Counter Point Bars: Morphology, Lithofacies and Reservoir Significance of a Newly Recognized Sedimentary Deposit in Large Modern Meandering Rivers and the McMurray Oil Sands

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Summary

Counter point bars in modern meandering river deposits previously were referred to as distal-most parts of point bar deposits, concave bank bench deposits and eddy accretion deposits (Fig. 1). Their potential relevance and implications in the exploitation of hydrocarbons has never been recognized and appreciated within the oil industry. In a recent study in the Peace River region of northern Alberta, Canada, counter point bar deposits were recognized as distinctive large-scale depositional elements, being quite different from adjacent point bars with respect to morphology, and particularly lithofacies. In plan-form, counter point bars have concave morphologic scroll patterns, rather than convex as in point bars. In large (>11,000 cubic metres per second at bankfull discharge), wide (>300-700 m) rivers with low gradients (about 5 cm/km), such as the meandering Peace River, counter point bars have silt-dominant lithofacies that contrast with sand-dominant lithofacies in adjacent point bars. Because of the high percentage of silt (80- 95 %), counter point bar deposits will have poor permeability, and thus very limited reservoir potential for water, natural gas, oil and bitumen. Such low permeable silt-dominant lithofacies could have considerable importance in the cost-effective recovery of bitumen in the subsurface, particularly in the middle McMurray Formation, an ancient tidally influenced meandering river deposit.

By properly interpreting counter point bar deposits from high resolution seismic time/slice maps of the subsurface, recognition and mapping of these silt-dominant deposits will have considerable importance in the planning, location and/or placement of well pairs in SAGD operations. Steam driven bitumen extraction projects should avoid counter point bar deposits. On the upside, in some steaming operations of bitumen-rich point bar deposits, counter point bar deposits may act as lateral seals to the steam chamber.

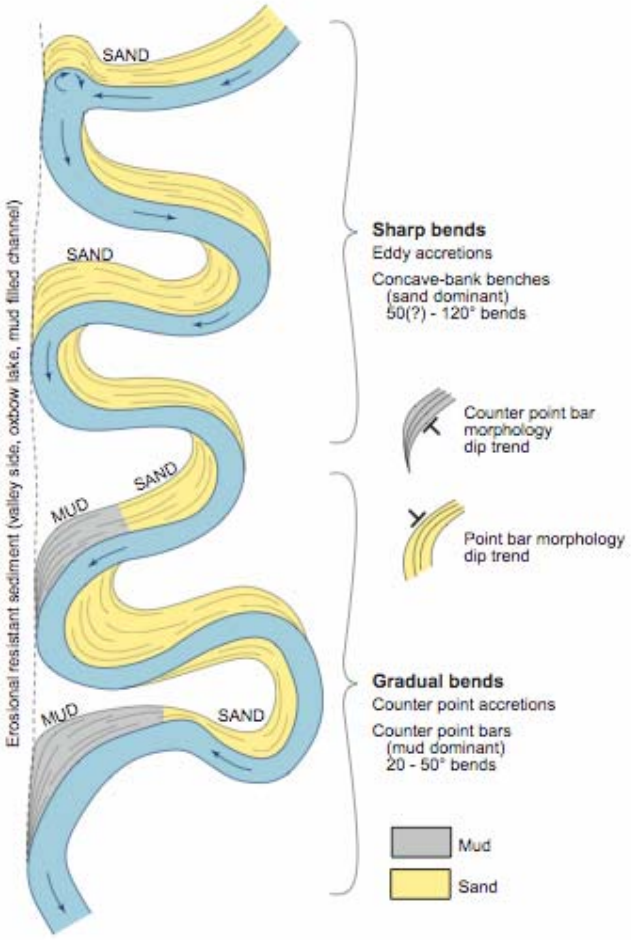
SAND
SAND
MUD
SAND
MUD
SAND
Erosional resistant sediment (valley side, oxbow lake, mud filled channel)
Sharp bends
Eddy accretions
Concave-bank benches
(sand dominant)
50(?) - 120° bends
Counter point bar
morphology
dip trend
Point bar morphology
dip trend
Gradual bends
Counter point accretions
Counter point bars
(mud dominant)
20 - 50° bends
Mud
Sand

Figure 1