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Pore Geometry and Permeability in a Dolomite Reservoir

Because pore geometry is an inherent element of permeability, one important objective of reservoir characterization is to describe, classify, and quantify the pore network of reservoir rocks. The principal components of pore geometry consist of size, shape, number of connecting throats (coordination number), pour-to-throat size ratio, and the spatial arrangement of different pore types. Thin-section analysis of dolomites in the Mississippian Greenbrier Limestone from an old field of West Virginia identifies five different pore types; intergranular, moldic, intercrystalline, intragranular, and feldspar solution pores. Moreover, hundreds of measurements of individual pores show that each type has its own set of petrographic characteristics. Moldic pores, for example, are largest and exhibit a high pore-to-throat ratio and high coordination number. On the other hand intergranular and intercrystalline pores are smaller and have low pore-to-throat ratios and low coordination numbers. Pore types in the Greenbrier reservoir generally occur in combination, and the specific mix of pore geometries proves significant in that it correlates to the dolomite's permeability. In addition to high total porosity and large pore size, the most beneficial properties of a compound pore network include a high number of connecting throats, relatively large pore throats, and a continuous or uniform arrangement of pore types both between and inside the framework grains. Owing to these favorable attributes, dolomite samples with an equal mix of moldic and intergranular pores have the greatest permeability, even though their total porosity is just middling.