

Composite Core – An Experimental Approach in Evaluating Ordering Criteria for Individual Cores in Composite

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Abstract. Composite cores made up of core plugs typically taken from different vertical sections of a 4” core are often used for special core analysis experiments. These core plugs are typically 1-3” in length and are combined in a composite core for relative permeability and coreflooding experiments. In the seminal work, ordering of individual core samples in composite cores was presented by Huppler (1969) based on the permeability of individual cores. A harmonic averaging method was proposed by Huppler resulting in averaging the permeability of the individual core plugs to match the overall permeability. Based on a theoretical framework on North Sea sandstones, Langaas (1998) proposed ordering the core plugs from higher to lower permeability from injection to production for effective relative permeability measurements. In this paper we test the methods proposed by Huppler and Langaas. Sandstone core samples with permeability ranging from 50 mD to 2 Darcy are used for this work. Three different orientations of the core samples are tested for permeability and relative permeability with water to oil ratio of 1:6 and compared with the theoretical model developed by Langaas and Huppler. Further a new theoretical model is developed and validated with the relative permeability experimental results and compared against a data driven approach.