Compartmentalization of the Southwestern Alberta Foothills Pincher Creek Field: a Retrospective

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ABSTRACT

Pincher Creek is a largely depleted 640 Bcf gas condensate field located in the Foothills of Southwestern Alberta. The long pressure history available in the public database allows the definition of three distinct reservoir compartments. The flow barriers inferred from the pressure history are caused by different structural features of the trap. One barrier is resolvable with geophysical and geological data and such features could be predicted as potential barriers or baffles prior to drilling. One appears to be non-resolvable and requires careful documentation of reservoir pressures as exploration and development projects proceed.

The Pincher Creek field produces from the Mississippian Rundle Group carbonate strata which are carried above regional elevation by Laramide age thrust faults. The overall trap geometry is a structural high carried on a low angle thrust fault. In detail the south half of the field is carried on a linear fault segment which exhibits an eastward en echelon step to the northern linear fault segment. The northern segment of the thrust is further complicated by a footwall splay fault.

Pressure data from each of the wells was plotted against time to investigate reservoir compartmentalization. The structurally-defined southern half of the field is not contiguous, but divided into two compartments. The southernmost well, 15-5-3-28W4, drained one compartment which is divided from the 8 km strike-length compartment defined by the wells in the rest of the southern half of the field. The barrier between these compartments can not be resolved with the available data. The second barrier, between the northern and southern compartments, is coincident with the en echelon step between the two larger fault segments which combine to form the overall trap. These fault segments define the northern and southern halves of the field. The northern compartment is interpreted to be a single large compartment with some permeability baffles. There is 9 km strike length continuity in the northern compartment despite the presence of a footwall splay. While the footwall splay fault provides a potential for structural separation, the 3-22-4-29W4 well, which produced from this part of the structure, is in pressure communication with the other wells in the northern compartment of the field. The baffles present in the northern compartment are inferred from delayed pressure response between wells and are interpreted to be a result of poor reservoir quality (porosity – net pay thickness) at those well locations.