	GEL MUD
860110	26	920.0	1.14	6	26	18/24	9.0	0.1/0.2	200	10000	0.2	6.0	GEL MUD
860111	26	920.0	1.14	5	25	16/21	9.0	0.1/0.2	200	10000	0.2	6.0	GEL MUD
860112	26	920.0	1.14	5	20	15/21	9.0	0.1/0.2	200	10000	0.2	6.0	GEL MUD
860113	26	920.0	1.15	5	21	15/20	9.0	0.1/0.2	200	10000	0.2	6.0	GEL MUD
860114	26	920.0	1.15	5	22	15/20	9.0	0.1/0.2	200	10000	0.2	7.0	GEL MUD
860115	26	920.0	1.15	5	21	15/20	9.0	0.1/0.2	200	10000	0.2	7.0	GEL MUD
860116	26	920.0	1.15	5	21	15/20	9.0	0.1/0.2	200	10000	0.1	7.0	GEL MUD
860117	26	920.0	1.14	6	23	14/22	9.5	0.2/0.2	200	8000	0.1	7.0	GEL MUD
860118	26	920.0	1.14	9	22	11/22	9.5	0.2/0.2	180	3000	0.1	7.0	GEL MUD
860119	26	920.0	1.14	8	24	11/31	9.5	0.2/0.2	160	3000	0.1	7.0	GEL MUD
860120	26	920.0	1.03										GYP/POLYMER MUD
860121	17-1/2	920.0	1.10	12	15	1/2	9.5	0.1/0.2	1400	20000	0.1	4.0	GEL MUD
860122	17-1/2	920.0	1.10	12	15	1/2	9.5	0.1/0.2	1400	20000	0.1	4.0	GYP/POLYMER MUD
860123	17-1/2	1120.0	1.11	19	21	2/3	9.9	0.1/0.3	2600	16000	0.2	5.0	GYP/POLYMER MUD
860124	17-1/2	1381.0	1.13	17	19	2/3	9.6	0.1/0.2	2400	18000	0.3	5.0	GYP/POLYMER MUD
860125	17-1/2	1695.0	1.31	20	22	2/5	9.5	0.1/0.2	2600	17000	0.2	11.0	GYP/POLYMER MUD
860126	17-1/2	1855.0	1.48	25	20	5/14	10.2	0.1/0.2	2700	19000	0.2	17.0	GYP/POLYMER MUD
860127	17-1/2	1855.0	1.48	25	22	7/16	10.5	0.1/0.3	2600	20000	0.2	17.0	GYP/POLYMER MUD
860128	17-1/2	1855.0	1.48	22	18	7/20	9.5	0.1/0.1	2400	20000	0.2	17.0	GYP/POLYMER MUD
860129	17-1/2	1855.0	1.48	24	19	9/21	10.5	0.1/0.1	2400	20000	0.2	17.0	GYP/POLYMER MUD

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6.2.1 MUD PROPERTIES, DAILY REPORT

