

Application of Rock Physics Templates to the Deep Basin in Alberta

Craig A Coulombe
Vermilion Energy

Summary

Rock Physics Templates have been established as a useful tool to define Seismic Lithofacies using Pre Stack Simultaneous Inversion attributes. In this study Vp/Vs ratio versus Acoustic Impedance cross plots of well log data are used to define Seismic Lithofacies that can be applied to seismic data and transformed in to meaning full reservoir properties (porosity thickness, average porosity). The resulting maps correlate well with development wells in the study area.

Workflow

The workflow involves 2 stages of lithofacies classification. The 1st stage is cross plotting VpVs ratio and Acoustic Impedance logs within a larger zone of interest to define larger facies units using basic cut offs. These facies unit polygons are then applied to the seismic data in the area to define gross stratigraphic units. Figure 1a shows the well log cross plot with lithofacies polygons identified. Figure 1b has the well log derived polygons overlain on the VpVs versus Acoustic Impedance cross plot of the Seismic Inversion data. These lithofacies identify stratigraphic units that are continuous laterally across the seismic data, and correlate very well with the lithofacies identified in the well logs (Figure 2).

The 2nd stage is further subdividing the reservoir zone into cross plot defined lithofacies. Figure 3 shows the detailed facies classification possible by focusing on the main zone of interest and how the Lithofacies can be divided into reservoir and non-reservoir units.

The final step in the workflow is to transform the reservoir lithofacies to porosity, which can then be mapped by thickness and porosity – thickness and other attributes. Figure 4 is the resulting porosity thickness map with the horizontal development wells and IP6 month production bubbles. There is a very good correlation of the highest porosity thickness with successful drilling results.

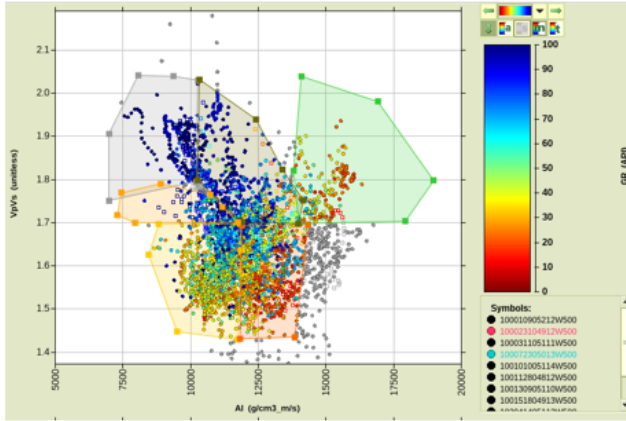
Conclusions

This study shows the advanced seismic quantification techniques can be applied successfully to tighter rocks within the Alberta Deep Basin using existing Rock Physics Templates.

Acknowledgements

I'd like to thank Vermilion Energy for permission to present this case study.

Well Log Based Polygons



Mannville Interval Arb Line Xplot

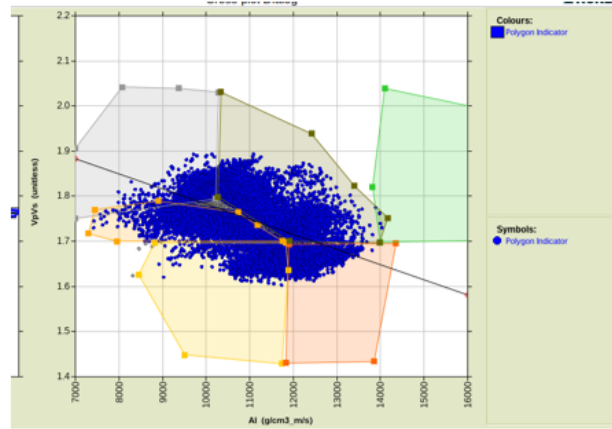


Fig 1a) 6 Seismic Lithofacies Identified from Well Logs
-Prior knowledge, GR and minor iteration to determine # polygons

Fig 1b) 6 Seismic Lithofacies Transferred to Seismic Xplot
- No obvious clusters on the seismic data

