SPE 109821: **A Critical Review for Proper Use of Water/Oil/Gas Transfer Functions in Dual-Porosity Naturally Fractured Reservoirs—Part I.**

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**Abstract**: Accurate calculation of multi-phase fluid transfer between the fracture and matrix in naturally fractured reservoirs is a crucial issue. In this paper, we will present the viability of the use of simple transfer functions to accurately account for fluid exchange resulting from capillary, gravity and diffusion mass transfer for *immiscible flow* between fracture and matrix in dual-porosity numerical models. The transfer functions are designed for sugar-cube or match-stick idealizations of matrix blocks.

The study relies on numerical experiments involving fine-grid simulation of oil recovery from a typical matrix block by water or gas in an adjacent fracture. The fine-grid results for water-oil and gas-oil systems were compared with results obtained with transfer functions. Both in water and gas injection, the simulations emphasize the interaction of capillary and gravity forces to produce oil depending on the wettability of the matrix.

In gas injection, the thermodynamic phase-equilibrium, aided by gravity-capillary interaction and to a lesser extent by molecular diffusion, is a major contributor to interphase mass transfer. For *miscible flow* the fracture-matrix mass transfer is less complicated because there is no capillary forces associated with solvent and oil; nevertheless, gravity contrast between solvent in the fracture and oil in the matrix creates convective mass transfer and drainage of oil.

Using the transfer functions presented in this paper, fracture and matrix flow calculations can be decoupled and solved sequentially–reducing the complexity of the computation. Furthermore, the transfer function equations can be used independently to calculate oil recovery from a matrix block.