Connectivity of Tight Sandstone Reservoirs in Clastic Transitional Depositional Environments: Learnings from Subsurface and Outcrop Study

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Understanding effective connectivity of thin bedded reservoirs in transitional depositional environments such as a terminal fluvial fan system is critical to model reservoirs formed in these environments. Layers such as thin, potentially clean sandy and silty lobes can in fact represent in the subsurface high-permeability streaks which ultimately control well production performance. However, accurate knowledge of architectural elements has to be coupled with a sound understanding of petrographical variability and especially diagenetic modification of primary textural and reservoir properties. For this purpose a detailed sedimentological study of a terminal fluvial fan system has been carried out in the Tertiary Ebro Basin (Spain) in order to capture the key architectural elements (e.g. thin sand terminal lobes, crevasse splays) which control lateral connectivity between large sand bodies and the results compared with subsurface data in Europe and North Africa. Capturing such sedimentological and petrographical characteristics in 3D reservoir models, using also appropriate upscaling approach, is therefore critical to be able to simulate correctly fluid flow behaviour within these reservoirs. The result of this study can hence be applied to subsurface cases (e.g. Permian Rotliegend Transition Zone in the Southern North Sea, or thin bedded Devonian reservoirs formed in distal fluvial systems in marginal marine settings in North Africa), where the effective production from several tight gas fields is based on a reliable understanding of the suburface.