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Characterization of Complex Grainstone-Microbial Reef Reservoirs, Vocation and Appleton Fields, Escambia County, Alabama

Smackover flow units in Vocation and Appleton Fields were identified, mapped, and ranked as part of an integrated reservoir characterization project. Pore categories, pore and pore throat geometries, diagenetic history, and depositional attributes were logged and resulting data were combined with core descriptions, mercury-injection capillary pressure data, and wireline log data to produce flow unit maps.

Appleton and Vocation Fields produce from grainstone buildups and microbial reefs. Microbial fabrics within reefs were found to have great influence on reservoir quality. Five fabric categories and growth forms that reflect variations in water energy, sedimentation rate and substrate were identified; they include Type I layered thrombolites with characteristic mm/cm-scale crypts, Type II reticulate and "chaotic" thrombolites, Type III dendroidal thrombolites, Type IV isolated stromatolitic crusts, and Type V oncoidal packstone/grainstones. Types I, II, and III buildups are the most productive reservoirs. Of these, Type III buildups contain the highest quality reservoir rocks, which consist of extensively dolomitized reticulate and dendritic fabrics that have well-connected intercrystalline and vuggy porosity. Type IV and V microbialites are poor reservoir rocks because Type IV reefs are rarely in communication with the bulk of the reservoir and Type V oncoids exhibit separate vug porosity.

Results of this work improve understanding of complex grainstone and microbial reef reservoirs and improve our ability to characterize and model complex reservoir architecture, pore systems and flow unit quality from pore to core to field scale.