

**General information**

Wellbore name	2/4-21
Type	EXPLORATION
Purpose	WILDCAT
Status	P&A
Press release	link to press release
Factmaps in new window	link to map
Main area	NORTH SEA
Field	FENRIS
Discovery	2/4-21 Fenris
Well name	2/4-21
Seismic location	VGCNSO5R07NH-inline 7862 & trace 18770
Production licence	146
Drilling operator	Statoil Petroleum AS
Drill permit	1382-L
Drilling facility	MÆRSK GALLANT
Drilling days	127
Entered date	19.01.2012
Completed date	24.05.2012
Release date	24.05.2014
Publication date	24.05.2014
Purpose - planned	WILDCAT
Reentry	NO
Content	GAS/CONDENSATE
Discovery wellbore	YES
1st level with HC, age	LATE JURASSIC
1st level with HC, formation	FARSUND FM
Kelly bushing elevation [m]	48.1
Water depth [m]	67.4
Total depth (MD) [m RKB]	5395.0
Final vertical depth (TVD) [m RKB]	5392.0
Maximum inclination [°]	7.6
Bottom hole temperature [°C]	183
Oldest penetrated age	LATE JURASSIC
Oldest penetrated formation	FARSUND FM
Geodetic datum	ED50
NS degrees	56° 42' 0.81" N
EW degrees	3° 8' 34.31" E



NS UTM [m]	6284166.46
EW UTM [m]	508748.77
UTM zone	31
NPDID wellbore	6736

Wellbore history

**General**

Well 2/4-21 was drilled on the King Lear prospect in the Central Graben of the Norwegian North Sea, approximately 20 km north of the Ekofisk Field. The prospect was considered a part of the same reservoir as in the 2/4-14 well that ultimately ended up in a major underground blowout in 1989. The main objective of the well was to prove commercial hydrocarbons in intra-Farsund Formation sandstone units.

Operations and results

Well 2/4-21 was spudded with the jack-up installation Mærsk Gallant on 19 Jan.2012 and drilled to TD at 5395 m in the Late Jurassic Farsund Formation. No over-pressured shallow gas was seen, but a 2-3 m thick sand at 627 m contained normal-pressured gas with a composition consistent with a biogenic origin. The well was planned as an HPHT well with pressure prognosis based on results from the 2/4-18 well. Pressures proved to be even higher than prognosed and at 5029 m influx of gas occurred. The well was shut in and after several days control operations the mud was weighted up to 2.1 g/cm³ and drilling continued to TD. Well 2/4-21 was plugged back after having reached TD. All data acquisition was carried out in the main track, but it was decided to drill a parallel vertical sidetrack (2/4-21 T2) for the purpose of achieving good cores from the main reservoir level (the Farsund II sandstone). The sidetrack was kicked off successfully at 4933m and the operations were carried out according to plan. The well was drilled with sea water/spud mud down to 248 m, with spud mud/KCl/Polymer mud from 248 to 453 m, with KCl/polymer/GEM mud from 453 to 1019 m, with oil based XP07-low ECD mud from 1019 m to 3022 m, and with oil based XP07-HPHT mud from 3022 m to TD. Oil based XP07-HPHT mud was used also in the coring side track.

Top Mandal Formation was encountered at 4767 m and top Farsund Formation at 4795 m. A main Intra Farsund Formation sandstone was penetrated as prognosed from 5122 to 5173 m. This interval had 23 m good quality reservoir sand with 21% porosity and 13 mD permeability. It contained rich gas-condensate in a gas-down-to situation. The pressure survey indicated pressure depletion compared to thin sandstones above and below the main reservoir due to the underground blow-out in well 2/4-14. Prognosed sandstone units below this level proved to be thin cemented sandstone and limestone stringers. No fluorescent shows are described from the cuttings in the Farsund II unit / main reservoir. Descriptions from the sidewall cores indicate oil stain and hydrocarbon odour on samples as shallow as 4996 m and tar filled voids down to 5182 m.

One core was cut in the Farsund Formation in the primary well bore from 5069 m to 5083.5 m. Two further cores were cut in the Farsund Formation in the 2/4-21 T2 sidetrack from 5116 m to 5166 m. Wire line fluid samples were taken at 5053.5 m (oil and gas; considered as the best sample with only 2.3% mud contamination), 5122.5 m (oil and gas; medium quality sample), and 5167.5 m (oil and gas). PVT analyses of the samples showed a GOR in the range 1200 - 1400 Sm³/Sm³.

