

**General information**

Wellbore name	1/9-6 S
Type	EXPLORATION
Purpose	APPRAISAL
Status	SUSPENDED
Factmaps in new window	link to map
Main area	NORTH SEA
Field	TOMMELITEN GAMMA
Discovery	1/9-4 Tommeliten Gamma
Well name	1/9-6
Seismic location	ST 404-410.shot point 100
Production licence	044
Drilling operator	Den norske stats oljeselskap a.s
Drill permit	318-L
Drilling facility	SEDCO 703
Drilling days	256
Entered date	21.03.1982
Completed date	01.12.1982
Release date	01.12.1984
Publication date	10.10.2012
Purpose - planned	APPRAISAL
Reentry	NO
Content	GAS/CONDENSATE
Discovery wellbore	NO
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]	26.0
Water depth [m]	76.0
Total depth (MD) [m RKB]	3880.0
Final vertical depth (TVD) [m RKB]	3529.0
Maximum inclination [°]	32.5
Bottom hole temperature [°C]	135
Oldest penetrated age	LATE CRETACEOUS
Oldest penetrated formation	HOD FM
Geodetic datum	ED50
NS degrees	56° 29' 3.85" N
EW degrees	2° 56' 0.14" E



NS UTM [m]	6260135.61
EW UTM [m]	495896.49
UTM zone	31
NPDID wellbore	44

Wellbore history

General

Well 1/9-6 S was drilled on the north-west flank of the Tommeliten Gamma structure in the Feda Graben in the southern North Sea. The main objective was to appraise the Tommeliten Field. The well was drilled deviated due to the planned use of this well as a production well. The main targets were the Ekofisk and Tor formations.

Operations and results

Appraisal well 1/9-6 was spudded with the semi-submersible installation Sedco 703 on 21 March 1982. Drilling of the 36" and 26" holes went without incident. There was some difficulty in getting logging tools in the 17 1/2" hole. Gumbo problems occurred while drilling the 12 1/4" hole and both open hole and cased hole logging runs were plagued with tool failures. Differential sticking also occurred while drilling the bottom part of the 8 1/2" hole. TD was set 3880 m, 99 m into the Late Cretaceous Hod Formation. After retrieving the RFT the well began flowing and sloughing large amounts of shale below the 9 5/8" shoe. While circulating and reaming to TD, the pipe became stuck many times due to shale sloughing above the bit. A bit and bit sub were left in the hole during these hole problems, and were never recovered. The well was drilled with "native" mud/seawater down to 1471 m and with polymer/dispersed solids/lignosulphonate/seawater from 1471 m to TD.

Top Ekofisk Formation was penetrated at 3411 m (3110 m TVD) and top Tor Formation at 3516 m (3199 m TVD). Both formations were gas/condensate bearing. No other permeable section in the well had indications of hydrocarbons.

A total of 14 cores were cut in the interval 3415.7 - 3619 m in the Ekofisk and Tor formations. Problems with jamming and differential sticking occurred while coring. The overall recovery was 90%. One run with the RFT tool on wire line was conducted, taking 14 good pressure points, but no fluid sample due to tight formation and stuck tool.

After testing the well was suspended on 1 December as a possible future producer. It is classified as a gas/condensate appraisal well.

Testing

Four DST's were performed in this well. Technical and operational problems plagued all tests.

DST1 tested the interval 3771.6 - 3776.8 m (3424.0 - 3428.6 m TVD) in the water zone at base Tor Formation. A few m3 water was produced in each of several flow periods. The temperature recorded in DST 1, at measurement depth 3750.4 m varied between 130.7 deg C and 133.0 deg C for different periods and gauges, with 131.7 deg C taken as a representative temperature.

DST 2, 2A, and 2B tested the interval 3636.3 - 3654.6 m (3301.0 - 3316.7 m TVD) in the lower Tor Formation. The first test, DST 2, was aborted due to technical problems. Maximum rate achieved from DST 2A was 536604 Sm3 /day of gas and 477 Sm3 /day of condensate on 32/64" choke. GOR was 1125 Sm3/Sm3, oil density was 0.810, and gas gravity was 0.689 (air = 1). H2S was measured to be 4-6 ppm and the CO2 content



was measured to be 3%. This test was aborted when the tester valve cut the wire line, and the zone was retested as DST 2B. The maximum flow rates were then close to 700 x 10 Sm³ /day of gas and 500 - 550 Sm³ /day of condensate on a 28/64". The maximum temperature in different flows from this interval, measured at 3652 m, varied between 121.8 and 122.4 deg C

