

Petrophysical Characteristics of Post-2000 Significant Discovery Wells in the Beaufort-Mackenzie Basin

Kezhen Hu, Zhuoheng Chen, and Dale Issler
Geological Survey of Canada

Abstract

The Beaufort-Mackenzie Basin contains large volumes of discovered oil and natural gas resources and has significant resource potential for future discoveries. By 2000, over 250 wells had been drilled, and 54 significant conventional oil and gas discoveries had been made since the first discovery well Atkinson H-25 was drilled in 1969. The only production is from the Ikhil gas field that was developed to supply Inuvik. Since 2001, more than 25 new exploration wells have been drilled, resulting in ten new significant discoveries (Mallik gas hydrate wells are excluded) that include the following wells: Tuk M-18 and B-02 in the Tuk field, Langley K-30 and E-07 in the Langley field, Ellice I-48 and J-27 in the Ellice field, Umiak N-05 and N-16 in the Umiak field, Olivier H-01 and Paktoa C-60 (Fig.1).

This study employs an integrated approach to derive reservoir parameters and provides an overview of petrophysical characteristics for the newly discovered oil and gas accumulations. Petrophysical models are developed for the evaluation of reservoir properties, including lithology, porosity, permeability and water saturation using core-calibrated log data. Potential oil or gas zones are also identified in the study.

Most of the log-identified petroleum zones in the ten wells occur in the Paleogene Taglu and Aklak sequences in sandstone reservoirs characterised by good porosity and permeability, or in shaly sandstone and siltstone reservoirs with fair to good porosity and permeability. However, major identified gas zones in the Tuk gas field were encountered in sandstone of the Lower Cretaceous Kamik Formation. Good quality gas zones in the Tuk M-18 well occur in fine to medium grained sandstone with good porosity (21% on average), excellent permeability (mainly between 100 and 1000 mD), and high gas saturation (>90% on average), and with restricted flow test rates up to 850,000 cubic meter of natural gas per day. In the Paktoa C-60 well, the only significant discovery drilled in the Beaufort Sea since 1990, an oil zone is identified in very fine grained siltstone and unconsolidated medium grained sandstone of the Taglu Sequence. This zone has good reservoir properties with an average porosity of 25% and maximum permeability of 10 to 100 mD. This log interpretation is consistent with drill stem testing that recovered oil from this interval.