

Limitation of Laboratory Measurement in Evaluating Rock Properties of Bioturbated Reservoirs (A Case Study from the Upper Jubaila Member of Central Saudi Arabia)

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Abstract

To understand the limitation of laboratory measurements in evaluating rock properties of bioturbated reservoirs, this study integrates field investigations, laboratory measurements, geostatistical modeling and previously published results of upper Jurassic bioturbated carbonate strata in central Saudi Arabia. Results of porosity and permeability measurements from previous studies indicated that the studied strata are very tight with porosity ranges from 0.0 to 5.0% and permeability ranges from 0.0 to 2.0 mD. Field investigation results in this study showed that these strata are extensively bioturbated (10% to 50% burrow intensity) and dominated by *Thalassinoides* burrow (TB). This TB has either open or partially filled shafts with a diameter in 2D outcrop face ranges from 2 to 5 cm. Results from CT-scanning showed that the TB develop connected burrow porosity network (up to 15% estimated porosity) within a tight matrix (spot permeability of the matrix range from 0.0 to 1.6 mD). The bulk permeability (permeability of a homogenized sample with a steady-state flow) and bulk porosity (average porosity of both burrow and matrix porosity) of the studied strata is thought to increase with burrow intensity and is estimated to be at least more than 1200 mD for a sample with 10% burrow intensity. This study highlights the inability of core plugs and whole core diameter to capture the full network of the burrow porosity, a limitation can be problematic in the characterization of rock properties of bioturbated strata.

