

Jean Marie Can No Longer Hide Her Wrinkles

D. Todorovic-Marinic*

EnCana, Calgary, AB

dragana_todorovic-marinic@encana.com

and

Rick Wierzbicki, Chuck Briere, Bahaa Beshry and Darrell Joy

EnCana, Calgary, AB, Canada

Summary/Introduction

This paper will document the evolution in thinking and understanding of the porosity and permeability distribution in the Jean Marie carbonate ramp interior, the “platform” area.

Theory

The Jean Marie is a low permeability gas-bearing heterogeneous carbonate reservoir. Reasons for heterogeneity of the Jean Marie reservoir range from depositional issues (that is the facies distribution as interpreted by the seismic anomalies) to diagenesis (has the anomaly been leached and porosity created) to permeability distribution (amount of diagenesis, fracture contribution).

This is where 3D seismic can play an important role. In the past isopach and amplitude maps have proven their ability to identify prospective trends. Recently Phi-H maps created using multi-attribute and probabilistic neural network analysis provide additional insight into porosity and reef distribution. Permeability distribution is more difficult to resolve, as good anomalies in the carbonate reservoir can be porous with low permeability while low porosity areas can have high permeability!

There is a simple positive linear relationship between porosity and permeability. However the variability in that linear relationship can explain a reservoir of the same porosity having different permeability. Pore throat size and connectivity, which are dependent on facies and degree of diagenesis, control this relationship. Any additional permeability is due to other factors. Petrographic work indicates that the reservoir generally exhibits microfractures and cores occasional show macrofractures. Spatial 2nd derivatives of seismic structure maps show lineaments which are interpreted as fracture fairways. These often coincide with areas identified from log and production data as having fracture permeability.

Conclusions

The focus of the next phase of exploitation of the Jean Marie platform interior will be to use new seismic techniques to exploit this new view that the Jean Marie is a fractured reservoir and porosity is only part of the reservoir story. These techniques have revealed a complex, faulted reservoir with a fracture permeability trend superimposed on a diagenetic porosity/permeability trend.

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