A QUANTIFIED RESOURCE ASSESSMENT OF A PERVASIVE SHALLOW BIOGENIC GAS SYSTEM IN SOUTHERN ALBERTA.

David W. Hume, Phil Esslinger, Jason Johnson, Rakhit Petroleum Consulting Ltd
E. R. (Ross) Crain, P.Eng., Spectrum 2000 Mindware
403 – 845 – 2527 ross@spec2000.net

Presented at AAPG International Conference and Exhibition, Sept 2003

ABSTRACT

An article by Schmoker in the November 2002 AAPG Bulletin (pp. 1993) addressed some of the difficulties in quantifying the resource potential of continuous gas systems over large areas. Many of these same difficulties manifest themselves in the evaluation of pervasive, under-pressured, biogenic gas systems in the southern part of the Western Canada Sedimentary Basin (WCB).

Santonian and Campainian aged sediments of the WCB have long been recognized to host continuous biogenic gas systems. Recently however, continuous systems have also been recognized in the uppermost Cretaceous (Maastrictian) and Tertiary (Paleocene) sediments of the WCB. To date there is very little production from these zones. This precludes a reservoir performance based resource assessment method. Instead a Gas in Place assessment was used to evaluate 9 formations occurring from surface to 1400 metres (4500 ft) depth in 3200 digital well logs distributed across a 12,800 km^2 (4950 mi^2) study area in Southern Alberta .

To accomplish this a multi-disciplinary approach was utilized. This encompassed high resolution stratigraphy, hydrogeology, petrophysics and reservoir modelling of volumetric reserve estimates. A sequence stratigraphic model was used to create a framework which isolated individual reservoir map units. The hydrogoelogy was critical to identify the limits of the continuous gas system and the expected reservoir pressures for each unit. The petrophysics was applied in a top to bottom analysis. This required some detailed petrophysical modelling and programming that resulted in the calculation of average porosity and net reservoir content of each map unit. In combination all of these parameters were then sampled and modelled across a cellular grid to create a volumetric based resource map for each potential unit. The final step was to sum the individual resource maps and create a total resource potential map for the entire 1400 metre deep section.

As seen in many other continuous gas systems the overall gas in place (GIP) numbers for this study area are considerable. By applying a minimum 18% porosity cut-off to the net reservoir and average porosity analysis, an overall GIP potential of 12.3 trillion cubic feet (3.5 E9m^3) of gas was determined. This equates to an GIP reserve potential of 2.5 billion cubic feet (70.8E6 m^3) per square mile.