General information

Wellbore name	6407/9-4
Type	EXPLORATION
Purpose	APPRAISAL
Status	P&A
Factmaps in new window	link to map
Main area	NORWEGIAN SEA
Field	DRAUGEN
Discovery	6407/9-1 Draugen
Well name	6407/9-4
Seismic location	84 - 117 A SP. 630
Production licence	093
Drilling operator	A/S Norske Shell
Drill permit	472-L
Drilling facility	WEST VENTURE OLD
Drilling days	69
Entered date	04.07.1985
Completed date	10.09.1985
Release date	10.09.1987
Publication date	09.03.2009
Purpose - planned	APPRAISAL
Reentry	NO
Content	OIL
Discovery wellbore	NO
1st level with HC, age	LATE JURASSIC
1st level with HC, formation	ROGN FM
2nd level with HC, age	MIDDLE JURASSIC
2nd level with HC, formation	GARN FM
Kelly bushing elevation [m]	32.0
Water depth [m]	244.0
Total depth (MD) [m RKB]	1820.0
Final vertical depth (TVD) [m RKB]	1820.0
Bottom hole temperature [°C]	47
Oldest penetrated age	EARLY JURASSIC
Oldest penetrated formation	TILJE FM
Geodetic datum	ED50
NS degrees	64° 22' 14'' N
EW degrees	7° 43' 21.84'' E
NS UTM [m]	7139103.84

EW UTM [m]	438354.84
UTM zone	32
NPDID wellbore	480

Wellbore history

General

Appraisal well 6407/9-4 is the fourth well on the Draugen Field. The main objective was the Late Jurassic Rogn Formation. Wells 6407/9-1, 6407/9-2 and 6407/9-3 had previously encountered under-saturated 40 deg API oil in sandstones of the Late Jurassic Rogn Formation. Net oil sand thicknesses in the three previous wells were 39, 12 and 34 m, respectively. Precise definition of the OWC in well 6407/9-1 was precluded by poor quality lithology at the base of sequence. A clearly defined oil-water contact at 1638.5 m MSL was however encountered in well 6407/9-2. The purpose of this fourth well was to evaluate the reservoir quality and sand development on the north-west flank of the accumulation, and to evaluate the oil deliverability and water injection potential of the reservoir sands.

Operations and results

Well 6407/9-4 was spudded with the semi-submersible installation West Venture on 4 July 1985 and drilled to TD at 1820 m in the Early Jurassic Tilje Formation. No significant problems were encountered while drilling the well. The well was drilled with seawater and bentonite down to 820 m, with KCl/polymer mud from 820 m to 1635 m, and with chalk mud from 1635 m to TD.

Light oil with low gas content was discovered in the Garn Formation, as the Rogn Formation proved to be only 2 m thick. The oil/water contact was found at 1672 m (1639 m MSL), the same contact that had been established in previous wells on the Draugen Field. This indicated communication in the Rogn and Garn Formations between the wells drilled so far on Draugen. No oil shows were recorded above the reservoir. Below OWC oil shows continued down to 1681 m, otherwise no further oil shows were observed.

Five cores were cut from 1666 m to 1711.5 m in the Fangst Group. An RFT segregated fluid sample was taken at 1664.5 m in the upper Garn Formation.

The well was permanently abandoned on 10 September 1985 as an oil appraisal well.

Testing

To Drill Stem Tests were performed. One injection test at 1708 - 1713 m in the water zone, and one production test at 1662 -1667 m in the oil zone. Maximum injection rate in the water test was 2080 m3 /day. The oil test produced at maximum 998 Sm3 oil /day on a 64/64" choke. The GOR was ca 35 Sm3/Sm3, the oil density was 0.82, and the gas gravity was 0.82 (air = 1). Temperature measurements in the test gave a reservoir formation temperature of 71.1 deg C (160 deg F).

Cuttings at the Norwegian Offshore Directorate

Cutting sample, top depth [m]	Cutting samples, bottom depth [m]
390.00	1820.00

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	1666.0	1671.1	[m]
2	1673.0	1674.7	[m]
3	1676.3	1684.0	[m]
4	1685.7	1695.0	[m]
5	1695.5	1711.0	[m]

Total core sample length [m]	39.4
Cores available for sampling?	YES

Core photos


1666-1671m


1671-1671m


1673-1674m


1676-1681m


1681-1684m


1685-1690m


1690-1695m


1695-1700m


1700-1705m


1705-1710m


1710-1711m

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	1662.00	1667.00		16.08.1985 - 23:30	YES

Lithostratigraphy

Top depth [mMD RKB]	Lithostrat. unit
277	NORDLAND GP
277	NAUST FM
887	HORDALAND GP
887	BRYGGE FM
1402	ROGALAND GP
1402	TARE FM
1443	TANG FM
1572	SHETLAND GP
1610	CROMER KNOLL GP
1637	VIKING GP
1637	SPEKK FM
1658	ROGN FM
1660	FANGST GP
1660	GARN FM
1702	NOT FM
1748	ILE FM
1767	BÅT GP
1767	ROR FM
1794	TILJE FM

Composite logs

Document name	Document format	Document size [MB]
480	pdf	0.36

Geochemical information

Document name	Document format	Document size [MB]
480_1	pdf	0.14
480_2	pdf	1.19
480_3	pdf	0.37

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

Document name	Document format	Document size [MB]
480_01_WDSS_General_Information	pdf	0.30
480_02_WDSS_completion_log	pdf	0.14

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

Document name	Document format	Document size [MB]
480_01_6407_9_4_Completion_Report	pdf	17.79
480_02_6407_9_4_Completion_log	pdf	1.01

Drill stem tests (DST)