DST 3 tested the intervals 3587.5 - 3578.4 m, 3569.2 - 3560.1 m and 3550.9 - 3523.5 m in the Tor Formation. It flowed 243808 Sm³ gas and 231 Sm³ condensate/day on a 16/64" choke after acidizing. GOR was 1054 Sm³/Sm³, condensate density was 0.823 g/cm³ and gas gravity was 0.680 (air = 1). Final build-up period was terminated mid-way due to technical problems. Same interval was tested in DST3A without further acidizing. This test produced 241259 Sm³ gas and 202 Sm³ condensate/day on a 20/64" choke. The GOR was 1196 Sm³/Sm³, the oil density was 0.791 g/cm³ and gas gravity was 0.684 (air = 1). The temperature measured at 3522.6 m was 131.1 deg C

DST 4 was perforated in two intervals, the upper zone from 3416.8 - 3426.0 m (3114.8 - 3122.7 m TVD) and the second from 3444.2 - 3459.4 m (3138.2 - 3151.3 m TVD), both in the Ekofisk formation. It produced gas and condensate after stimulation. The maximum rates from these intervals were 834213 Sm³ gas and approximately 559 Sm³ condensate/day of condensate on a 56/64" choke. The GOR was 1491 Sm³/Sm³ on this choke. A GOR of 2800 Sm³/Sm³ was measured before acidization, with a low flowing pressure.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
170.00	3880.00

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	3415.7	3426.3	[m]
2	3427.0	3444.4	[m]
3	3445.0	3457.0	[m]
4	3463.6	3481.1	[m]
5	3481.7	3499.5	[m]
6	3500.9	3517.8	[m]
7	3518.7	3530.0	[m]
8	3530.5	3534.3	[m]
9	3537.9	3555.0	[m]
10	3556.5	3573.5	[m]
11	3575.0	3584.4	[m]
12	3584.8	3597.5	[m]
13	3598.0	3615.8	[m]



14	3618.1	3618.7	[m]
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Total core sample length [m]	182.0
Cores available for sampling?	YES

Core photos



3415-3420m



3420-3425m



3425-3426m



3427-3432m



3432-3437m



3437-3442m



3442-3444m



3445-3450m



3450-3455m



3455-3457m



3463-3468m



3468-3473m



3473-3478m



3478-3481m



3481-3486m



3486-3491m



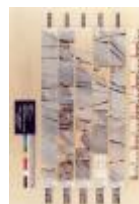
3491-3496m



3496-3499m



3500-3505m



3505-3510m



3510-3515m



3515-3517m



3518-3523m



3523-3528m



3528-3530m



3530-3534m



3537-3542m



3542-3547m



3547-3552m



3552-3555m



3556-3561m



3561-3566m



3566-3571m



3571-3573m



3575-3580m



3580-3584m



3584-3589m



3589-3594m



3594-3597m



3598-3602m



3603-3608m



3608-3613m



3613-3615m



3618-3619m

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	TEST2A	3636.00	3655.00		17.09.1982 - 00:00	YES
DST	TEST2B	3655.00	3636.00		17.09.1982 - 00:00	YES
DST	TEST3	3523.00	3587.00		03.10.1982 - 00:00	YES



DST	TEST4	3417.00	3459.00		25.11.1982 - 00:00	YES
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Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
102	NORDLAND GP
1755	HORDALAND GP
3242	ROGALAND GP
3242	BALDER FM
3275	SELE FM
3322	LISTA FM
3400	VÅLE FM
3411	SHETLAND GP
3411	EKOFISK FM
3516	TOR FM
3781	HOD FM

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

Document name	Document format	Document size [MB]
44 01 WDSS General Information	pdf	0.20
44 02 WDSS completion log	pdf	0.24

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

Document name	Document format	Document size [MB]
44 1 9 6 Analyst report	pdf	2.63
44 1 9 6 Analyst report Enc 1	pdf	0.71
44 1 9 6 Analyst report Enc 2	pdf	3.98
44 1 9 6 Analyst report Enc 3	pdf	0.07
44 1 9 6 Analyst report Enc 4	pdf	0.05
44 1 9 6 Analyst report Enc 5	pdf	0.06
44 1 9 6 Analyst report Enc 6	pdf	0.05
44 1 9 6 Completion report	pdf	47.50
44 1 9 6 Conventional core analysis	pdf	2.77
44 1 9 6 Drilling Programme	pdf	2.96





