

PRESSURE UNITS:		BAR		RIG: Scarabeo 5				DATE: 04.03.98			
				KB (M): 25.0 m							
RUN #:	DEPTH	DEPTH	IN. HYDROST.	FORMATION	FIN. HYDROST	TEMP	MOB.	REMARKS			
1A	MD	TVD	PRESSURE	PRESSURE	PRESSURE	INDEX					
TEST #	RKB	RKB	EMW	HP	EMW	HP	EMW	HP			
1	4205.5	2511.9	1.62	397.97	1.38	340.51	1.62	399.42	90.8	254.0	Volumetric pre-test 20 cc
2	4204.8	2511.4	1.62	398.81					90.7		Tight, abandon test
3	4205.3	2511.8	1.62	398.40	1.38	340.50	1.62	398.32	90.7	2754.0	Volumetric pre-test 20 cc
4	4187.0	2496.6	1.61	394.81	1.34	327.63	1.62	395.61	90.7	187.0	Volumetric pre-test 20 cc
5	4184.5	2494.5	1.61	394.40	1.34	327.48	1.61	394.97	90.6	139.0	Volumetric pre-test 20 cc
6	4173.0	2485.0	1.61	391.90	1.34	326.79	1.61	392.82	90.1	2795.0	Volumetric pre-test 20 cc
7	4164.0	2477.6	1.60	389.58	1.34	326.29	1.61	390.92	89.6	1448.0	Volumetric pre-test 20 cc
8	4150.0	2466.0	1.60	387.76	1.35	325.47	1.61	388.39	89.3	98.0	Volumetric pre-test 20 cc
9	4135.0	2453.5	1.60	384.00	1.35	324.62	1.60	385.29	88.9	292.0	Volumetric pre-test 20 cc
10	4131.5	2449.8	1.60	383.40	1.35	324.34	1.60	384.56	88.5	40.0	Volumetric pre-test 20 cc
11	4124.0	2444.4	1.59	382.03					88.1		Tight, abandon test
12	4205.0	2511.5	1.62	399.40	1.38	340.55	1.63	400.48	93.4		Sampling point (2 3/4 +1 gal)
13	4182.0	2492.5									Stop log due to increase in head tension
14	4181.0	2491.6	1.62	395.51	1.34	327.37					Loosing seal when starting pump
15	4175.0	2486.7	1.61	392.98	1.34	326.94	0.00				Stop due to plugging of flowline
16	4175.0	2486.7	1.61	393.74	1.34	327.40	0.00				Loosing seal when starting pump
17	4153.0	2468.4	1.61	388.69	1.34	325.68	0.00				Leak in pump out, retract
18	4153.0	2468.4	1.61	389.12	0.00		0.00				One 1 gal filled in 1.5 hrs
19	4125.0	2445.3	1.59	382.48					89.9		Tight, abandon test
20	4123.5	2444.0	1.59	381.84					89.7		Tight, abandon test

Table 5.6: MDT wellsite worksheet

## 5.5 Production test no. 1

### 5.5.1 Operations

The interval 4203.5 - 4207.5 m MD RKB (2477.0 - 2480.3 m TVD MSL) was perforated 28.03.98 (approx. 9 bars) underbalanced on wireline against a closed choke manifold. A Schlumberger 3 3/8" (RDX, "Clean Shot", 20.5 gr., 60deg. phasing, 6 SPF) gun was used.

The well was opened for clean-up flow after the gun was out of hole and rigged down. After 4.5 hours clean-up, the flow was directed through the separator for about 2 hours. The max. rate during this flow was estimated to approximately 800 Sm<sup>3</sup>/d. There were no water or sand measured during the last 3-4 hours.

Prior to the sampling/main flow, a drift run was made. Due to sand/high deviation, the drift stopped at 3240 m MD RKB. After three bailing runs (filled with sand), another 200 meters was achieved. Due to the sand problem, it was decided not to run the down-hole shut-in valve as planned. To get as much data as possible, without having to clean-up the well twice, samplers and gauges were run separate to a depth of 2500 m MD RKB (expected to provide single phase sampling). A short sampling flow and a pressure build-up were then performed.

After nine bailing runs, a max. depth of 4027 m MD RKB was reached. Due to slow progress and little/no sand in bail, the options were to clean out the sand by flowing the well or using coiled tubing. A high rate clean-up flow (to the burner) was performed and sand was measured at surface during maximum rate, 1700-1800 Sm<sup>3</sup>/d (56/64" choke). The well was flowed at max. rate for 7 hours, with slugs of sand, but only traces at the end. However, only a depth of 3650 m MD RKB was reached during the following bailing run. An injection attempt (water/glycol) was also made, but with no success.

