



General information

Wellbore name	7/4-2
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Press release	link to press release
Factmaps in new window	link to map
Main area	NORTH SEA
Field	BRYNHILD
Discovery	7/7-2 Brynhild
Well name	7/4-2
Seismic location	inline 6564 & crossline 9386 Survey : CGMNOR94
Production licence	148
Drilling operator	Lundin Norway AS
Drill permit	1161-L
Drilling facility	MÆRSK GIANT
Drilling days	90
Entered date	15.12.2007
Completed date	13.03.2008
Release date	13.03.2010
Publication date	13.03.2010
Purpose - planned	APPRAISAL
Reentry	NO
Content	OIL
Discovery wellbore	NO
1st level with HC, age	LATE JURASSIC
1st level with HC, formation	ULA FM
Kelly bushing elevation [m]	43.0
Water depth [m]	82.0
Total depth (MD) [m RKB]	3459.0
Final vertical depth (TVD) [m RKB]	3458.0
Maximum inclination [°]	3.3
Bottom hole temperature [°C]	153
Oldest penetrated age	LATE PERMIAN
Oldest penetrated formation	ZECHSTEIN GP
Geodetic datum	ED50
NS degrees	57° 30' 13.05" N
EW degrees	2° 18' 33.18" E



NS UTM [m]	6373803.68
EW UTM [m]	458603.25
UTM zone	31
NPDID wellbore	5683

Wellbore history

General

Well 7/4-2 was drilled on the Nemo prospect on the Jæren High in the North Sea. Two wells had previously been drilled for the evaluation of the Nemo structure. The 7/7-2 was drilled by Statoil in 1992 and discovered 19.5 m oil filled Ula Formation. No OWC was detected and no reliable pressure measurements were retrieved in the underlying Triassic Smith Bank Formation. Well 7/7-3 was drilled down flank to the SSW in 1993 and penetrated a 16.5 m Ula Formation which was water bearing with oil shows. The primary objective of the 7/4-2 Nemo well was to appraise the 7/7-2 oil discovery. This objective included determination of the OWC deeper than 3372 m (3371.1 m TVD RKB) oil down to in well 7/7-2; to verify the seismic interpretation and geological model for the Nemo discovery, including facies changes in the Farsund Formation; and finally to obtain fluid samples (oil and formation water). The secondary objective was to test the reservoir potential of the Triassic Smith Bank Formation.

The well was designed as a potential future water injector.

Operations and results

Appraisal well 7/4-2 was spudded with the jack-up installation Mærsk Giant on 15 December 2007 and drilled to TD at 3459 m in the Late Permian Zechstein Group. A 9 7/8" pilot hole was drilled from the 30" conductor shoe at 208 m and down to 236 m when losses were discovered. A passage through the cement from the 30" conductor shoe to seabed allowed the pumped seawater to escape from the circulating system. While monitoring the losses when pumping at 3000 l/min, 42 m³/hr travelled unhindered behind the conductor to the seabed. Due to the severity of the losses a cement stinger was run in to 207 m and 37 m³ cement pumped to seal the passage and cure the losses. The well was drilled with Seawater and hi-vis pills down to 950 m, with Aquadril /KCl (glycol-) mud from 950 m to 1857 m, and with CarboSea oil based mud from 1857 m to TD.

The top of the Jurassic reservoir Ula Formation was encountered at 3382 m, 7 meter deeper than prognosed. The seismic interpretation of a possible thickening of the reservoir, up to 54 m, towards the Triassic pod was not proven. The observed increased sediment thickness belongs to the non-reservoir Triassic Smith Bank Formation. Hence, the Ula Formation thickness of 18 m was penetrated. Pressure points taken from 3389 m to 3345.5 m (Ula Formation) varied from 632.73 bar to 633.69 bar. It gave an oil gradient of 0.076 bar/m equivalent to a density of 0.77 g/cc. The water density in the reservoir was derived from a sample (1.09 g/cc). From evaluation of the wire line logs, pressure points and sample analysis, the OWC was estimated to be found in the interval 3397 m to 3399 m MD RKB / 3396.1 m to 3398.1 m TVD RKB. Down to top Mandal Formation the gas composition was mainly C1 and there were no shows on cuttings. The entire Ula Formation sandstone and 4 m of the Skagerrak Formation had HC shows, from 3381 m to 3404 m. In the underlying Triassic sediments, no shows were seen.

Two conventional cores were taken, from 3378.5 m to 3403.9 m and 3403.9 m to 3421.7 m with 97 % and 98 % recovery, respectively. RCI fluid samples were taken at three levels, 3392.5 m (oil), 3389 m (oil), and 3399.2 m (water).

The well was plugged back and made ready for permanent abandonment on 27



February, abandoning also the plan to use it as a future injector. Gas bubbles were seen from the well crater. Analysis of the gas bubbles concluded that the gas was from shallow formations (biogenic gas), i.e. gas percolating between the 20" surface casing and 30" conductor, not gas from the reservoir. The rig waited on weather for 14 days before jacking down, observing that the leak rate did not increase. The well was permanently abandoned on 13 March 2008 still with a small gas leak from the well crater. It is classified as an oil appraisal well

Testing

No drill stem test was performed.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
240.00	3459.00

Cuttings available for sampling?	YES
----------------------------------	-----

Cores at the Norwegian Offshore Directorate

Core sample number	Core sample - top depth	Core sample - bottom depth	Core sample depth - uom
1	3378.5	3403.2	[m]
2	3403.9	3421.4	[m]

Total core sample length [m]	42.2
Cores available for sampling?	YES

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		0.00	3389.00			YES

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
125	NORDLAND GP
1190	HORDALAND GP



2504	ROGALAND GP
2504	BALDER FM
2528	SELE FM
2686	LISTA FM
2745	VÅLE FM
2757	SHETLAND GP
2757	EKOFISK FM
2886	TOR FM
3013	HOD FM
3123	CROMER KNOLL GP
3123	RØDBY FM
3155	SOLA FM
3163	TUXEN FM
3204	ÅSGARD FM
3288	TYNE GP
3288	MANDAL FM
3336	FARSUND FM
3382	VESTLAND GP
3382	ULA FM
3400	NO GROUP DEFINED
3400	SKAGERRAK FM
3421	SMITH BANK FM
3457	ZECHSTEIN GP

Logs

Log type	Log top depth [m]	Log bottom depth [m]
HDIL XMAC ZDL CN SL WGI	3214	3455
MWD LWD - DIR	125	213
MWD LWD - GR RES DEN NEU SON DIR	1857	3226
MWD LWD - GR RES DIR PWD	213	1857
MWD LWD - GR RES DIR PWD	3368	3459
RCI GR	3379	3408
SST 500 GR	847	3407

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	208.0	36	210.0	0.00	LOT
SURF.COND.	20	950.0	26	950.0	1.96	LOT
INTERM.	13 3/8	1848.0	17 1/2	1847.0	1.91	LOT
INTERM.	9 5/8	3219.0	12 1/4	3229.0	2.10	LOT
OPEN HOLE		3450.0	8 1/2	3458.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
319	1.57			water based	
550	1.76	38.0		Oil Based	
1103	1.45			water based	
1400	1.55			water based	
1586	1.55			water based	
1826	1.57			water based	
1968	1.71			oil based	
2781	1.71			oil based	
3020	1.95	51.0		Oil Based	
3028	1.71			oil based	
3147	1.75			oil based	
3226	1.76			oil based	
3278	1.95			oil based	
3403	1.95			oil based	
3459	1.95			oil based	

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]
5683 Formation pressure (Formasjonstrykk)	pdf	0.22