Test number	From depth MD [m]	To depth MD [m]	Choke size [mm]
1.0	1708	1713	0.0
2.0	1662	1668	25.4

Test number	Final shut-in pressure [MPa]	Final flow pressure [MPa]	Bottom hole pressure [MPa]	Downhole temperature [°C]
1.0				
2.0				

Test number	Oil [Sm3/day]	Gas [Sm3/day]	Oil density [g/cm3]	Gas grav. rel.air	GOR [m3/m3]
1.0					
2.0	962		0.820	0.820	36

Logs

Log type	Log top depth [m]	Log bottom depth [m]
CBL	1590	1710
CBL VDL	700	1620
CST GR	1258	1753
ISF LSS GR	365	816
ISF LSS GR	805	1626
ISF LSS GR	1622	1816
LDL CNL GR	365	818
LDL CNL GR	805	1628
LDL CNL NGS	1622	1817
MSFL DLL GR	1622	1813
RFT	1664	1664
SHDT	1622	1815
SWC	1666	1710
VSP	365	1818

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	365.5	36	375.0	0.00	LOT
SURF.COND.	20	804.5	26	820.0	1.55	LOT
SURF.COND.	20	805.5	26	820.0	1.55	LOT
INTERM.	13 3/8	1622.0	17 1/2	1635.0	1.81	LOT
INTERM.	9 5/8	1793.0	12 1/4	1820.0	0.00	LOT

Drilling mud

Depth MD [m]	Mud weight [g/cm3]	Visc. [mPa.s]	Yield point [Pa]	Mud type	Date measured
295	1.03			WATER BASED	05.07.1985
375	1.03			WATER BASED	09.07.1985
375	0.00			WATER BASED	10.07.1985
417	1.06	11.0	59.0	WATER BASED	10.07.1985
506	1.20			WATER BASED	06.09.1985
745	1.06	41.0	16.0	WATER BASED	12.07.1985
820	1.09	50.0	26.0	WATER BASED	12.07.1985

820	1.10	120.0		WATER BASED	15.07.1985
820	1.03			WATER BASED	15.07.1985
820	1.30			WATER BASED	18.07.1985
820	1.03			WATER BASED	15.07.1985
820	1.03			WATER BASED	16.07.1985
820	1.03			WATER BASED	16.07.1985
820	0.00			WATER BASED	18.07.1985
820	1.10	120.0		WATER BASED	15.07.1985
820	1.30			WATER BASED	18.07.1985
1000	1.35	43.0	21.0	WATER BASED	19.07.1985
1010	1.20			WATER BASED	05.09.1985
1076	1.36	53.0	24.0	water based	22.07.1985
1076	1.36	53.0	24.0	WATER BASED	22.07.1985
1084	1.38	53.0	4.0	WATER BASED	22.07.1985
1408	1.40	50.0	5.0	WATER BASED	22.07.1985
1470	1.20			WATER BASED	04.09.1985
1477	1.15			WATER BASED	03.09.1985
1510	1.40	47.0	5.0	WATER BASED	23.07.1985
1635	1.20			WATER BASED	02.08.1985
1635	1.40	50.0	3.0	WATER BASED	25.07.1985
1635	1.40	50.0	3.0	WATER BASED	23.07.1985
1635	1.40	50.0	3.0	WATER BASED	25.07.1985
1635	1.40	50.0	3.0	WATER BASED	26.07.1985
1635	1.40	50.0	3.0	WATER BASED	26.07.1985
1635	1.20			WATER BASED	02.08.1985
1635	1.15			WATER BASED	20.08.1985
1666	1.19	15.0	20.0	WATER BASED	29.07.1985
1673	1.15			WATER BASED	20.08.1985
1676	1.19	15.0	18.0	WATER BASED	29.07.1985
1683	1.15			WATER BASED	20.08.1985
1683	1.15			WATER BASED	21.08.1985
1683	1.15			WATER BASED	21.08.1985
1683	1.15			WATER BASED	22.08.1985
1683	1.15			WATER BASED	23.08.1985
1683	1.15			WATER BASED	26.08.1985
1683	1.15			WATER BASED	27.08.1985
1683	1.15			WATER BASED	28.08.1985
1683	1.15			WATER BASED	29.08.1985
1683	1.15			WATER BASED	30.08.1985
1683	1.15			WATER BASED	02.09.1985

1700	1.20	45.0	4.0	WATER BASED	31.07.1985
1755	1.15			WATER BASED	19.08.1985
1755	1.15			WATER BASED	20.08.1985
1755	1.15			WATER BASED	19.08.1985
1755	1.15			WATER BASED	09.08.1985
1793	1.13			WATER BASED	09.08.1985
1820	1.20	15.0	19.0	WATER BASED	02.08.1985
1820	1.20	17.0	23.0	WATER BASED	05.08.1985
1820	1.20			WATER BASED	05.08.1985
1820	1.15			WATER BASED	09.08.1985
1820	1.20	44.0	4.0	WATER BASED	31.07.1985
1820	1.20	15.0	19.0	WATER BASED	02.08.1985
1820	1.20	17.0	23.0	WATER BASED	05.08.1985
1820	1.20			WATER BASED	05.08.1985
1820	1.15			WATER BASED	09.08.1985

Thin sections at the Norwegian Offshore Directorate

Depth	Unit
1674.00	[m]
1680.00	[m]
1681.00	[m]
1688.00	[m]
1688.00	[m]
1688.00	[m]
1691.00	[m]
1691.00	[m]
1691.00	[m]
1692.00	[m]
1692.00	[m]
1692.00	[m]
1692.00	[m]

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]
480_Formation_pressure_(Formasjonstrykk)	PDF	0.25