

Paleogeographic Reconstruction and Tight Sandstone Reservoir Characterization of the Falher “F” Sub-Member of the Spirit River Formation in Western Alberta

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The lower Albian Falher Member of the Spirit River Formation has been recognized as one of the most prolific gas reservoirs in the Deep Basin of the Western Canada Sedimentary Basin. During its early decades of exploration, interest was focused on the regressive shallow marine conglomeratic succession. However, the advancement of horizontal drilling and multi-stage fracs has encouraged the exploration of thicker, laterally more extensive finer-grained tight sandstone units.

Nevertheless, such drilling programs often face several issues such as the low rates of penetration (ROP) and frequent bit replacement due to the durability heterogeneity within the sandstone intervals. One of the likely causes in terms of mineralogy is the high percentage of durable components, i.e. chert grains and clasts, within the succession. Thus, this study is established to integrate sedimentology, stratigraphy, and petrography approaches to primarily predict the distribution of chert and understand such occurrence in a paleogeographic context within the Falher “F”. Other mineralogical aspects that affect the reservoir quality will also be discussed.

The Falher “F” was deposited as a strandplain succession and along-strike wave-dominated delta equivalents. The deposition took place in a series of four parasequences, informally assigned F1 through F4. These parasequences consist of sand-bearing strata, with the exception of F3 which is enriched with thick pebble-rich conglomerate beds that laterally grade into sandstone.

Trends could be discerned where proximal to distributary channels and where wave reworking was the dominant sedimentary process. This study shows that primary factors that affect

variations in chert distribution and the corresponding petrographic features include proximity to fluvial sources, mechanical abrasion, and possibly chemical weathering to some extent.