Chapter 7: Structural Analysis of Kennetcook #1, Kennetcook #2, and N-14-A/11-E-05

Notes for Slides:

Slide 1: Kennetcook is located in the Windsor Basin, a Carboniferous onshore basin containing the Horton Shales, a potential gas rich resource play. Triangle Resources drilled a vertical well in 2006 to investigate the potential of the Carboniferous Horton Group (Devonian).

Slide 2&3: Geology of Nova Scotia, the dominant structural element is the Cobequid Strike-Slip system running through the central portion of the province and separating the Carboniferous Sedimentary Basins which are likely syn-tectonic to the fault system.

Slide 4: 2D Seismic data set used in the structural interpretation of the Windsor Basin.

Slide 5: High Resolution Aeromagnetic Data shot across the Windsor Basin. The data shows the southern bounding Rawdon Fault as a strike-slip system. This fault was previously considered to be a normal fault that is partially responsible for the opening of the Windsor Basin. The fault has the appearance of sinistral (left-lateral) motion.

Slide 6: The major structural elements of the Windsor basin based on seismic and aeromagnetic data. The system is dominated by strike-slip motion. The system becomes constraining.

Slide 7: Fracture systems associated with stress in a homogeneous isotropic medium.

Slide 8: Wellbore breakout patterns and interpretation of stress direction.

Slide 9: Induced fractures are different than breakout patterns but still give the stress directions

Slide 10: Poles to breakout patterns from the N-14-A well

Slide 11: By displaying the poles as a density plot it is easier to see two distinct sets.

Slide 12&13: Plotting the position of the break-out patterns by depth, there is a zone that is absent of breakout patterns. In this case it looks to be a stress domain boundary. The breakout pattern rotates by 40 degrees across this boundary. This is interpreted as a rotation of the stress field in a strike-slip environment

Slide 14: Rose Diagram showing breakout patterns

Slide 15: The stress rotation will create problem in wellbore stimulation in terms of breakdown pressures and fracture propagation. The stress domain boundary will likely be a fracture boundary as well limiting fracture growth. This will have a compromising effect on the wellbore stimulation.

Slides 16-20: A series of strereonet plots showing the bedding orientation to be flat. It is interesting that the bedding data can be used to see a fold within the underlying metasediments confirming that a major unconformits exits between the deeper basement strata and the younger flat lying data

Slide 21-23: Fracture data from Kennetcook #1 shows open fractures oriented NW-SE. The set remains consistent and open in Kennetcook #2. Both of these wells are located on the flank of the basin, The N-14-A well has the same dominant fracture set but it is closed. The N-14-A well is near a strike-slip faults. This well also has a greater fracture intensity with numerous shear fractures through the section.

Slide 24: The presence of strike-slip stress patterns in the basin compromises the fracture system within the section. The system has greater difficulty in moving hydrocarbons because of the large horizontal stress, the sub-vertical nature of the fractures, and the rapid rotation of the stress direction. Strike-slip systems create great structural complexity but they also create greater uncertainty in the nature of the fracture pattern and the ability of the wellbore stimulation to open these fractures up and place proppant.