General information

Wellbore name	2/4-5
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Factmaps in new window	link to map
Main area	NORTH SEA
Field	EKOFISK
Discovery	2/4-2 Ekofisk
Well name	2/4-5
Seismic location	LINE PG-0312 - SP 719
Production licence	018
Drilling operator	Phillips Petroleum Company Norway
Drill permit	40-L
Drilling facility	PENTAGONE 81
Drilling days	68
Entered date	21.06.1970
Completed date	27.08.1970
Release date	27.08.1972
Publication date	02.04.2007
Purpose - planned	APPRAISAL
Reentry	NO
Content	OIL
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]	24.0
Water depth [m]	68.0
Total depth (MD) [m RKB]	3320.0
Maximum inclination [°]	3.5
Bottom hole temperature [°C]	132
Oldest penetrated age	LATE CRETACEOUS
Oldest penetrated formation	TOR FM
Geodetic datum	ED50
NS degrees	56° 34' 27.24'' N
EW degrees	3° 12' 11.82'' E
NS UTM [m]	6270151.28

EW UTM [m]	512490.31
UTM zone	31
NPDID wellbore	177

Wellbore history

General

Well 2/4-5 (named 2/4-4X by operator Phillips) was drilled to appraise the northern segment of the 2/4-2 Ekofisk discovery. The Ekofisk discovery is located in the Central Trough in the southern Norwegian North Sea and its structure is an anticline, uplifted by halokinetic movements of Permian salt. The objective of well 2/4-4 was to test the Tertiary and the top of the Late Cretaceous. Planned total depth was 11000 ft (3352 m).

The well is Type Well for the Ekofisk Formation.

Operations and results

Well 2/4-5 was spudded with the semi-submersible installation Neptune 7 on 21 June 1970 and drilled to TD at 3320 m in the Late Cretaceous Tor Formation. The well was drilled with seawater and hi-vis mud down to 585 m, with seawater/lignosulphonate mud from 585 to 3217 m, and with seawater/drill-aid mud from 3217 m to TD. Below 584 m 2 - 5 % diesel was added to the mud.

The Danian Chalk (Ekofisk Formation) was encountered at 3037 m and the Maastrichtian chalk (Tor Formation) was encountered at 3164 m. Both formations were hydrocarbon bearing. A total of 86.2 m core was recovered in 12 cores in the interval 3094 to 3206 m in the Ekofisk and Tor Formations. No fluid samples were taken on wire line.

The well was permanently abandoned on 27 August 1970 as an oil appraisal.

Testing

Five zones in the Ekofisk and Tor Formations were perforated for testing.

DST 1 and DST 1A tested the intervals 3164 -3203 m and 3177 - 3186 m in the Tor Formation, respectively. DST 1 produced at maximum 165795 Sm3 gas and 701 Sm3 oil /day on a 24/64" choke. The GOR was 236 Sm3/Sm3; the oil gravity was 37.3 deg API. The reservoir temperature in the DST1 zone was reported to be 129.4 deg C. DST 1A was conducted with smaller choke sizes and gave somewhat lower rates than in DST 1, but fluid properties were similar.

DST 2 tested the interval 3106 -3143 m in the Ekofisk Formation, but was discontinued for weather conditions. DST 2A tested the same interval and flowed 112020 Sm3 gas and 486 Sm3 oil of 37 deg API gravity through a 50/64" choke and, after acidization, 113410 Sm3 gas and 480 Sm3 oil of 37.1 deg API gravity through a 21/64" choke. The GOR before and after acidization was 231 and 236 Sm3/Sm3, respectively. The reservoir temperature in the DST 2A zone was reported to be 125.6 deg C.

DST 3 should test the interval 3088 - 3094 m in the Ekofisk Formation, but was a failure.

DST 4 tested the interval 3042 - 3075 m in the Ekofisk Formation. It flowed 18240 Sm3 gas and 58 Sm3 oil of 37.5 deg API gravity through a 24/64" choke. The GOR was 313 Sm3/Sm3. After acidization, it flowed 92115 Sm3 gas and 411 Sm3 oil of 37.3 deg API gravity with the same choke size. The GOR was 224 Sm3/Sm3. The reservoir temperature in the DST 4 zone was reported to be 125.6 deg C.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
591.31	1536.19

Cuttings available for sampling?	NO

Cores at the Norwegian Offshore Directorate

Core sample number	Core sample - top depth	Core sample - bottom depth	Core sample depth - uom
1	10150.0	10151.0	[ft]
2	10168.0	10198.0	[ft]
3	10198.0	10220.0	[ft]
4	10220.0	10232.0	[ft]
5	10280.0	10300.0	[ft]
6	10440.0	10458.0	[ft]
7	10458.0	10488.0	[ft]
8	10488.0	10518.0	[ft]
9	10518.0	10548.0	[ft]
10	10548.0	10578.0	[ft]
11	10578.0	10608.0	[ft]
12	10608.0	10638.0	[ft]