44 1 9 6 Drilling Programme Vedlegg 1	pdf	0.11
44 1 9 6 Drilling Programme Vedlegg 2	pdf	0.09
44 1 9 6 Drilling Programme Vedlegg 3	pdf	0.03
44 1 9 6 Drilling Programme Vedlegg 4	pdf	0.46
44 1 9 6 Formation Testing Report Test3A	pdf	3.85
44 1 9 6 Formation Testing Report Test4	pdf	1.95
44 1 9 6 Geokjemiske Kjernelogger Ekofisk Torfms	pdf	1.22
44 1 9 6 High Accuracy Pressure Temp DS T1 SDR	pdf	2.56
44 1 9 6 High Accuracy Pressure Temp DS T1 TPT82138	pdf	2.79
44 1 9 6 High Accuracy Pressure Temp DS T2A	pdf	2.60
44 1 9 6 Offshore Gas Testing	pdf	0.25
44 1 9 6 Paleo and strat final report	pdf	5.86
44 1 9 6 Petrophysical Analysis	pdf	2.70
44 1 9 6 Pressure Survey Report Sperry D ST2B Bottom Hole	pdf	1.90
44 1 9 6 Pressure Survey Report Sperry D ST3A	pdf	1.39
44 1 9 6 Pressure Survey Report Sperry D ST4	pdf	0.88
44 1 9 6 Pressure Test Data Summary Sperry DST3A	pdf	0.41
44 1 9 6 PVT Study on Recombined sample DST3A	pdf	0.61
44 1 9 6 PVT Study Report DST2B	pdf	1.08
44 1 9 6 PVT Study Report DST3A	pdf	1.11
44 1 9 6 PVT Study Report DST4	pdf	1.10
44 1 9 6 Special Core Analysis	pdf	0.33
44 1 9 6 Special Core Analysis CoreLab	pdf	11.68
44 1 9 6 Special Core Analysis Geco Jan84	pdf	4.85
44 1 9 6 S Completion log	pdf	2.59
44 1 9 6 TBP distillation of condensate DS T3A	pdf	0.33
44 1 9 6 TBP distillation of condensate DS T4	pdf	0.39
44 1 9 6 Water Analysis DST1	pdf	0.65
44 1 9 6 Well Testing Report	pdf	6.62
44 1 9 6 Well Testing Report DST1	pdf	3.18
44 1 9 6 Well Testing Report DST2B	pdf	6.06
44 1 9 6 Well Testing Report DST2 2A	pdf	3.77





44 1 9 6 Well Testing Report DST3	pdf	2.33
44 1 9 6 Well Testing Report DST3A	pdf	6.49
44 1 9 6 Well Testing Report DST4	pdf	10.47
44 1 9 6 Well Testing Report Vedlegg 1	pdf	0.20
44 1 9 6 Well Testing Report Vedlegg 2	pdf	0.14

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	3772	3777	0.0
2.0	3636	3655	11.1
3.0	3524	3588	17.4
4.0	3417	3459	22.2

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					
2.0	500	530000	0.799	0.705	1115
3.0	700	850000	0.828	0.687	1215
4.0	605	850000	0.878	0.695	1406

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBL	435	1452
CNL	1100	1500
COMPARISON FDC GR	3139	3877
DLL MSFL GR	3139	3876
EPT PDC GR	3139	3877
ISF BHC GR SP	462	3154





ISF BHC NGT SP	2980	3877
ISF SON GR SP	100	478
LDL GR	462	1223
LDL GR	1451	3153
LDT CNL	3139	3877
NGT	2980	3867
OH VAVEFORM	3139	3867
OH VDL	3139	3867
PEQ	3400	3800
RFT	3139	3880
SHDT	3139	3880

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	168.0	36	168.0	0.00	LOT
SURF.COND.	20	463.0	26	479.0	1.34	LOT
INTERM.	13 3/8	1453.0	17 1/2	1472.0	1.87	LOT
INTERM.	9 5/8	3140.0	12 1/4	3155.0	2.06	LOT
LINER	7	3866.0	8 1/2	3880.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
163	1.05			spud mud	
478	1.02			spud mud	
701	1.08			waterbased	
1471	1.31			waterbased	
1471	1.33			waterbased	
1729	1.70			waterbased	
2869	1.87			waterbased	
3155	1.87			waterbased	
3359	1.70			waterbased	
3414	1.65			waterbased	
3537	1.58			waterbased	
3574	1.57			waterbased	
3879	1.59			waterbased	

**Pressure plots**

The pore pressure data is sourced from well logs if no other source is specified. In some wells where pore pressure logs do not exist, information from Drill stem tests and kicks have been used. The data has been reported to the NPD, and further processed and quality controlled by IHS Markit.

Document name	Document format	Document size [MB]
44 Formation pressure (Formasjonstrykk)	pdf	0.21

