Sedimentology, Ichnology and Reservoir Properties of the Low Permeability Upper Cretaceous Alderson Member – Hatton Gas Pool, SW-Saskatchewan, Canada

Ryan Thomas Lemiski*
University of Alberta, Edmonton, AB
rlemiski@ualberta.ca

Murray Gingras, S. George Pemberton and Andrew LaCroix
University of Alberta, Edmonton, AB, Canada

Jussi Hovikoski
University of Turku, Turku, Finland

and

James MacEachern
Simon Fraser University, Burnaby, BC, Canada

Summary

The upper Cretaceous Alderson Member of western Canada is an example of a giant gas-play that revolves around low permeability, gas-prone, non-associated reservoirs. The fields contained within this play produce from shallow zones (less than ~600m) from thin bedded, fine-grained sand within muddy units. In many cases the productive zones are interbedded with, or are, the source rock. Such intervals can be laterally extensive and continuous.

Due to their fine-grained nature, sedimentary facies within the Alderson Member have been difficult to interpret. Various studies have suggested deep through shallow-water affinities for the deposit. We show that the ichnological assemblages are dominated by common *Planolites, Phycosiphon*, and escape traces along with rare *Asterosoma, Schaubcylindrichnus, Schaubcylindrichnus freyi, Scolicia (Laminites), Arenicolites, Thalassinoides, Chondrites, Zoophycos,* and *Helminthopsis*. The trace fossil assemblage represents the *Cruziana* Ichnofacies and is interpreted to represent shallow-water sedimentation in quiescent settings, possibly in association with deltaic processes.

The trace fossil assemblage also admixes sand with the fine-grained media. We suggest that burrow fabrics within the Alderson Member enhance the storativity of gas. This concept is especially important in gas-bearing reservoirs, where slight variations in permeability can have a direct effect on resource assessment and deliverability. We make efforts to quantify burrow volume and connectivity to estimate their potential impact on reservoir behavior. In general, burrow permeability demonstrates 1 to 2 orders of magnitude higher permeability than the matrix. The impact of the permeability depends, however, on the size of burrows and the burrowing intensity in a given unit.