Total core sample length [m]	86.3
Cores available for sampling?	YES

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
91	NORDLAND GP
1716	HORDALAND GP
2905	ROGALAND GP
2905	BALDER FM
2914	SELE FM
2950	LISTA FM
3024	VÅLE FM
3037	SHETLAND GP
3037	EKOFISK FM
3164	TOR FM

Composite logs

Document name	Document format	Document size [MB]
177	pdf	0.47

Geochemical information

Document name	Document format	Document size [MB]
177_1	pdf	0.53

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

Document name	Document format	Document size [MB]
177_01_WDSS_General_Information	pdf	0.20

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

Document name	Document format	Document size [MB]
177_01_2_4_5(4AX)_Completion_Report_and_Completion_log	pdf	20.47
177_01_2_4_5(4AX)_Final_Report_Individual_Well_Status	pdf	0.57
177_02_2_4_5(4AX)_Casing_and_Valve_Failure_Report	pdf	5.43
177_02_2_4_5(4AX)_Drilling_Fluid_Summary	pdf	4.44
177_02_2_4_5(4AX)_Individual_Well_Completion_record	pdf	24.04
177_02_2_4_5(4AX)_Mud_Report	pdf	10.56
177_02_2_4_5(4AX)_Well_Recompletion_Report	pdf	20.47
177_03_2_4_5(4AX)_Analyst_Quantitative_Logs	pdf	10.98
177_03_2_4_5(4AX)_Complex_Lithology_Analysis	pdf	12.23
177_03_2_4_5(4AX)_Geochemistry_of_Side_Wall_Cores	pdf	4.41
177_03_2_4_5(4X)_Micropaleontology_and_Stratigraphy	pdf	2.71
177_04_2_4_5(4AX)_Columnar_Core_Record	pdf	7.23

177_04_2_4_5 (4AX)_Core_Analysis_and_Core_Lithological_Description	pdf	3.75
177_05_2_4_5(4AX)_Drill_Stem_Tests	pdf	13.15
177_05_2_4_5(4AX)_Drill_Stem_Test_2	pdf	7.94
177_05_2_4_5(4AX)_Drill_Stem_Test_3	pdf	1.71
177_05_2_4_5(4AX)_Drill_Stem_Test_4	pdf	7.17
177_05_2_4_5(4AX)_North_Sea_Oils_Data	pdf	5.41
177_05_2_4_5(4AX)_Reservoir_Fluid_Studies	pdf	1.00
177_05_2_4_5 (4AX)_Reservoir_Fluid_Studies_3000_feet	pdf	3.05
177_05_2_4_5 (4AX)_Reservoir_Fluid_Studies_and_Fluid_Analysis	pdf	10.95
177_05_2_4_5 (4AX)_Reservoir_Fluid_Studies_DST_Nos_1_and_4	pdf	0.69
177_05_2_4_5 (4AX)_Reservoir_Fluid_Studies_DST_No_4	pdf	0.99

Documents - Norwegian Offshore Directorate papers

Document name	Document format	Document size [MB]
177_01_NPD_Paper_No.25_Lithology__Well_2_4_5	pdf	18.62
177_02_NPD_Paper_No.25_Lithologic_Correlation_chart__Well_2_4_5	pdf	1.95
177_03_NPD_Paper_No.25_Paleocene_Maastrichtian_Correlation_chart_Well_2_4_5	pdf	1.18

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	3165	3204	9.5
2.0	3178	3187	5.6
3.0	3107	3143	19.8
4.0	3087	3098	25.4
5.0	3041	3075	9.5
6.0	3043	3076	0.0

Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0	29.000	22.000	42.000	
2.0	32.000	23.000	44.000	
3.0	29.000	6.000	20.000	
4.0				
5.0	25.000	16.000	34.000	
6.0				

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
1.0	701	165696	0.838	0.896	
2.0	433	94918	0.842		
3.0	483	111785	0.840		
4.0					
5.0	411	92060	0.838		
6.0					

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBL	2964	3260
CCL	2952	3309
CDM	3034	3323
DIR	1639	3046
FDC	3030	3323
GR	91	569
IES	561	3321
MLL-C	3030	3323
SGR	569	1639
SGR-C	1639	3320
SNP	1639	3323
VELOCITY	595	3319
AA	3030	3320

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	130.0	36	130.0	0.00	LOT
SURF.COND.	20	573.0	26	585.0	0.00	LOT
INTERM.	13 3/8	1639.0	17 1/2	1646.0	0.00	LOT
INTERM.	9 5/8	3029.0	12 1/4	3056.0	0.00	LOT
LINER	7	3321.0	8 1/2	3321.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
130	1.05			seawa/slugs	
960	1.68			seawa/slugs	
1646	1.72			seawa/ligno	
2225	1.71			seawa/ligno	
3056	1.72			seawa/ligno	
3320	1.71			seawa/ligno	

Thin sections at the Norwegian Offshore Directorate

Depth	Unit
10220.00	[ft]
10220.00	[ft]
10455.00	[ft]
10474.00	[ft]
10497.00	[ft]
10191.00	[ft]
10283.00	[ft]
10612.00	[ft]
10625.00	[ft]