

Denne rapport  
tilhører



**UND DOK.SENTER**

L.NR. 20090434028

KODE Well 25/1-3 nr 7

**Returneres etter bruk**

**W**

GEOLOGICAL NOTE

ON FRIGG 3

(25/1-3X)

ELF NORGE A/S

Well: 25/1-3x FRIGG

Pertinent Data

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Classification:	Extension well
Area:	Field 25 - Block 1 - Production Licence 024
Location:	x: 02° 10' 05" y: 59° 54' 05"  i.e. SP 96 of line 69.5954
Water depth:	105 m
KB elevation:	24 m
Objective:	To test the lower tertiary sands gas bearing in Frigg 1
Results:	Gas and oil bearing Eocene-Paleocene sands
Status:	Plugged and abandoned
Total depth:	2872 m (DD)
Contractor and rig:	Neptune "Pentagone 81" (semi-submersible)
Date spudded:	14.11.71
At total depth:	19.12.71
Completed:	27.01.72

I. GENERAL  
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A) - Prospect geology and objectives

Frigg 3 was located on the Eastern flank of a large seismic amoeboïd structure at the base of tertiary, related to gas bearing sand bodies in the previous wells. The purpose of this test was to check for their extension, facies variations and fluid contents Eastwards in good structural position. It was to be stopped in the upper cretaceous carbonates.

B) - Technical Data

- RKB elevation: + 24
- Water depth: 105 m

Drilling\_and\_casing\_data:

- Drilled 36" hole and set 30" casing at 165 m.
- Drilled 17" 1/2 hole to 415 m. Set 13" 3/8 casing at 405 m.
- Drilled 12" 1/4 hole to 1886 m. Set 9" 5/8 casing at 1880 m.
- Drilled 8" 1/2 hole to TD (2872 m). Set 7" casing at 2036 m for testing.

Drilling\_fluids:

Sea water was used down to 405 m and below a sea-water LFC mud system of light density (1.25) viscosities of 45 and water loss < 5 utilized down to TD.

Coring

- 4 mechanical cores were cut
  1. 1951 - 1969 m - recovered 80 %
  2. 1969 - 1987 m " 80 %
  3. 1987 - 2005 m " 75 %
  4. 2563 - 2568 m " 50 %
- 43 sidewall cores were recovered out of 57 bullets shot in two runs.

Testing

- Two wire line tests were shot
  - 1. 2550,5: Filtrate and mud
  - 2. 2576,3: Id.
- Six conventional DST's through perforations were conducted on the Frigg sands. (see 1/5000 log).

Logging (see 1/5000 log)

II STRATIGRAPHY AND LITHOLOGY

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The formations and members considered below are based on microfloras analysis, dipmeter interpretation and on petrographical and electrical correlations with the surrounding wells.

1. Quaternary - Tertiary - 129 - 2711 m (2582 m)

1.1. Lignitic series (Pleistocene - Miocene) - 129 - 835 m (706 m)-----

This thick unit drilled without returns down to 405 m is mainly composed of heterometric sands with shell fragments and lignite, and minor grey-greenish soft clay intervals.

1.2. Brown clays group (Oligocene - Middle Eocene)  
835 - 1782 m (th. 947 m)-----

1.2.1. 835 - 994 m (th. 159 m)

Soft dark grey silty sandy clay with a sand interbed (897 - 908 m) make up this unit.

1.2.2. 994 - 1782 m (th. 788 m)

This is a very monotonous section of clays grey-brown hygrofissile (gumbo) with brown dolomite stringers and nodules (septaria). Only one waterwet sand interbed is present between 1081 and 1100 m. These clays are slightly less compacted below 1335 m. Pyrite is common throughout.

1.3. 1782 - 1951 m - "Green shale member" (Middle-Lower Eocene)

Pale apple green shale interbedded with dark brown and reddish claystones characterize this unit -

It is dated middle Eocene (Nt III Palynozone) and lower Eocene Ypresian (Nt II C Palynozone) for the bottom 20 m forming a distinct cycle on the gamma-ray curve.

