Significance of Early Marine Cementation on Reservoir Development and Evolution In Silurian Forereef Slope Deposits at Pipe Creek Jr. Quarry, Indiana-Applications for the Michigan Basin

Alejandra Santiago Torres[1]
[1]Oklahoma State University- Boone Pickens School of Geology, Petroleum, Stillwater, OK USA
alejandra.santiago_torres@okstate.edu

ABSTRACT

Silurian forereef slope deposits exposed at Pipe Creek Jr. Quarry (IN) are characterized by steeply dipping beds (35-45°) consisting of cyclically bedded units of grainstone and boundstone facies with abundant syndepositional abiotic marine cement as well as in situ microbial and cement boundstones. The early stabilization of steep carbonate slope deposits has been attributed by previous authors to syndepositional abiotic marine cementation. However, recent studies suggest that extensive microbial binding may be another significant factor.

A main focus of this study is to evaluate the control on early diagenetic modification of porosity and permeability in these deposits as a model for Silurian reef slopes in and around the Michigan Basin that have produced more than 500 MMBOE, but where production has been limited to the cores of reefs and not from the subsequent forereef slopes. Comparison of interpreted depositional processes and slope geometry in the Silurian to those described in subsurface examples including the supergiant Tengiz Field in Kazakhstan and in the Bahamas, shows similarity in depositional processes, potential reservoir geometry, and effects of early diagenesis on reservoir properties. The aim of this study is to evaluate the significance and timing of syndepositional marine cementation (abiotic and microbially mediated) in the early stages of stabilization and lithification of these steep forereef slope deposits and to assess the effects of syndepositional marine cementation (both abiotic and microbially mediated) on the reduction of initial porosity and permeability as well as modifications to the primary pore system architecture. Methods used include (1) Thin Section Petrography, (2) SEM Analysis, (3) Optical Cathodluminescence Microscopy, and (4) Confocal Microscopy.

AAPG Search and Discovery Article #90321 2018 Grants-in-Aid Projects