The Application of Sequence Stratigraphy to a Practical Mining Problem: A Case Study from the Saskatchewan Potash Mining District

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The oil and gas industry routinely uses geophysical methods as a means of lessening drilling risk. Potash mining companies also rely extensively upon geophysical methods as a tool to lessen mining risk; for instance, PCS Potash routinely shoots 3D seismic programs in advance of mining operations in order to identify potential mining problems such as roof stability and ore grade.

An approach recently taken by PCS is to first, create a geophysical model based upon analysis of velocity, amplitude, and reflections. A geological model is then prepared, focusing upon rock properties that are relevant to the measured geophysical properties. In creating the model it became clear that geophysical reflectors corresponded to boundaries between strata of differing rock properties such as velocity contrasts between adjacent strata and horizons formed by unconformities or hardgrounds. In the final integration of analyses we discovered that the geophysical record corresponds to boundaries determined by sequence stratigraphic analysis and not traditional stratigraphic subdivisions.

Creating a sequence stratigraphic subdivision of the Upper Devonian of PCS Potash Saskatchewan mining divisions required the correlation of borehole geophysical logs to continuous cores taken in pilot shaft holes, paying close attention to surfaces of erosion or transgression, condensed sequences, lowstand clastic beds, transgressive lag deposits, and such.

The most disconcerting aspect of this approach was that it required casting away the traditional stratigraphy based upon formations and members; however the benefit, namely more consistent geophysically-based isopach and structural mapping, more than compensated for the geological angst.