1.4. Frigg Formation 1951 - 2169 m (th. 218 m)

1.4.1. 1951 - 2036 m

Clean medium sands poorly sorted with subangular grains make up this interval. The first 7 m (above 1958 m) are more shaly and calcareous laminated and the base of this first unit well marked by a calcareous cemented stringer.

Sediment transport, in a high energy environment, is Eastwards above 2003 m and veers to North-East below.

This interval is dated lower Eocene by palynology (Nt II b - zone).

1.4.2. 2036 - 2169 m

Nine main sand bodies, isolated by thinner grey shale intervals, make up this lower part of the Frigg formation. These sands are fine to medium, lignitic, subangular and transported from South to North in a more quiet depositional environment.

This unit is comprised in Palynozone Nt II a, upper part (Paleocene).

1.5. Upper sand-shale member and tuffitic zone 2169 - 2318 m

1.5.1. 2169 - 2244 m

Four sand bodies grading to shale upwards compose this interval. These sands are fine to very fine, sub-angular and grading to a light green soft clay very micaceous.

A high energy prevailed during their deposition.

1.5.2. Tuffitic zone 2244 - 2272 m

A rapid sequence of volcanic ashes in a shaly matrix variegated zeolitic shales and grey ashy limestones in thin beds make up this unit.

A radioactive peak clearly defines the lower boundary of this interval -

1.5.3. 2272 - 2318 m

Black shales and fine to coarse subrounded sands increasing downwards in grain size, thickness and cleanliness - are the components of this unit.

1.5.2. and 1.5.3. zones are corresponding to middle Nt II a Palynozone (Paleocene).

1.6. "Cod formation" 2318 - 2492 m (174 m)

Sand and shales alternates disposed in 5 to 10 m cycles build up this formation. These sands are clear, medium to very coarse, subrounded to rounded, in the 25 - 30 % porosity range.

They are grading, to or from, silty shales and greenish grey shales with intermediate finer sections - Lignite debris and Pyrite are present throughout.

A secondary calcareous cementation gives way to metric sandstone stringers located at the end or beginning of cycles where the porosities were the greatest.

A North to South sediment transport in a much quieter environment than for the Frigg Formation originated this second reservoir level.

It corresponds to zone Nt II a lower (Paleocene) specially characterized by the D. 361 Dinoflagellate.

1.7. Lower shale-sand member 2492 - 2556 m (th. 64 m)

Dark grey silty shale with stringers of red brown marly limestones is followed below 2542 m by a more detritic episode of fine shaly sand and then by a clean fine to medium micaceous sand of 5 m, grading down again to a fine shaly siltstone. With this interval we enter the Palynozone Nt I b (lowermost Paleocene to Danian).

1.8. 2556 - 2711 Basal shale member (th. 155 m)

Dark grey greenish shale becoming more compacted and carbonated below 2642 m is the dominant lithology of this unit.

A few cyclic metric beds of sandy limestones with reddish reworked upper cretaceous microfaunas occur throughout. Abundant Radiolaria are present in the lower part.

This member is dated Danian (Nt I a zone) and possibly Lower Paleocene - Danian Nt I b) for its upper part.

2. Upper Cretaceous (Danian p.p. ?) 2711 - 2872 m TD (> 161 m)

2.1. 2711 - 2734 m

A thin bed of limestone buff, micritic, compact, is followed by 20 m of sand, poorly sorted, fine to very coarse, subangular to subrounded, crossbedded.

2.2. 2734 - 2872 m (TD) -

White to buff micritic chalky limestone in discrete beds up to 5 m, within grey to black splintery shale and marls make up this interval -

Micropaleontology indicates a definite Maestrichtian age for this second unit with a possible transition to Campanian near TD - The first unit (2-1) with a mixture of faunas possibly being lowermost Danian.