While waiting on CT (coiled tubing), the rig spent about one week doing well intervention on Tordis. The well was cleaned up, using CT, and drifted down to 4220 m MD RKB. The amount of sand obtained at surface was less than 1 m<sup>3</sup>.

Main results are shown in Table 5.7 and Table 5.8, and graphically in Figure 5.2 and Figure 5.3.

Period	Event	Duration (hr)
FL1	Cleanup flow (up to 36/64" choke)	7.68
BU1	Clean-up build-up	3.00
FL2	Sampling / main flow (20/64" choke)	5.08
BU2	Sampling / main build-up	5.72
FL3	High rate clean-up flow (up to 56/64" choke)	21.23
BU2	High rate clean-up build-up	1.00

**Table 5.7: Flow- and build-up periods, 34/7-26A test # 1**

Period	WHP (bar)	WHT (DegC)	BHP* (bar)	BHT* (DegC)	Q <sub>GAS</sub> ** (sm <sup>3</sup> /d)	Q <sub>oil</sub> ** (sm <sup>3</sup> /d)	GOR** (sm <sup>3</sup> /sm <sup>3</sup> )	PI*** (sm <sup>3</sup> /d/bar)
FL1	125.0	24	283.45	89.2	-	800 (estim.)	-	< 26
FL2	140.0	14	301.14	87.1	31 560	346	91	< 26
FL3	100.0	30	251.26	89.6	-	1750 (estim.)	-	< 28

\*) Permanent downhole gauge at 3612 m MD RKB (2131 m TVD RKB). \*\*) Refers to 14 bar (GasP), 50 DegC (OilT) separator conditions.

\*\*\*) Steady state flow was not reached.

**Table 5.8: Summary of production results (data from end of period), 34/7-26A test # 1**

## 5.5.2 Fluid Sampling

The following samples were collected:

Date	Time	Set no.	Sample point
31.03.98	02:30	BHS	down hole
31.03.98	02:30	BHS	down hole
31.03.98	02:30	BHS	down hole
31.03.98	02:30	BHS	down hole

Bottom hole samples contains approximately 0.55 lt.

The following additional samples were taken:

2 gas samples for geochemistry (each 0.3 lt.)

2 oil samples for geochemistry (each 0.5 lt.)

3 oil samples for SCAL/TBP (each 20 lt.)

10 dead oil samples, (each 18 lt.)

2 oil samples for Ni/V/Po 210 (each 1.0 lt.)

## 5.6 Production test no. 2

### 5.6.1 Operations

Due to sand production during test no.1, the well was cleaned up using coiled tubing before the bridge plug was set at 4200 m MD RKB (had to bullhead to get it down). The intervals were perforated 16.04.98 in two wireline runs. The lower interval, 4161.5-4179.5 m MD RKB (2442.7-2457.4 m TVD MSL), was perforated first with an overbalance of 2 bars (used to avoid sand production). After one miss-run, the second perforation interval, 4140.0-4149.0 m MD RKB (2425.1-2432.4 m TVD MSL) was perforated with the well shut-in. Schlumberger 3 3/8" (RDX, "Clean Shot", 20.5 gr., 60deg. phasing, 6 SPF) guns were used.

The well was opened for clean-up flow after the gun was out of hole and rigged down. After 7.5 hours clean-up, the flow was directed through the heater, separator and sand-separator. The choke size was increased in steps, while checking for sand, to a max. separator rate of about 1750 Sm<sup>3</sup>/d. After a total clean-up time of 17.5 hours and no sand production, the well was shut-in at the choke manifold for a pressure build-up.

After a successful drift run to 3600 m MD RKB, a tool string made up of packer element, pre set shut-in valve, four bottomhole samplers and three gauges were put together and run in hole. Due to high deviation and little clearance, about nine hours were spent running in hole. To assist getting down, the well had to be flowed on a small rate for four hours. The tool was set at 3602 m MD RKB (just above the permanent gauge). After the running tool was pulled out and rigged down, the well was opened for sampling/main flow. The well was opened gradually to desired rate, in about one hour, and flowed on this rate (Oil rate of about 1350 Sm<sup>3</sup>/d at a 44/64" fixed choke) for 12 hours. The well was shut-in automatically, on the downhole valve, and soon after on the choke manifold. After 14 hours build-up, the downhole valve automatically opened and the tool string was pulled out of hole.

