



LITHOSTRATIGRAPHY & HISTORY FOR WELL 24/9-1

Wellbore History

GENERAL

Wildcat well 24/9-1 is located in the Vana Sub-basin in the Southern Viking Graben, about 11 km east of the border to British sector. The well was drilled to test a large, dip-closed structure located in the centre of the Viking Graben. The target was Late Jurassic sandstones. Two sandstone intervals were expected in the well, with a possible gross thickness of about 250-300 m. The prognosis was based on a correlation with the UK wells 16/7-1, 16/8-1 and the Norwegian well 15/3-1 which are situated in a similar position as 24/9-1 relative to the eastern boundary fault of the Viking Graben.

The well is Reference Well for the Svarte, Tryggvason, Kyrre, and Jorsalfare Formations.

OPERATIONS AND RESULTS

Well 24/9-1 was spudded with the semi-submersible installation Ross Rig on 29 February 1976 and drilled to TD at 4907 m in the Late Jurassic Heather Formation. Below the 20" casing at 758.3 m the Formations drilled contained abundant sand and was drilled extremely fast. This created problems as the solids removal system on the rig was incapable of removing the sand as fast as it was drilled. In addition the polymer mud system chosen did not provide sufficient fluid loss control in the porous formation and large amounts of fluids were lost to the formation. From ca 2440 m to TD at 2752 m in the 17 1/2" hole low penetration rates was a problem. Of 126 rig days 20 % was counted as lost time, but the total time spent on the well was still less than the originally estimated 139 days. Problems related to tight/sloughing hole and down hole tool failure accounted for roughly half of the lost time. The well was drilled with seawater down to 256 m, with lime / lignosulphonate from 256 m to 3983 m, with Dextrid / Lignosulphonate from 3983 m to 4613 m, and with lime / lignosulphonate from 4613 m to TD.

Tertiary sandstones were encountered in the Grid Formation (1131 m to 1420 m), The Heimdal Formation (2202 m to 2497 m), and the Ty Formation (2545 m to 2659 m). The well encountered Jurassic shales at 4330 m with a high increase in background gas and additional ethane to pentane gases. The Draupne Formation proved to be 470 m thick, while The Heather Formation was encountered at 4800 m and continued down to TD. Only thin Jurassic sandstones (Intra Heather Formation Sandstones) were penetrated.

Both cuttings and sidewall cores revealed that Late Jurassic sandstones had low visible porosities. Evaluation of petrophysical logs substantiate this observation. The net thickness sandstone was approximately 18.5 m, none of the individual beds were, however, thicker than 4 m, scattered throughout a gross of about 490 m. Average porosity was 13 % and average Sw is 40%.

No oil shows were found while drilling and only two of the sidewall cores at 2582 and 4832 m showed trace of cut fluorescence. Gas shows and log analysis suggested that the Jurassic sands are gas bearing. Down to a depth of about 4325 m only minor amounts of methane background gas were encountered. Below this depth down to TD, variable but largely high amounts of gas lighter than hexane were recorded. Shows of gas were continuous and the highest amounts are associated with some of the thin sand-stringers. Shale gas was also present. The Draupne Formation represent a significant source rock with TOC typically in the range 4 % to 6 % and Hydrogen Index typically in the range 130 to 160 mg HC/g rock. Maturity is advanced with Vitrinite reflectance %Ro from 0.9 to 1.3, which imply that most of the hydrocarbon potential already has been realised and expelled. The Heather Formation shales are also source rocks, but slightly leaner (TOC = 3% to 5%). One core was cut in the interval 4441.9 m to 4460.2 m in the Draupne Formation. Fluid sampling was attempted on wire line at 4815 m and at 4816.5 m, but failed due to tight Formation.

The well was considered a valid test of the Late Jurassic sands, which were considered to contain little commercial hydrocarbons. The well was plugged and abandoned on 3 July 1976 with gas shows in Late Jurassic sandstones.

TESTING

No drill stem test was performed