The Evolution of AVO use for Cadomin Exploration in Leland Area of Alberta

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Abstract

Introduction

The Leland Cadomin exploration area is within the Deep Basin hydrodynamic trap region where gas in porous conglomeratic sands is trapped by updip water due to relative permeabily changes. The Cadomin formation consists of alluvial fan deposits shed off the incipient mountain range to the south west and reworked by a braided stream system. Typical reservoir porosities are in the 6-12% range, with thicknesses of 5-10 meters. The Leland field produces about 80 MMcf/day.

Case History

Conventional interpretation of Lower Cretaceous sands of the Bluesky/Gething/Cadomin formations on normal migrated seismic has typically presented a number of difficulties. These include poor well ties to stacked data, lack of a distinct seismic signature for productive zones, poor ties between 2-d and 3-d data and unexplained variations in seismic waveform.

Examination of offset synthetics and gathers indicated that the Cadomin is a peak at near offsets and a trough at far. AVO analyis was performed on a 3-d which had good well control. Fluid factor anomalies appeared where there were porous wells. Other anomalies were drilled with good success, however the strongest anomalies had less porous Cadomin overlain by gas charged coals in the lower Gething.

In an effort to separate the coals from the sands, model based inversion was performed on the AVO attributes followed by LMR calculations. The results were not really an improvement until neural network analysis achieved a significantly better agreement with existing well control. A further refinement yeilded a Density volume which compared remarkably with well based phi-h maps.

Conclusions

The AVO method appears to work well for relatively deep/tight sands. LMR results may be improved significantly by using Neural Network analysis.