

**General information**

Wellbore name	2/10-2
Type	EXPLORATION
Purpose	WILDCAT
Status	P&A
Factmaps in new window	link to map
Main area	NORTH SEA
Well name	2/10-2
Seismic location	SG 9107- ROW 541 & COLUMN 1442
Production licence	163
Drilling operator	Saga Petroleum ASA
Drill permit	757-L
Drilling facility	TREASURE SAGA
Drilling days	69
Entered date	16.02.1993
Completed date	25.04.1993
Release date	25.04.1995
Publication date	24.09.2003
Purpose - planned	WILDCAT
Reentry	NO
Content	OIL SHOWS
Discovery wellbore	NO
Kelly bushing elevation [m]	26.0
Water depth [m]	71.0
Total depth (MD) [m RKB]	4164.0
Final vertical depth (TVD) [m RKB]	4162.0
Maximum inclination [°]	6
Bottom hole temperature [°C]	148
Oldest penetrated age	EARLY PERMIAN
Oldest penetrated formation	ROTLIEGEND GP
Geodetic datum	ED50
NS degrees	56° 13' 8.48" N
EW degrees	3° 6' 41.62" E
NS UTM [m]	6230600.20
EW UTM [m]	506918.76
UTM zone	31
NPDID wellbore	2050



Wellbore history

General

Well 2/10-2 is located in the western area of block 2/10 in PL163, in an inverted half graben structure at the Grensen Spur. The block, being the southernmost in the Norwegian North Sea sector, borders both the UK and Danish sector lines, and held only one previously drilled exploration well at the time of drilling

The main objective of the well was to test the hydrocarbon potential of Late Jurassic sandstones, prospect-A, a combined structural and stratigraphic trap located in the hanging wall of a half graben structure. The well should also test the prospectivity of the Shetland Group, which held oil in the Tor Formation in well 2/7-2; the reservoir potential of the Cromer Knoll Group in stratigraphic closures formed by pinch outs against Base Cretaceous Unconformity; and possible hydrocarbon potential of the pre-Triassic/Rotliegendes Group.

Operations and results

Exploration well 2/10-2 was spudded with the semi-submersible installation "Treasure Saga" on 16 February and drilled to TD at 4164 m in rocks of undefined age. The well was drilled with spud mud down to 1169 m, with KCl mud from 1169 m to 3681 m, and with "HI TEMP" polymer mud from 3681 m to TD. The Tor and Hod limestones slowed down the penetration rate in the 12 1/4" section. Drill string vibrations and torque fluctuations were created which ruined several bits and resulted in one drill string failure.

The 8 3/8" section was surprisingly easy to drill. It was easy to achieve penetration rates of 15 m/hr, but due to geological and pressure control, the penetration rate had to be controlled through most of the section. The pore pressure increased very rapidly at top of the Mandal Formation, and the mud weight had to be adjusted accordingly. The mud weight was increased from 1.70 SG to 1.95 SG over an interval of approximately 30 m. Maximum estimated bottom hole static temperature was approximately 150°C based on Horner plot.

The predicted Late Jurassic sandstone section was not present in the well position, and no hydrocarbons were encountered. The possible sandy sequences within the Lower Cretaceous, Cromer Knoll Group, were also absent.

In the Nordland and Hordaland Groups the well penetrated mainly claystones with sandstone beds.

The Rogaland Group consisted of 4 formations, the Balder, Sele, Lista and the Vågå Formation. The top of the Balder Formation was penetrated at 2893 m and consisted of tuffaceous claystones with minor traces of sandstones and dolomites/limestones. The Top Sele Formation was reached at 2910 m and the formation comprised claystones with minor sandstones. The Top Lista Formation was penetrated at 2952 m and the Vågå Formation at 2990 m. Both formations consisted of claystones with traces of limestone lamina.

The Shetland Group consisted of the Ekofisk, Tor, Hod, Blodøks, and Hydra Formations. In the Tor Formation cores showed limestones with weak shows in the upper part, from 3085 to 3086.63 m and 70 - 80 cm zone of residual oil from 3090 to 3091 m. Also cuttings from the Tor Formation showed minor shows, otherwise there were no significant hydrocarbon indications. Average log porosity in the Tor Formation was 20%. In general the formations in the Shetland Group comprised of limestones with minor traces of cherts and marl. At 3709 m the Cromer Knoll Group was penetrated. The Cromer Knoll Group consisted of the Røby and Åsgard Formations. The formations comprised claystones with minor marl beds. No shows were seen. The top Tyne Group



was reached at 3882 m and consisted of the Mandal Formation. The lithology was claystones. The Smith Bank Formation was penetrated at 3905 m and comprised claystones alternating with siltstones. There were traces of sandstones and anhydrite beds. The Zechstein Group consisted of anhydrites. An undefined formation was penetrated at 4128 m and consisted of argillaceous sandstones with an average log porosity of 10.2%.

