Reservoir Characteristics of the Chalk of the Wyandot Formation, Scotian Margin: Case Study of the Eagle D-21 and Primrose A-41 Wells

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The Wyandot Formation (Coniacian-Maastrichtian) is widely distributed beneath the Scotian Shelf and subcrops beneath the Cenozoic Banquereau Formation about 100 km offshore Nova Scotia. The Wyandot extends for ~500 km parallel to the shelf with an average thickness of 135 m and reaches ~400 m maximum. Gas flows have been recorded from the Wyandot Chalk at Primrose Field and in the Eagle D-21 well. Wyandot Formation chalks were deposited through slow pelagic sedimentation by algal coccolithophorids and foraminifera.

Three lithofacies (1, 2 and 3) can be recognized in the studied parts of Eagle D-21 and Primrose A-41 cores. The upper facies-1 can be seen in both wells while the intermediate facies-2 and the lower facies-3 can be seen only in Primrose. Facies 1 is white bioturbated chalk facies that includes thin lamina of diagenetically formed subfacies-1a as dark grey to black marly limestone subfacies (stylo-laminite). Facies-1 in Primrose contains rare glauconite. Facies-2 is glauconite and clay-moderate, light greyish green chalk facies, while facies-3 is glauconite and clay-rich, dark brownish green chalk facies. Mineralogically Wyandot chalk consists dominantly of calcite and minor amounts of quartz, apatite, glauconite, pyrite, marcasite and clays. The amount of impurities associated with calcite increases from facies 1 through 3 which are also reflected in the darkening of the colour from pure white to pale brown to greenish brown. The average porosity of Eagle D-21 and Primrose A-41 cores is 27.8 and 25.5% and the average permeability is 0.58 and 1.28 md, respectively. There is good positive correlation between porosity and permeability. The chalk of all three facies is highly bioturbated which has positively affected porosity and permeability and also show stylolitization and other pressure effects. Compared to the chalk of the North Sea (Ekofisk area), Wyandot chalk has relatively good reservoir characteristics due to shallow burial rather than overpressures; fracturing and gas occur in both areas.