HISTORY AND FUTURE TRENDS FOR EXPLORATION IN THE EAST COAST BASIN

D Francis
1A Fantail Grove
Lower Hutt, New Zealand

Abstract

Oil exploration in the East Coast began after 1865, when seeps were recorded at Waitangi, inland of Gisborne. Subsequently seeps at Rotokautuku and Totangi stimulated further interest, and lots of wells were drilled by hand or by cable-tool close to these seeps in search of the sweet, kerosine-rich crude in demand then. The best well (Waingaromia-1, 1886–87) was drilled 3 km away from the main Waitangi seeps, and produced up to 40 bbl/d from shallow Miocene sandstones before gas caught fire and the wooden rig burnt down.

Later exploration (1926–1940) saw wells drilled by Taranaki Oil Ltd and Vacuum Oil Co/NZPC on surface-mapped structural highs. Although some strong gas shows were discovered, oil was hard to find, probably because of asymmetric structures at depth.

The phase of exploration from 1960–1975 by BP Shell & Todd (and others) generally targeted either Cretaceous (where reservoir was the problem) or Pliocene (target absent or flushed; too far west of source) and drilling problems meant that the only offshore well (Hawke Bay-1, 1975) was never tested. Very few wells had adequate seismic control. The most recent wells drilled were Rere-1 (1986) and Te Hoe-1 (1990), both near the western margin of the basin.

Recent exploration and research demonstrates that the most reliable and widespread reservoirs are in the Tertiary, in particular in thick-bedded lower to mid-Miocene sandstones up to 2200 m thick and sealed by thick mudstones. Reservoirs occur also in Paleocene, Oligocene, and other Miocene formations, and Pliocene limestones coquina are excellent reservoirs. Cretaceous sandstones, the target of many previous wells, generally have poor reservoir characteristics in outcrop.

Geochemical research on East Coast oils indicates they are derived dominantly from marine sources, as with some north Taranaki oils. Source characteristics of the widespread Paleocene formations are excellent, with tantalising part-correlation to oils in seeps. Subsidiary source input may come from thinner Cretaceous or Miocene carbonaceous interbeds. Seeps and stains are distributed throughout the whole length of the basin.

Structural trends in the East Coast Basin show narrow zones of intense structuring (with outcropping or sub-cropping source, reservoir, and seeps) between broader, more gentle provinces with deeply buried source and large highly prospective structural closures on Tertiary reservoir formations. Seismic acquisition has been of variable quality (excellent to poor) even in recent years. Interpretation of both onshore and offshore seismic benefits from documentation of exposed stratigraphy and structure.

The best indications for future East Coast discoveries are to concentrate on relatively shallow Tertiary, especially Miocene, exploration targets.

Author

DAVE FRANCIS is a field-oriented geologist with over 13 years' active experience in the geology of the East Coast Basin. Before becoming a consultant in 1990, he worked at New Zealand Geological Survey, where he was involved in regional mapping and basin analysis in the East Coast. He has also worked successfully in mineral exploration in Australia and Canada, and in New Zealand is author or co-author of various geological papers, reports and maps dealing with aspects of the East Coast Basin. Present work, much of it collaborative, is focused on reservoir, source, stratigraphy, structure, seeps and exploration history of the East Coast Basin.