Four cores were cut during drilling of well 2/10-2. The first core was cut in the Tor Formation from 3085.0 - 3089.0 m. The core recovery was 1.63 m (41%). The second core was also cut in the Tor Formation from 3089.0 m - 3098.18 m. The core recovery was 9.18 m (100%). The third core was cut in an undefined formation from 4151.0 m - 4154.0 m. The core recovery was 2.1 m (70%). The fourth core was also cut in the undefined formation from 4154.0 m - 4164.0 m. The core recovery was 9.55 m (95%). The FMT tool was run on wire line, but due to tight formation few representative pressure points were obtained and no fluid samples taken.

The stratigraphic tops prognosed for the well were well within the expected margins for all of the present horizons.

The well did however build an angle from the last casing point and downwards which resulted in a total deviation of approximately 90 m eastwards and up dip of the planned well bore. This resulted both in a penetration of the deeper horizons somewhat shallower than predicted, but of more importance a deviation towards the fault separating the up thrown block of the prospect. A possible crossing of the fault plane must therefore be considered in the interpretation of the strata encountered in the well. The operator held a structural model where the well had been drilled into a pop-up block, not representative for the entire half graben, as one of the more likely cases. The well was therefore temporarily plugged. A technical sidestep of the well in westward direction, from the last casing point and down, were also considered and proposed by the operator, but it was agreed that such an operation would not generate enough deviation from existing well bore to be conclusive. The well was suspended on 25 April 1993 as a well with oil shows.

Testing

No drill stem test was performed.

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
1180.00	4151.00

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	3085.0	3086.6	[m]
2	3089.0	3098.2	[m]
3	4151.0	4153.1	[m]
4	4154.0	4163.6	[m]



Total core sample length [m]	22.5
Cores available for sampling?	YES

Core photos



3085-3086m



3089-3093m



3093-3097m



3097-3098m



4151-4153m



4154-4158m



4158-4162m



4162-4163m

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
97	NORDLAND GP
1508	HORDALAND GP
2893	ROGALAND GP
2893	BALDER FM
2910	SELE FM
2952	LISTA FM
2990	VÅLE FM
3014	SHETLAND GP
3014	EKOFISK FM
3084	TOR FM
3221	HOD FM
3561	BLODØKS FM
3566	HIDRA FM
3709	CROMER KNOLL GP
3709	RØDBY FM
3720	ÅSGARD FM



3882	TYNE GP
3882	MANDAL FM
3905	NO GROUP DEFINED
3905	SMITH BANK FM
4062	ZECHSTEIN GP
4128	ROTLIEGEND GP

Composite logs

Document name	Document format	Document size [MB]
2050	pdf	0.62

Geochemical information

Document name	Document format	Document size [MB]
2050_1	pdf	1.73
2050_2	pdf	1.12

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

Document name	Document format	Document size [MB]
2050_2_10_2_COMPLETION_REPORT_AND_LOG	pdf	16.92

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBIL	3000	3150
DIFL ACL CDL GR	1151	2719
DIFL ACL ZDL CN GR	2699	3684
DIFL ACL ZDL CN GR	3665	4165
DIFL ACL ZDL GR	193	1163
DIPLOG	3665	4165
DIPLOG GR	2699	3684
DLL MLL GR	2965	3205





FMT	3078	3128
FMT GR	4129	4162
FMT GR	4152	4153
MWD - GR RES DIR	97	4151
MWD CDR - S/D RES	3681	4164
MWD CDR - SNR	197	1165
SWC	1198	2445
SWC	3701	4148
SWC	3908	4149
VSP	500	4160

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	194.0	36	197.0	0.00	LOT
INTERM.	20	1152.0	26	1165.0	2.02	LOT
INTERM.	13 3/8	2699.0	17 1/2	2722.0	1.97	LOT
INTERM.	9 5/8	3665.0	12 1/4	3686.0	2.17	LOT
OPEN HOLE		4164.0	8 3/8	4164.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
160	1.03	9.0		WATER BASED	
160	1.03	9.0		WATER BASED	
197	1.03			WATER BASED	
210	1.03			WATER BASED	
609	1.03			WATER BASED	
1165	1.05			WATER BASED	
1169	1.20			WATER BASED	
3681	1.70	18.0		WATER BASED	
4164	1.97	20.0		DUMMY	

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]
2050 Formation pressure (Formasjonstrykk)	pdf	0.22

