Limestone Frequency and Well Performance Redux

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Abstract

The Lower Eagle Ford on the southwestern flank of the San Marcos arch consists mainly of thin interbeds of brittle, recrystallized limestone and thicker, more ductile, organic-rich calcareous mudstone (marl). On average, the limestone beds are about 0.25 m (0.85 ft) thick and the marls about twice that, 0.56 m (1.85 ft). The limestones can be recognized, but not fully resolved, on logs. The number of limestone beds can be ascertained from the logs and their thickness approximated. Limestone bed frequency can be calculated by dividing the number of limestones in an interval by the thickness of the interval. Mechanical models show that the density of natural fractures increases as bed thickness decreases, suggesting overall fracture effectiveness and complexity will increase as limestone bed thickness decreases. In the study area, limestone bed frequency and limestone bed thickness are inversely related, and increased limestone frequency has been identified as a key driver for well performance. Another operator in the play has identified thin limestones interbedded with organic-rich marls as “the most productive and most brittle” facies in the Eagle Ford. Shale reservoirs can be considered in terms of storage capacity, reservoir energy, and connectivity. In the Eagle Ford, marl thickness is an important component of storage capacity and limestone frequency of connectivity. Other factors being equal, the best production will be associated with thick marl sequences with enough interbedded limestone to maximize the complexity of the combined natural and induced fracture network, but not so much limestone as to substantially lower storage of hydrocarbons in the system.