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The Basal Colorado Sandstone - Prolific Gas Production From An Erosional Remnant of Sandstone

SPEAKER

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The Basal Colorado Sandstone (BCDS) has been studied in the central part of the Irrigation Block (T14-24 R 11-21W4). In the Countess-Makepeace area the BCDS occurs as a long (80 km), narrow (10 km) and perfectly linear sand body up to 20 m thick, whereas in the Tide Lake and Cessford areas, the BCDS spreads over a wider area. The present shapes of the sand bodies do not reflect their depositional origin, and it will be shown that they are erosional remnants defined by two area-wide transgressive surfaces of erosion (or more specifically, flooding surfaces¹ sequence boundaries, FSSBs).

The Top Mannville FSSB resulted from a fall and rise of relative sea level following deposition on the Mannville floodplain. During the fall, valleys were incised and subsequently filled with smectite-rich lithic sandstones (resulting in easily-damaged wells). The rise of sea level was episodic, with several pauses during which shoreface sediments prograded southwestward. In the Countess-Makepeace area, there are 22 producing gas wells along a 60 km stretch of shoreface - all of these wells are in pressure communication. The cumulative production is about 230 BCF, with the best well producing 42 BCF. Southeastward along the Countess-Makepeace shoreface, the section becomes finer grained, thinner and muddier, until reservoir sandstones disappear and wells are no longer in communication with the main trend. In the Tide Lake area, up to five shoreface successions are present, with an irregular but overall backstepping stacking pattern.

Following transgression and formation of the BCDS shorefaces, there was a second major fall and rise of relative sea level, which resulted in formation of the Top Basal Colorado FSSB. During the fall, a second set of Basal Colorado valleys was incised. This upper set of valleys is filled with quartzose sandstones with no smectite and no damage problems. In the Cessford area, cumulative production (mainly from the channels) is 540 BCF, with the best individual well having produced 67 BCF.

The BCDS is preserved between the Top Mannville FSSB and the Top Basal Colorado FSSB. The FSSBs contain scattered transgressive lags that can produce up to 7 BCF from a lag only about 1 m thick.

In the Tide Lake area, the reservoirs are extremely compartmentalized, due to 1) local structure on the top of the BCDS, 2) the stacking pattern of the shoreface deposits, and 3) lateral facies changes in the shorefaces.

BIOGRAPHY

Roger Walker received his D.Phil. from Oxford University, was a Postdoctoral Fellow at the Johns Hopkins University, and taught at McMaster University for 32 years. He moved to Calgary as a consultant in 1998. He is an honorary member of SEPM and has received their Pettijohn Medal. He also received the Past Presidents' Medal and the Logan Medal from GAC, and the RJ W Douglas Memorial Medal from CSPG. The AAPG has awarded him the Distinguished Educator Award, and he is a Fellow of the Royal Society of Canada. In July this year, in Johannesburg, he was awarded the Henry Clifton Sorby Medal of the International Association of Sedimentologists - he wed the Basal Colorado as the topic of his Keynote Address there.