Well no: 34/4-6

Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf / Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
860130	17-1/2	1855.0	1.48	24	19	9/20	10.4	0.1/0.1	2400	19000	0.2	17.0	GYP/POLYMER MUD
860131	12-1/4	1861.0	1.48	17	20	8/22	10.5	0.2/0.3	2800	21000	0.2	18.0	GYP/POLYMER MUD
860201	12-1/4	2127.0	1.55	19	24	14/28	9.8	0.2/0.5	2800	20000	0.2	20.0	GYP/POLYMER MUD
860202	12-1/4	2274.0	1.65	27	25	18/31	10.2	0.2/0.5	1680	19000	0.2	24.0	GYP/POLYMER MUD
860203	12-1/4	2345.0	1.65	21	23	19/31	10.1	0.2/0.8	1680	19000	0.2	24.0	GYP/POLYMER MUD
860204	12-1/4	2443.0	1.68	21	21	18/32	10.2	0.2/0.8	1480	20000	1.0	25.0	GEL MUD
860205	12-1/4	2495.0	1.68	16	18	14/44	10.5	0.2/1.0	1280	20000	1.0	24.0	GEL MUD
860206	12-1/4	2498.0	1.68	18	20	17/38	10.2	0.2/0.8	1280	19000	1.0	24.0	GEL MUD
860207	12-1/4	2549.0	1.70	19	14	5/24	10.4	0.1/0.2	1200	20000	1.0	24.0	GEL MUD
860208	12-1/4	2560.0	1.70	19	13	5/24	10.2	0.2/1.0	720	18000	0.8	24.0	GEL MUD
860209	12-1/4	2576.0	1.70	22	14	4/26	10.4	0.2/0.8	680	19000	1.0	24.0	GEL MUD
860210	12-1/4	2588.0	1.70	22	13	4/24	10.4	0.2/1.1	480	18000	1.0	24.0	GEL MUD
860211	12-1/4	2600.0	1.70	23	14	4/23	10.7	0.3/1.1	480	19000	0.8	24.0	GEL MUD
860212	12-1/4	2614.0	1.70	22	13	3/20	10.8	0.3/0.9	520	19000	1.0	24.0	GEL MUD
860213	12-1/4	2632.0	1.70	22	14	3/23	10.7	0.2/0.8	520	19000	1.0	24.0	GEL MUD
860214	12-1/4	2632.0	1.70	23	15	3/23	10.5	0.2/0.8	560	19000	0.2	24.0	GEL MUD
860215	12-1/4	2650.0	1.70	22	16	3/21	10.6	0.2/0.7	560	19000	0.2	24.0	GEL MUD
860216	12-1/4	2746.0	1.70	20	16	3/21	10.5	0.2/0.7	620	19000	0.5	24.0	GEL MUD
860217	12-1/4	2770.0	1.70	20	16	3/20	10.7	0.2/0.6	600	19000	0.5	24.0	GEL MUD
860218	12-1/4	2770.0	1.70	22	16	3/23	10.7	0.2/0.7	600	19000	0.5	24.0	GEL MUD
860219	12-1/4	2770.0	1.70	22	16	3/23	10.7	0.2/0.7	600	19000	0.3	24.0	GEL MUD
860220	12-1/4	2770.0	1.70	22	16	3/21	10.5	0.2/0.7	600	19000	0.2	24.0	GEL MUD
860221	12-1/4	2770.0	1.70	27	16	3/21	10.7	0.2/0.7	600	19000	0.2	24.0	GEL MUD
860222	12-1/4	2770.0	1.70	27	16	3/28	10.7	0.2/0.7	600	19000	0.2	24.0	GEL MUD
860223	12-1/4	2770.0	1.62	43	17	5/23	9.9	0.1/0.4	600	17000	0.2	21.0	GEL MUD
860224	12-1/4	2770.0	1.62	26	14	3/20	9.9	0.1/0.4	600	17000	0.2	21.0	GEL MUD
860225	8-1/2	2792.0	1.62	19	14	4/31	11.4	0.2/0.8	600	17000	0.2	21.0	GEL MUD
860226	8-1/2	2862.0	1.62	21	15	7/41	11.4	0.2/0.7	450	13000	0.2	21.0	GEL MUD
860227	8-1/2	2993.0	1.62	17	16	9/42	11.2	0.2/0.8	480	13000	0.5	21.0	GEL MUD
860228	8-1/2	3039.0	1.62	18	14	5/35	11.1	0.2/1.0	540	13000	0.3	21.0	GEL MUD

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6.2.1 MUD PROPERTIES, DAILY REPORT

