Analogs to Fluvial Reservoirs: What Factors are Important?

Nigel Mountney, Luca Colombera
University of Leeds

9.29.2020 - 10.1.2020 – AAPG Annual Convention and Exhibition 2020, Online/Virtual

Abstract

Outcrop and modern analogs are vital for characterizing reservoir architecture and heterogeneity, and hence for predicting the likely distribution of net volumes in stages of appraisal and for planning field development. Geologic analogs are commonly employed for these purposes through their use in reservoir-modeling workflows. A large amount of analog data is available that can be referred to in the characterization and modeling of fluvial subsurface successions, deriving from a growing number of field studies conducted on ancient fluvial strata, and from analyses of the geomorphic organization of modern rivers; such datasets offer insight into preserved sedimentary architectures. However, selecting analogs that are appropriate for any given subsurface succession is not a trivial task. A systematic analysis is still warranted of which attributes that describe depositional contexts and controlling factors on deposition are important for analog selection, and which have highest predictive value, depending on the type of application.To this end, a quantitative analysis of the sedimentary architecture of many classified case studies of fluvial successions has been undertaken employing a database (FAKTS) that stores multi-scale sedimentological data on depositional elements, architectural elements and lithofacies, from 300+ case studies of ancient and modern depositional systems. The database additionally classifies case studies on attributes that define depositional context (e.g., river pattern) and controlling factors (e.g., subsidence rate). Thus, the database permits investigation of the predictive power of parameters that are routinely available for subsurface characterization (e.g., sandbody thicknesses from well logs, river-catchment size from detrital-zircon studies), which can be assessed on a statistical basis. Furthermore, the analyses are conducted with respect to the types and scales of heterogeneity that are

relevant for different applications (e.g., modeling the distribution of channel-belt sandbodies, assessing the extent of facies-scale thief zones in channel deposits). This approach results in guidelines on how to screen for analogs to fluvial reservoirs that are suitable to specific tasks. By demonstrating how different parameters act as primary controls at different scales, recommendations for analog selection and application can be tied to steps that define hierarchical reservoir-modeling workflows.