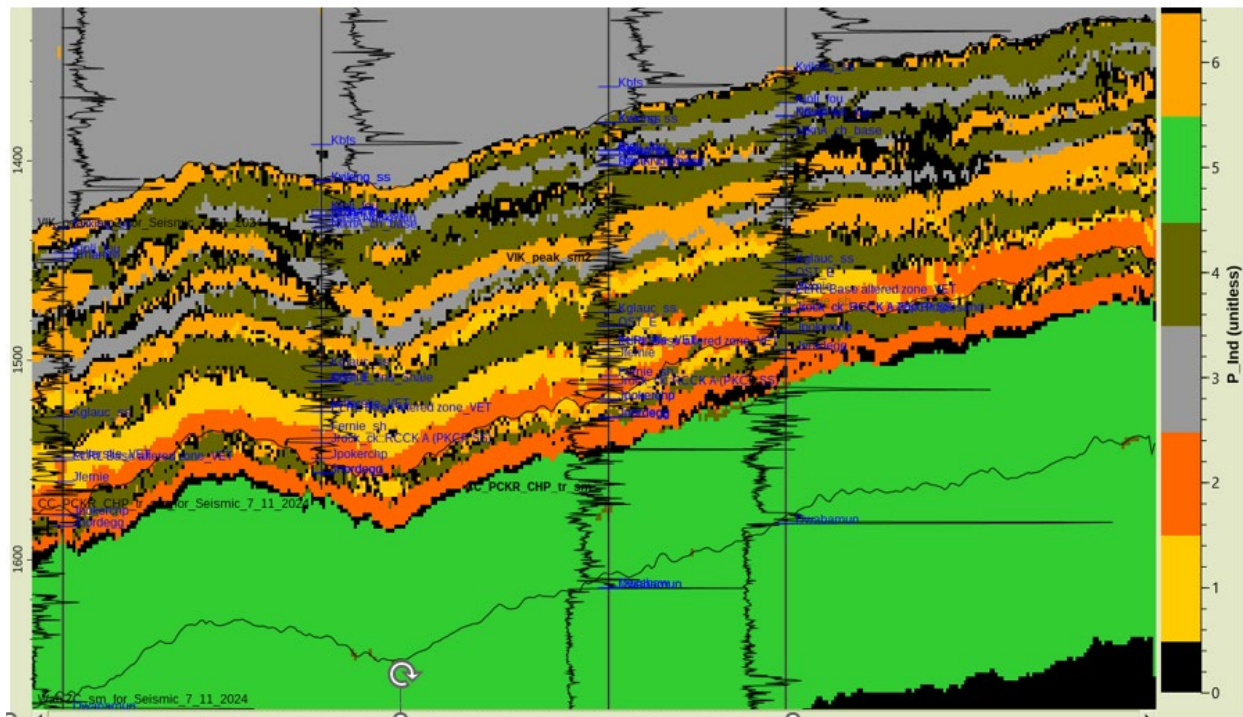


Fig 2) Lithofacies Classification on arbitrary seismic line

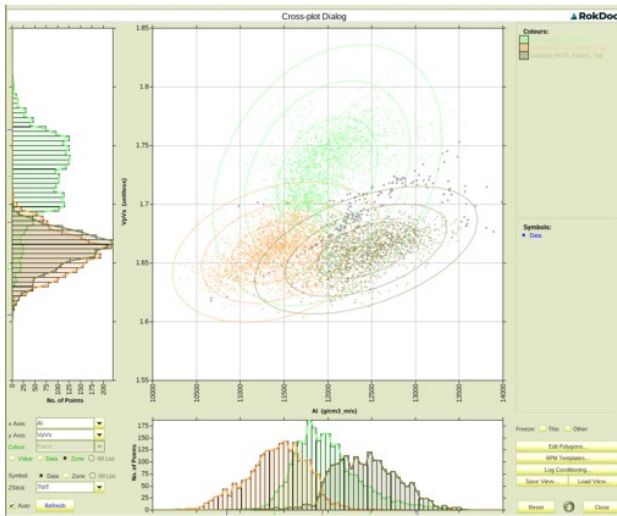


Fig 3) Detailed Lithofacies Classification of Reservoir Zone

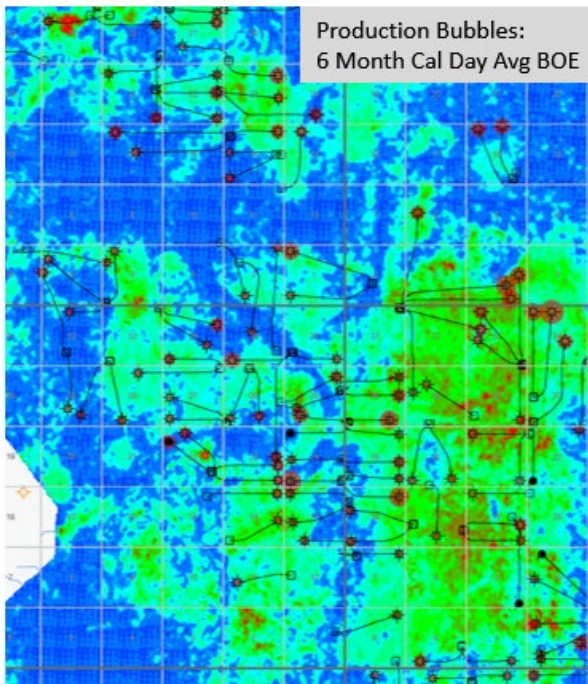
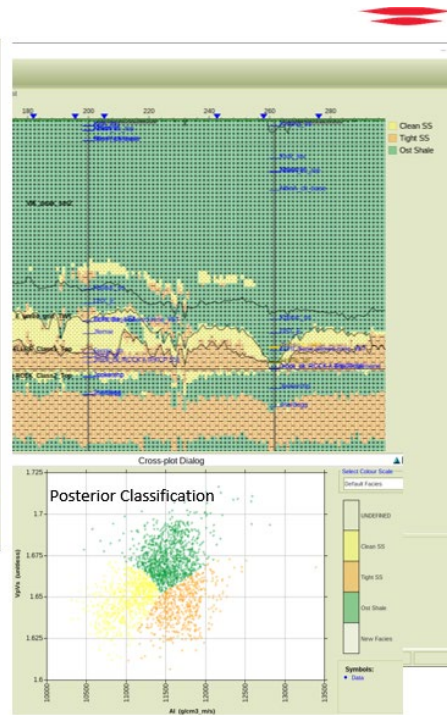


Fig 4) Seismic Derived Porosity Thickness Map