RECOGNITION OF CHANNEL FILL TYPES IN DELTAS AND SUBMARINE FANS

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Channels are elongate features of negative relief that can either result from erosion of the substrate or by deposition in which case the relief is maintained by simultaneous transport with some deposition in the channel and construction of levee/overbank areas during overflows. Fluvial and deltaic channels/distributaries and submarine fan channels have a lot in common morphologically and architecturally. For this reason it makes sense to use information from one system thus making it easier to gain knowledge in the other system.

Individual delta and submarine fan channels are often too small to be observed or detected on multifold seismic data, or if visible to see sufficient internal detail. Well log correlations are based on experience of the professional and the results often differ between persons. Channel systems are often too large to be visible in their entirety within one outcrop. In order to develop the most acceptable interpretations, it is common to compare as many types of data as possible. In this presentation well log data from east central Louisiana are demonstrated together with outcrop observations on submarine fan channels from Arkansas and South Africa. It is important to realize that most deltaic channels are constructed and preserved during transgressive and highstand systems tracts, while submarine fans are commonly constructed during falling relative sea level (low stand systems tract).

The Wilds delta, a subsurface interval deposited during the transgressive system tract within Paleocene middle Wilcox time, can be considered an ideal candidate for comparison with submarine fan channels. Owing to the excellent well coverage through this interval, detailed E-log correlations and net sand mapping has provided a means of recognizing genetic facies architectures within the Wilds delta. These facies include distributary channels, overbank bay fills, and crevasse splays. A conventional core taken through the distributary channel area of the Wilds has provided a means of measuring the physical parameters within this 70 foot thick channel fill.

Thin section petrography shows the Wilds distributary channel sandstones to consist mainly of subangular to subrounded, very fine to medium quartz grains. Occasional siltstones and shales are interbedded within the sandstone layers that contain flaser bedding, rip-up clasts, and planar laminations. Porosities within this predominantly sandstone portion of the channel average 30%, permeabilities range between 150 and 525 md and average 300 md.

The dimensions of the Wilds distributary channels as observed from the net sand geometries vary somewhat from place to place. However, channel thickness ranges between 60 and 100 feet and the width varies between 0.5 and 2 miles. Since abundant data are available for this Wilds interval, it becomes rather obvious that channel fills can differ tremendously in morphology and architecture within one system.

Normally, the width/depth (thickness) ratio of a channel fill increases downdip. The major filling types for deltaic and submarine fan channels are: 1) massive sandstone, 2) massive fill going over into a bedded fill, 3) monotonous horizontally bedded fill of only sandstone or an alternation of sandstones and thick or thin shales, 4) a bedded fill of sandstones and shales with a thinning-upward sequence, 5) a non-rhythmic alternation of thin and/or thick layers, or 6) an oblique fill with or without any sequence pattern and with or without erosional contacts.

A good understanding of the internal architecture of channel fills is essential for production personnel before proper calculations can be made on connectivity trends, reservoir volumes, and other parameters. Therefore, the combined knowledge about deltaic channels and submarine fan channels can only result in improved understanding of these systems.