Well no: 34/4-6

Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf / Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
860301	8-1/2	3152.0	1.62	17	16	8/45	10.6	0.2/0.7	250	13000	0.3	21.0	GEL MUD
860302	8-1/2	3201.0	1.62	19	16	9/40	10.6	0.1/1.0	200	13000	0.3	22.0	GEL MUD
860303	8-1/2	3282.0	1.62	17	14	8/40	10.6	0.2/0.8	200	12000	0.3	22.0	GEL MUD
860304	8-1/2	3282.0	1.62	17	14	8/39	10.6	0.2/0.9	200	11000	0.3	22.0	GEL MUD
860305	8-1/2	3282.0	1.70	18	15	9/40	11.0	0.2/0.7	230	11000	0.3	22.0	GEL MUD
860306	8-1/2	2700.0	1.70	17	16	10/45	11.6	0.3/0.7	230	11000	0.3	22.0	GEL MUD
860307	8-1/2	2700.0	1.70	18	14	10/40	12.4	0.2/0.7	250	11000	0.3	22.0	GEL MUD
860308	8-1/2	2720.0	1.70	18	14	10/41	12.4	0.2/0.7	250	11000	0.3	22.0	GEL MUD
860309	8-1/2	2720.0	1.70	18	14	10/40	12.4	0.2/0.7	250	11000	0.3	22.0	GEL MUD
860310	8-1/2	2720.0	1.70	18	13	10/40	12.4	0.3/0.7	350	11000	0.3	22.0	GEL MUD
860311	8-1/2	2720.0	1.70	18	13	10/40	12.4	0.3/0.7	350	11000	0.3	22.0	GEL MUD
860312	8-1/2	2720.0	1.70	18	13	10/40	12.4	0.3/0.7	350	11000	0.3	22.0	GEL MUD
860313	8-1/2	2720.0	1.70	18	13	8/41	12.4	0.4/0.7	350	11000	0.3	22.0	GEL MUD
860314	8-1/2	2720.0	1.70	19	14	10/42	12.2	0.4/0.8	350	11000	0.3	22.0	GEL MUD
860315	8-1/2	2720.0	1.70	18	14	11/41	12.2	0.4/0.8	350	11000	0.3	22.0	GEL MUD
860316	8-1/2	2720.0	1.70	17	13	10/40	11.9	0.4/0.8	350	11000	0.3	22.0	GEL MUD
860317	8-1/2	2720.0	1.70	17	13	12/42	11.7	0.4/0.8	350	11000	0.3	22.0	GEL MUD
860318	8-1/2	2720.0	1.70	19	14	14/50	11.4	0.2/0.7	300	10000	0.3	22.0	GEL MUD
860319	8-1/2	2490.0	1.70	19	15	14/50	11.4	0.2/0.7	300	10000	0.3	22.0	GEL MUD
860320	8-1/2	2500.0	1.70	19	15	14/50	11.2	0.2/0.7	300	11000	0.3	22.0	GEL MUD
860321	8-1/2	2500.0	1.70	18	14	12/45	11.2	0.2/0.7	300	11000	0.3	22.0	GEL MUD
860322	8-1/2	2500.0	1.70	18	14	12/45	11.2	0.2/0.7	300	11000	0.3	22.0	GEL MUD
860323		400.0	1.03	18	14	12/45	11.2	0.2/0.7	300	11000	0.3	22.0	GEL MUD

SAGA PETROLEUM A.S.

6.2.2 MUD MATERIALS USED

Well no: 34/4-6

Materials	Unit	36 in hole	26 in hole	17-1/2 hole	12-1/4 hole	8-1/2 hole	Total
BARITE	M/T	0	213	355	719	241	1528
BICARBONATE	50 KG	3	0	4	0	27	34
PROTHIN	25KG	0	0	16	506	89	611
CAUSTIC SODA	25 KG	24	26	59	177	12	298
DRISPAC REG	50 LB	0	0	132	5	9	146
DRISPAC S/L	50 LB	0	0	0	128	6	134
GYPSUM	50 KG	0	0	520	27	0	547
MILBIO	55 GA	0	0	6	2	0	8
MILPOL 302	25 KG	0	0	132	21	0	153
PERMALOSE	25 KG	0	0	274	46	0	320
PRO-DEFOAMER	25 L	0	0	2	13	5	20
SODA ASH	50 KG	0	1	0	0	2	3
W.O.21	25 KG	0	0	0	0	2	2
BENTONITE	M/T	23	65	0	0	8	96