

## **Reflectance of Dispersed Organic Matter and Thermal Maturity in Four Hydrocarbon Exploration Wells of the Hudson Bay Basin**

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### **Introduction**

The Hudson Bay Basin is one of the largest but is the least explored Palaeozoic sedimentary basins in North America. Sporadically explored at a reconnaissance scale for hydrocarbons resources in the late sixties to the early eighties, a more complete assessment of its hydrocarbon potential has been initiated by the Geological Survey of Canada as part of its new Geo-Mapping for Energy and Minerals program.

The stratigraphic succession preserved in this basin covers a shorter geologic period compared to that of the others North American intracratonic basins. The oldest deposits are Late Ordovician in age and most of the preserved sediments are Silurian to Devonian. Locally, a blanket of Cretaceous deposit is present. The main hydrocarbon source rock in the basin is the Upper Ordovician Red Head Rapids Formation. Many potential reservoir rocks are present in the overlying strata.

### **Problematic**

Thermal maturity reached by these rocks is controversial to this day. The geochemical results ( $T_{max}$  and PI from Rock Eval) and those based on the coloration of microfossils remain ambiguous. Some parameters indicate that this basin is immature whereas others suggest that the Ordovician strata and the Red Head Rapids Formation have reached the oil window. It is therefore important to resolve this ambiguity in order to evaluate the hydrocarbon potential of the basin.

### **Method and results**

Sixty-five samples of cuttings from four offshore oil wells in the Hudson Bay were used to determine the reflectance of the dispersed organic matter in the sedimentary rocks. With the exception of the most condensed succession (Netsiq N-01 well) characterized by organic matter of continental origin (vitrinite, inertinite), amorphous material of algal origin dominates in the successions of all other wells (Beluga O- 23,

Polar Bear C-11 and South Narwhal O-58 wells). Zooclasts (scolecodonts, chitinozoans and some graptolites) compensate for the lack of vitrinite, and are used to evaluate the succession thermal maturity.

Our results show that the oil window is reached at the base of three of the four studied wells. Only the successions of the Netsiq well are immature from base to top ( $R_{o-evi} < 0.5\%$ ). Immature at the top of the well ( $R_{o-evi} = 0.3\%$ ), rocks in the Beluga well reach the stage of maximum oil production in the Red Head Rapids Formation ( $R_{o-evi} = 0.9\%$ ). The maturity of the equivalent succession in the Polar Bear well is lower ( $R_{o-evi} = 0.7\%$ ), but still reaches the oil window. Finally, in the Narwhal South well, rocks are more mature and the  $R_{o-evi}$  reaches 1% at the base of the succession.

## **Conclusions**

In conclusion, considering the geology of this basin, the qualities of its reservoir and hydrocarbon source rocks and the thermal maturity reached in the central part of the basin, the Hudson Bay Basin is a highly prospective area for the discovery of liquid hydrocarbons.