

Identification of Petroleum Productive Low Temperature Hydrothermal Dolomite Reservoirs: Difficulties and Challenges Identifying and Finding

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Abstract

Low temperature hydrothermal dolomites that are characterized as Mississippi Valley Type (MVT) deposits are well known in the base metals industry but are not as well recognized in the petroleum sector. The historical perception of these type of reservoirs is porous dolomites in structural sags in association with wrench fault systems. Well known examples are the Albion-Scipio and Stoney Point fields in southern Michigan Basin, Michigan, USA. These extremely narrow but very elongated features have produced over 200 MMBOE at less than 6,000 feet from these fields. Within these reservoirs low temperature hydrothermal fluids replace limestone with dolomite causing reduction in rock volume, increase in porosity, zones are typically 3 to over 50 meters thick, overpressured, brecciation, and associated secondary chert, barite, and minor base metals. Similar reservoirs occur in central New York, Southwestern Ontario, south central Kentucky, and north central Tennessee. The Livengood and Runamuck fields in Northeastern Kansas, Midcontinent, USA, are also associated with wrench faults and their reservoirs are secondary dolomites caused by low temperature hydrothermal fluids. However they produce from structural highs. The Arikaree Field in the southern Denver Basin, Rocky Mountains, USA, produces from a low temperature hydrothermal dolomite reservoir from three different structural closures associated with a wrench fault system of Mississippian to Pennsylvanian in age. The difficulty in finding these types of reservoirs, except for the wrench faulting and closure, seismic is generally not definitive. Many of the fields are related to flower structures and structural depressions representing collapse and brecciation caused by wrenching and replacement of limestone to dolomite. These fields are highly prolific. This paper will discuss the seismic and subsurface geology of some of these fields and the caveats and pitfalls associated with finding and developing them.