

**General information**

Wellbore name	1/9-4
Type	EXPLORATION
Purpose	WILDCAT
Status	SUSPENDED
Factmaps in new window	link to map
Main area	NORTH SEA
Field	TOMMELITEN GAMMA
Discovery	1/9-4 Tommeliten Gamma
Well name	1/9-4
Seismic location	line 404-410 shot point 100
Production licence	044
Drilling operator	Den norske stats oljeselskap a.s
Drill permit	182-L
Drilling facility	ROSS RIG (1)
Drilling days	153
Entered date	13.08.1977
Completed date	12.01.1978
Release date	12.01.1980
Publication date	26.05.2009
Purpose - planned	WILDCAT
Reentry	NO
Content	GAS/CONDENSATE
Discovery wellbore	YES
1st level with HC, age	PALEOCENE
1st level with HC, formation	EKOFISK FM
2nd level with HC, age	LATE CRETACEOUS
2nd level with HC, formation	TOR FM
Kelly bushing elevation [m]	25.0
Water depth [m]	75.0
Total depth (MD) [m RKB]	3710.0
Maximum inclination [°]	7.5
Bottom hole temperature [°C]	150
Oldest penetrated age	LATE PERMIAN
Oldest penetrated formation	ZECHSTEIN GP
Geodetic datum	ED50
NS degrees	56° 29' 3.76" N
EW degrees	2° 56' 0.29" E
NS UTM [m]	6260132.83



EW UTM [m]	495899.06
UTM zone	31
NPDID wellbore	247

Wellbore history

General

Well 1/9-4 was drilled on a salt diapir structure in the Central Graben in the neighbourhood of the Norwegian - UK median line. The primary purpose was to test the Ekofisk and Tor formations of Danian and Maastrichtian age. Lower possible porous zones in chalk and Jurassic sands, if present, were secondary objectives.

Operations and results

Wildcat well 1/9-4 was spudded with the semi-submersible installation Ross Rig on 13 August 1977 and drilled to TD at 3710 m in Late Permian Zechstein salt. There were no serious drilling problems down to a depth of 3100 m. At 3100 m the bit-junksub assembly was lost in the hole. The hole was cemented back and sidetracked after the fishing attempts proved unsuccessful. After one unsuccessful sidetrack attempt the hole was sidetracked again from 3041 m and drilled on to core point at 3122 m. When cutting core no 10 the bottom hole assembly got stuck and a long section of the BHA had to be left in the hole. After some unsuccessful attempts on jarring, the hole was cemented and sidetracked again, from 3059 m in the first sidetrack hole. This second sidetracked hole was drilled to a measured depth of 3353 m. At this point 7" liner was run. 6" hole was drilled to a total measured depth of 3710 m with only minor problems and top of the salt was found at 3650 m. The 6" hole was logged and plugged back. It was found necessary to perform a squeeze job around the 7" liner shoe, but when attempting to pull out after this operation, the BHA stuck just above the cementing stinger. Jarring did not free the pipe, and a cement plug was set above the fish. The well was drilled with high viscosity spud mud of pre-hydrated bentonite, lime, and caustic soda down to 437 m and with Drispac/lime mud from 437 m to 2580 m. From 2580 m the lime was phased out and the remaining well to TD was drilled with a lignite/lignosulphonate gel mud. During abandonment an anchor chain broke in severe weather. The well was plugged back while a supply boat pulled on the anchor chain. A cap was installed on the well head and the well was suspended.

No significant reservoir rock was penetrated above Danian level. The Early Cretaceous Valhall Formation was found resting directly on the salt. No Jurassic sediments were penetrated by the well. Hydrocarbons were encountered and tested in the Ekofisk and Tor Formations from 3114 m down to top Hod Formation at 3312 m. Above the reservoir shows in the form of cut and fluorescence was recorded on occasional shale/limestone/silty cuttings was seen from 1990 to 2733 m. More continuous shows were seen on limestone/shale cuttings in the interval 2808 to 2991 m in the Lower Hordaland Group, through the Balder Formation and into the Sele Formation.

Nine cores were cut from - 3123 m to - 3273 m with close to 100% recovery. No RFT surveys were run and no wire line fluid samples were taken.

The well was suspended on 12 January 1978 as a dry well.

Testing

Four drill stem tests to evaluate productivity and fluid composition were carried out. Hydrocarbons were produced during all the tests. Weather conditions and operational problems interfered with the designed test program.



DST 1 tested the Tor Formation in from interval 3292 to 3296 m. The second flow produced 30582 Sm3 of gas and in the range of 16 Sm3 oil /day. There was no water production. The oil produced had a gravity of 46 deg API and the gas gravity (air = 1) was 0.68. GOR varied in the range 890 to 14000 Sm3/Sm3. Maximum recorded down hole temperature was 136 deg C but the temperature readings were not stable.

DST 2 tested the Tor Formation from the interval 3235 to 3255 m. After acid stimulation the well flowed 673940 Sm3 of gas and 592 Sm3 oil /day on a 48/64" choke. The oil gravity was 48-49 deg API at separator conditions and the gas gravity (air = 1) was 0.67 with 2 - 3 % CO2. The GOR was in the range 890 to 1160 Sm3/Sm3. No representative temperature reading is available from this test.

DST 3 tested the Ekofisk Formation from the interval 3176 to 3198 m. After acid stimulation the well flowed 32000 Sm3 of gas and 17 Sm3 oil /day with a bottom hole flowing pressure 750 psig at depth 3154 m. This test also produced some emulsion and water. The gas and oil gravities were 0.81 (air = 1) and 45 deg API at separator conditions, respectively. 3% CO2 was measured in the gas. The GOR varied in the range 1070 to 2140 Sm3/Sm3. Due probably to gas expansion and cooling in the borehole it is assumed that the maximum recorded temperature of 122.2 deg C was not representative for the formation.

