



## Wellbore History

### GENERAL

Appraisal well 6407/9-3 was the third well on the antiform structure of the Draugen Field in the Haltenbanken area. It was placed on the crestal part of the structure, some four kilometres south of the discovery well. The main objectives of the well were to evaluate the lateral continuity and quality of the reservoir; to establish the velocity trend in a North-South direction; to improve the volumetric estimate; and to evaluate the oil deliverability.

### OPERATIONS AND RESULTS

Appraisal well 6407/9-3 was spudded with the semi-submersible installation Borgny Dolphin 3 may 1985 and drilled to TD at 1868 m in the Early Jurassic Tilje Formation. Drilling proceeded without serious problems, except for the sections trough glacial deposits were boulders caused minor problems. After setting 13 3/8" casing at 1601 m the RKB datum was shifted one m to 26 m above MSL. Operations were interrupted for nearly 17 days from 13 June 1985 by a crew strike. Although amplitude anomalies indicated gas charged sands, no shallow gas was encountered. The well was drilled with seawater and bentonite down to 781 m, with KCl mud from 781 m to 1617 m, and with chalk mud from 1617 m to TD.

The top of the Rogn Formation was penetrated at 1630 m (1604 m SS) and the reservoir was oil bearing down to an oil-water contact at 1664 m (1638 m SS), which is in line with the OWC observed in the other Draugen wells. The contact in this well was interpreted in the transition between the good sands and the basal shales and was for that reason not very clear. The average hydrocarbon saturation was calculated as 82% over the 34 m oil column. Average porosity was 31% in this interval, of which 16.7 m had a porosity above 32.5%. Prior to testing an FMT survey was carried out: the reservoir pressure measured was hydrostatic, 2395 psia at datum (1630 m SS). The Garn Formation was penetrated from 1685 m to 1770 m and was water wet. Oil and oil shows were recorded in the Rogn formation only, not in any other porous section in the well. Nine conventional cores were cut in the interval 1620.5 m to 1679.8 m. One FMT oil sample was taken at 1637.5 m.

The oil appraisal well 6407/9-3 was suspended 28 July 1985 as a possible producer. In 1993 it was re-entered reclassified to development well (producer).

### TESTING

One DST test was performed. The oil column was perforated from 1630.5 m to 1642.5 m (1606.5 to 1618.5 m SS). The interval was gravel packed and flow rates up to 2496 Sm<sup>3</sup>/day (15700 stb/d) were achieved during the clean up. A multirate test incorporating 4 flow periods with a total flow duration of 36 hrs and a 24 hrs pressure build-up survey was carried out. The evaluation showed an average permeability of 5.7 Darcy over 36 m. Skins calculated ranged from 24 to 29. Observed productivity indices after gravel packing varied from 147 to 166 stb/d/psi. The calculated ideal PI is 660 stb/d/psi. With flow rate at 2496 Sm<sup>3</sup>/day on a 2 x 128/64" choke, GOR was 18 - 27 Sm<sup>3</sup>/Sm<sup>3</sup> (100 - 150 scf/stb), oil gravity was 40 deg API, CO<sub>2</sub> content was 0.75%, and H<sub>2</sub>S was not detectable.

## LITHOSTRATIGRAPHY & HISTORY FOR WELL: 6407/9-3