The well was permanently abandoned on 24 May 2012 as a gas-condensate discovery.

Testing

No drill stem test was performed.

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Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
260.00	5394.00



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	5069.0	5083.4	[m]
2	5116.0	5136.9	[m]
3	5139.0	5166.2	[m]

Total core sample length [m]	62.5
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
MDT		0.00	5167.50	CONDE NSATE		YES
MDT		0.00	5121.50	CONDE NSATE		YES
MDT		0.00	5053.50	CONDE NSATE		YES

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
115	NORDLAND GP
1823	HORDALAND GP
3168	ROGALAND GP
3168	BALDER FM
3192	SELE FM
3262	LISTA FM
3354	VÅLE FM
3382	SHETLAND GP
3382	EKOFISK FM
3505	TOR FM
3977	HOD FM
4519	BLODØKS FM



4520	HIDRA FM
4540	CROMER KNOLL GP
4540	RØDBY FM
4560	TUXEN FM
4605	ÅSGARD FM
4768	TYNE GP
4768	MANDAL FM
4795	FARSUND FM

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBL GR	3100	4625
CORGUN	5068	5083
CTN ALD EWR P4 DGR PWD DIR FTWD	5030	5250
DIR PWD	253	447
EWR - P4 DGR DIR PWD	253	5030
EWR P4 DEG GEOPILOT PWD	1015	3019
GEOTAP GM EWR P4 PWD ALD CTN DIR	5250	5395
HNGS AIT PEX	4600	5256
MDT	4994	5243
MDT	5053	5122
MDT	5167	5167
MSCT	4995	5245
MWD	115	253
OBMI IS MSIP GR	3600	5257
VSI ZO	2569	5256
XPT	0	0

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	240.0	36	248.0	1.20	FIT
SURF.COND.	20	434.0	26	453.0	1.40	FIT
PILOT HOLE		447.0	9 7/8	447.0	0.00	
INTERM.	16	1005.0	20	1019.0	1.68	FIT



INTERM.	14	3003.0	17 1/2	3022.0	1.90	FIT
INTERM.	9 7/8	4638.0	12 1/4	4649.0	2.16	FIT
OPEN HOLE		5395.0	8 1/2	5573.0	0.00	

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
248	1.10	33.0		KCl/Polymer	
447	1.20	15.0		KCl/Polymer/GEM	
447	1.13	16.0		KCl/Polymer	
652	1.16	15.0		KCl/Polymer/GEM	
1015	1.22	16.0		KCl/Polymer/GEM	
1244	1.45	19.0		OBM-Low ECD	
2320	1.60	21.0		OBM-Low ECD	
3019	1.60	23.0		OBM-Low ECD	
3414	1.61	28.0		OBM-Low ECD	
4140	1.61	28.0		OBM-Low ECD	
4513	1.74	32.0		OBM-Low ECD- HTHP	
4646	2.04	43.0		OBM-Low ECD- HTHP	
4646	1.78	36.0		OBM-Low ECD- HTHP	
4646	1.76	34.0		OBM-Low ECD	
4649	2.08	77.0		OBM-Low ECD- HTHP	
4840	2.04	41.0		OBM-Low ECD- HTHP	
4932	2.08	64.0		OBM-Low ECD- HTHP	
5013	2.04	45.0		OBM-Low ECD- HTHP	
5029	2.08	54.0		OBM-Low ECD- HTHP	
5029	2.09	51.0		OBM-Low ECD- HTHP	
5029	2.09	52.0		OBM-Low ECD- HTHP	
5063	2.08	58.0		OBM-Low ECD- HTHP	
5083	2.08	56.0		OBM-Low ECD- HTHP	



5115	2.08	67.0		OBM-Low ECD- HTHP	
5139	2.08	73.0		OBM-Low ECD- HTHP	
5166	2.08	73.0		OBM-Low ECD- HTHP	
5250	2.10	61.0		OBM-Low ECD- HTHP	
5250	2.10	61.0		OBM-Low ECD- HTHP	
5392	2.08	63.0		OBM-Low ECD- HTHP	
5395	2.08	62.0		OBM-Low ECD- HTHP	