DST 4 tested the Ekofisk Formation in the intervals 3127 to 3137 and 3120 to 3123 m. After acid treatment the well flowed 498380 Sm3 of gas and 223 Sm3 oil /day on a 48/64" choke. The gas and oil gravities were 0.688 (air = 1) and 50 - 51 deg API at separator conditions, respectively. 2-3% CO2 was measured in the gas. The GOR varied in the range 960 - 2850 Sm3/Sm3. The maximum temperature recorded, and the one assumed to be the most representative for the Formation in all four tests, was 134.2 deg C.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
153.00	3710.00

Cuttings available for sampling?	YES
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Cores at the Norwegian Offshore Directorate

Core sample number	Core sample - top depth	Core sample - bottom depth	Core sample depth - uom
1	3122.8	3141.2	[m]
2	3141.2	3159.5	[m]
3	3159.5	3173.5	[m]
4	3173.5	3191.8	[m]
5	3191.8	3210.1	[m]
6	3210.1	3218.6	[m]
7	3219.9	3238.0	[m]
8	3238.2	3256.5	[m]
9	3256.5	3273.8	[m]



Total core sample length [m]	149.6
Cores available for sampling?	YES

Core photos



3122-3125m



3125-3128m



3128-3130m



3130-3133m



3133-3136m



3136-3138m



3138-3141m



3141-3143m



3143-3146m



3146-3149m



3149-3152m



3152-3154m



3154-3157m



3157-3159m



3159-3162m



3162-3164m



3164-3167m



3167-3170m



3170-3173m



3173-3173m



3173-3176m



3176-3178m



3178-3181m



3181-3184m



3184-3187m



3187-3189m



3189-3191m



3191-3195m



3194-3197m



3197-3199m



3199-3202m



3202-3205m



3205-3208m



3208-3210m



3210-3212m



3212-3215m



3215-3218m



3218-3218m



3219-3222m



3222-3225m



3225-3228m



3222-3225m



3225-3228m



3228-3230m



3230-3233m



3233-3236m



3236-3238m



3238-3240m



3240-3243m



3243-3246m



3246-3249m



3249-3251m



3251-3254m



3254-3256m



3256-3259m



3259-3261m



3261-3264m



3264-3267m



3267-3270m



3270-3272m



3272-3273m

Oil samples at the Norwegian Offshore Directorate

Test type	Bottle number	Top depth MD [m]	Bottom depth MD [m]	Fluid type	Test time	Samples available
DST	TEST1	3292.00	3296.00		01.12.1977 - 00:00	YES
DST	TEST2	3235.00	3255.00		15.12.1977 - 03:00	YES
DST	TEST3	3176.00	3198.00		24.12.1977 - 19:00	YES
DST	TEST4	3137.00	3127.00		29.12.1977 - 00:00	YES

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
100	NORDLAND GP
1025	HORDALAND GP
2941	ROGALAND GP
2941	BALDER FM
2960	SELE FM
3021	LISTA FM
3091	VÅLE FM
3114	SHETLAND GP
3114	EKOFISK FM



3212	TOR FM
3312	HOD FM
3450	BLODØKS FM
3494	HIDRA FM
3646	CROMER KNOLL GP
3646	RØDBY FM
3665	ÅSGARD FM
3690	ZECHSTEIN GP

Geochemical information

Document name	Document format	Document size [MB]
247_1	pdf	2.18
247_2	pdf	3.15
247_3	pdf	0.52

Documents - older Norwegian Offshore Directorate WDSS reports and other related documents

Document name	Document format	Document size [MB]
247_01 WDSS General Information	pdf	0.21
247_03 WDSS lithlog	pdf	0.06

Documents - reported by the production licence (period for duty of secrecy expired)

Document name	Document format	Document size [MB]
247_00_1_9_4 Completion Log	pdf	2.48
247_00_1_9_4 Completion Report	pdf	34.55

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	3292	3296	19.0
2.0	3235	3255	19.0
3.0	3176	3198	19.0
4.0	3137	3127	19.0





Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0				
2.0				
3.0				
4.0				

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
1.0	16	30582	0.790		
2.0	592	673944	0.790		
3.0		311487			
4.0	223	498379	0.770	0.690	

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBL VDL GR	282	1375
CBL VDL GR	1334	2553
CBL VDL GR	2445	3345
CBL VDL GR	3050	3300
CBL VDL GR	3075	3338
DIL	3065	3348
DLL MSFL CAL SP GR	3000	3347
FDC CNL CAL GR	427	3707
HDT	2875	3349
HDT	3345	3640
IES SP	2090	3347
ISF SONIC	427	3705
SONIC	151	435
VELOCITY	535	3684

Casing and leak-off tests

Casing type	Casing diam. [inch]	Casing depth [m]	Hole diam. [inch]	Hole depth [m]	LOT/FIT mud eqv. [g/cm3]	Formation test type
CONDUCTOR	30	151.0	36	151.0	0.00	LOT



SURF.COND.	20	428.0	26	437.0	0.00	LOT
INTERM.	13 3/8	1376.0	17 1/2	1391.0	0.00	LOT
INTERM.	9 5/8	2569.0	12 1/4	2580.0	0.00	LOT
LINER	7	3352.0	8 1/2	3362.0	0.00	LOT
OPEN HOLE		3710.0	6	3710.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
151	1.02			WATERBASED	
954	1.17			WATERBASED	
1394	1.70			WATERBASED	
2580	1.89			WATERBASED	
3100	1.75			WATERBASED	
3210	1.75			WATERBASED	
3555	1.70			WATERBASED	
3710	1.72			WATERBASED	