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Reservoir Properties of the Bakken Shale

Three dominant fracture types occur within the Bakken Formation: structural related tectonic fractures, stress related regional fractures and expulsion fractures associated with overpressuring due to hydrocarbon generation. The expulsion fractures are found throughout the basin on a macro and micro scale.

Lithology differences within the shale control the degree and type of fracturing. Composition of the shale consists of quartz, feldspar, dolomite, pyrite, clay and minor calcite. The greatest degree of variation of composition is noted in the quartz and clay content. An influx of the quartz and feldspar content is associated with the higher clay content as opposed to the higher quartz and feldspar rocks, which have lower organic content. As expected, expulsion fractures are closely associated with higher clay content. These lithology changes can be tied into neutron density log responses.

Because the expulsion fractures are closely associated with the generation of hydrocarbon, they are immediately filled with oil when created. Cementation or the creation of druse surfaces is not possible. However, one theory suggests that the acids associated with thermal maturation of hydrocarbons are present and are capable of dissolving silicate and carbonate minerals. This process produces a micro porous surface identified only by SEM, and is useful in distinguishing true from induced fracturing.

Micro porosity and the kerogen network could contribute to the reservoir. The micro porosity is accessed by the micro fractures. A previous published paper suggests that oil can easily (but slowly) flow through the kerogen network.