

Introductory note on the history of the Kudu prospect

L.R. McLachlan

Soekor, P.O. Box 307, Parow 7500, South Africa

On the 13th December 1973, the drilling of Kudu 9A-1, the first petroleum exploration borehole in the offshore of Namibia, was started by a consortium consisting of Regent Petroleum (SWA) Limited (45%), Soekor (10%) and Chevron Oil Company of SWA (45%), who acted as operators. The prospecting lease was granted by Swakor (Pry) Ltd, the Namibian national petroleum exploration agency (*now known as Namcor Ed.*). The well was located 170 km due west of the Orange River mouth, 130 km from the nearest landfall at a water depth of 167.2 m and was drilled using the Sedco 135K semi-submersible rig.

Results were initially disappointing as neither potential reservoir rocks nor significant background gas values were found at the primary target level (ca. 1000 to 3500 m below sea level) where Upper Cretaceous sandstones were prognosed to be present within a structural closure provided by roll-over on a series of growth faults at the outer edge of the palaeocontinental shelf. It was decided none-the-less to continue drilling to the planned total depth of 4572 m. Following the setting of the 9⁵/₈ inch casing at 3557 m, the problems and costs of drilling increased rapidly and the condition of the hole started to deteriorate. Despite the encouragement of high mud-gas values below 3800 m, these factors coupled with the lack of potential reservoir rock caused considerable debate on the merits of drilling ahead. Soekor and Swakor, however, felt strongly that the stratigraphy and hydrocarbon potential at deeper levels should be tested despite the lack of any demonstrable trap, and serendipitously, gas was encountered beneath horizon P2 at 4400 m below sea level. Further drilling to a total depth of 4452.5 mbKB (metres below kelly bushing) established that the reservoir consists of two main sandstone bodies of 52 m (4426 to 4278 mbKB) and 24 m (4317 to 4341 mbKB) thickness separated by a basalt and underlain by a succession of basalt and non-marine sandstone. The calculated average sandstone porosity values of 12 and 22%, respectively, are excellent considering the depth of burial. Due to the high formation pressure of about 7760 psi and the poor condition of the hole, a proper drill-stem test could not be performed, but the results obtained indicated a low potential of up to 200 million standard cubic feet of dry gas per day for the lower sandstone body alone. The gas was shown to consist of 92.2% methane (by weight) with the bulk of the remainder consisting of ethane (4.1 %). Although the trapping mechanism for the reservoir could not be demonstrated, it was concluded that the potential exists for a giant gas field (Van Wyk *et al.*, 1977).

Further work including the acquisition and processing of a significant amount of extra seismic data resulted in recommendations to drill further wells (Van Wyk *et al.*, 1977; Gerrard, 1985; West Coast Team, 1987) but nothing could be done because of the degree of political uncertainty relating to Namibia. Further limiting factors were the withdrawal of Chevron and Regent from the exploration venture and the cession of their interest to Soekor in July 1977, and the subsequent relinquishment by Soekor in 1987 of all its interest in the prospecting lease to Swakor. It was only later in 1987, with the aid of a special grant from the Namibian Government, that Swakor was able to recommence evaluation of the Kudu gas field.

The drilling site initially recommended by Soekor was relocated slightly on the advice of a consultant to Swakor and the Kudu 9A-2 well was started on the 30th October 1987 using the Asterie semi-submersible drilling rig. It was located along strike 7.5 km north of Kudu 9A-1 but, although the main target interval showed evidence of gas, this was not sufficiently promising to warrant testing the well.

After the evaluation of all of the data by Soekor and by Exploration Consultants Limited (ECL) who acted for Swakor, ECL recommended a closer step-out well site 4 km to the south-southwest of Kudu 9A-1 (Lawrence and Jackman, 1988). Kudu 9A-3 was started on 20th January 1988 and encountered a combined thickness of gas-bearing sandstone in the upper and lower reservoirs of about 147.5 m. The lower gas sand showed good porosity and permeability and flowed to surface at the rate of 38.03 million standard cubic feet of dry gas per day.

The results to date provide encouragement that the Kudu prospect may represent a giant gas field and Swakor is undertaking further evaluation work.

The following reports in this volume are based on some of the studies commissioned by Swakor. They deal principally with the Kudu 9A-2 and 9A-3 wells as the quality of the geophysical data and rock samples, in particular the cores, are very good in contrast to Kudu 9A-1. Further background information on the geology of the Kudu area and its regional setting can be gained from Gerrard and Smith (1983).

References

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