When investigating the bottomhole samplers, it was found that three had failed. However, one good sample was considered acceptable. Before finishing off the test, two gauges (set to read pressure for 284 and 355 days) were placed above the plug at 4202 m MD RKB. The well was handed over the GFC 22.04.1998.

Main results are shown in Table 5.9 and Table 5.10, and graphically in Figure 5.4 and Figure 5.5.

Period	Event	Duration (hr)
FL1	Clean-up flow (up to 52/64")	17.60
BU1	Clean-up build-up	3.00
	Shut-in/flowing (drift run and placing tool string at right depth)	27.72
FL2	Sampling / main flow (44/64")	13.03
BU2	Main build up	14.00

**Table 5.9: Flow- and build-up periods, 34/7-26A test # 2**

Period	WHP (bar)	WHT (DegC)	BHP* (bar)	BHT* (DegC)	Q <sub>GAS</sub> ** (sm <sup>3</sup> /d)	Q <sub>Oil</sub> ** (sm <sup>3</sup> /d)	GOR** (sm <sup>3</sup> /sm <sup>3</sup> )	PI <sub>Oil</sub> *** (sm <sup>3</sup> /d/bar)
FL1	139	36	295.42	88.4	-	1730	-	241
FL2	144	31	296.79	88.4	99664	1361	73	234

\*) Permanent gauge at 3612 m MD RKB (2131 m TVD RKB). \*\*) Refers to 54 bar (GasP) and 46 deg C (OilT) separator conditions.

\*\*\*) Inclusive formation skin and friction loss between perforation and gauge.

**Table 5.10: Summary of production results (data from end of period), 34/7-26A test # 2**

## 5.6.2 Fluid sampling

The following samples were collected :

Date	Time	Set no.	Sample point
19.04.98	14:33	PVT set no.1	test separator
19.04.98	15:20	PVT set no.2	test separator
19.04.98	16:00	PVT set no.3	test separator
19.04.98	16:40	PVT set no.4	test separator
19.04.98	10:50	BHS	down hole
19.04.98	10:30	BHS	down hole
19.04.98	10:40	BHS	down hole
19.04.98	11:43	BHS	down hole

Bottom hole samples contains approximately 0.55 lt.

All PVT sets consists of 0.5 lt. oil and 20 lt. gas pressurised bottles.

The following additional samples were taken:

2 gas samples for geochemistry (each 0.3 lt.)

2 oil samples for geochemistry (each 0.5 lt.)

4 oil samples for SCAL/TBP (each 20 lt.)

10 dead oil samples, (each 18 lt.)

2 oil samples for Ni/V/Po 210 (each 1.0 lt.)

Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf /Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
980206	12 1/4"	1396.0	1.40	21.0	18.0	11/15		/		105000	.3	17.5	PSEUDO OIL BASED
980207	12 1/4"	1708.0	1.40	26.0	19.0	14/19		/		112000	.7	18.0	PSEUDO OIL BASED
980208	12 1/4"	2051.0	1.40	26.0	21.0	17/23		/		123000	.6	18.5	PSEUDO OIL BASED
980209	12 1/4"	2507.0	1.42	27.0	20.0	16/22		/		126000	.6	19.0	PSEUDO OIL BASED
980210	12 1/4"	3071.0	1.45	32.0	22.0	17/24		/		114000	.6	20.0	PSEUDO OIL BASED
980211	12 1/4"	3306.0	1.47	34.0	21.0	17/23		/		116000	.5	21.0	PSEUDO OIL BASED
980212	12 1/4"	3306.0	1.47	31.0	19.0	15/21		/		109000	.5	20.5	PSEUDO OIL BASED
980213	12 1/4"	3306.0	1.47	29.0	17.0	14/21		/		107000	.5	20.5	PSEUDO OIL BASED
980214	12 1/4"	3681.0	1.47	33.0	20.0	16/23		/		114000	.9	21.0	PSEUDO OIL BASED
980215	12 1/4"	3750.0	1.49	33.0	20.0	16/25		/		116000	1.0	21.5	PSEUDO OIL BASED
980216	12 1/4"	3750.0	1.49	33.0	20.0	16/24		/		116000	1.0	21.5	PSEUDO OIL BASED
980217	12 1/4"	3750.0	1.49	24.0	18.0	15/22		/		110000	.3	20.0	PSEUDO OIL BASED
980218	8 1/2"	3750.0	1.49	24.0	18.0	15/22		/		110000	.3	20.0	PSEUDO OIL BASED
980219	8 1/2"	3750.0	1.49	24.0	18.0	15/22		/		110000	.3	23.0	PSEUDO OIL BASED
980220	8 1/2"	4009.0	1.53	30.0	19.0	17/22		/		112000	.5	22.0	PSEUDO OIL BASED
980221	8 1/2"	4104.0	1.58	31.0	22.0	16/25		/		112000	.8	23.0	PSEUDO OIL BASED
980222	8 1/2"	4104.0	1.58	30.0	22.0	16/24		/		114000	.8	23.0	PSEUDO OIL BASED
980223	8 1/2"	4130.0	1.58	33.0	20.0	16/26		/		114000	.6	23.0	PSEUDO OIL BASED
980224	8 1/2"	4130.0	1.58	32.0	20.0	15/25		/		114000	.6	23.0	PSEUDO OIL BASED
980225	8 1/2"	4130.0	1.58	29.0	22.0	15/25		/		117000	.6	23.0	PSEUDO OIL BASED
980226	8 1/2"	4130.0	1.58	33.0	22.0	14/24		/		107000	.8	23.0	PSEUDO OIL BASED
980227	8 1/2"	4290.0	1.62	35.0	19.0	14/24		/		109000	.6	24.0	PSEUDO OIL BASED
980228	8 1/2"	4290.0	1.62	35.0	20.0	14/24		/		107000	.5	24.0	PSEUDO OIL BASED
980301	8 1/2"	4290.0	1.62	34.0	21.0	14/24		/		107000	.5	24.0	PSEUDO OIL BASED
980302	8 1/2"	4290.0	1.62	35.0	19.0	14/24		/		107000	.5	24.0	PSEUDO OIL BASED
980303	8 1/2"	4290.0	1.62	33.0	22.0	14/25		/		109000	.5	24.0	PSEUDO OIL BASED
980304	8 1/2"	4290.0	1.62	34.0	25.0	14/25		/		109000	.5	24.0	PSEUDO OIL BASED

Table 6.4: Mud Properties, Well 34/7-26A, Daily Report, Part 1

Date	Hole size	Hole depth	Mud weight	PV	YP	Gel strength	pH	Alkalinity Pf /Mf	Ca++ mg/l	Cl- mg/l	Sand %	Solids %	Mudtype
980305	8 1/2"	4205.0	1.62	34.0	21.0	14/24		/		107000	.5	24.0	PSEUDO OIL BASED
980306	CO#1	4205.0	1.55	30.0	21.0	15/23		/		110000	.5	22.0	PSEUDO OIL BASED
980307	CO#1	4205.0	1.55	36.0	20.0	13/20		/		98000	.4	21.5	PSEUDO OIL BASED
980308	CO#1	4205.0	1.55	32.0	18.0	14/20		/		97000	.3	22.0	PSEUDO OIL BASED
980309	CO#1	4205.0	1.55	32.0	19.0	14/20		/		97000	.3	22.0	PSEUDO OIL BASED
980310	CO#1	4205.0	1.55	32.0	18.0	14/20		/		97000	.3	22.0	PSEUDO OIL BASED
980311	CO#1	4205.0	1.55	32.0	19.0	14/20		/		97000	.3	22.0	PSEUDO OIL BASED
980312	CO#1	4205.0	1.55	32.0	18.0	14/19		/		97000	.3	22.0	PSEUDO OIL BASED

**Table 6.4: Mud Properties, Well 34/7-26A, Daily Report, Part 2**

## 6.5.2 Mud materials used

The mud materials used is shown in Table 6.5.

Material	Unit	12 1/4"	8 1/2"	Total
Ancotec B	M3		1	1
A Tec B with 40kg/m3 Novamul	M3	216	48	264
Barite	MT	281	99	380
Bentone 128	KG	2725	475	3200
Cal. Chloride	KG	21450	1050	22500
Calcium Carbonate Coarse	KG	600		600
Kwik Seal Medium	KG	561		561
Lime	KG	14775	4180	18955
Mica Fine	KG	550		550
Mix-II Fine	KG	547		547
Novamod	KG	1496	187	1683
Novamul	Litre	3750	2450	6200
Nut Plug Fine	KG	725		725
XC Polymer	kKG		100	100
Venn Fyber 201	KG	543		543

**Table 6.5: Mud materials used in well 34/7-26A**