

Abstract - Are We Leaving KH on the Table? Upscaling Core-Based Permeability Predictions to the Reservoir Scale. Common Workflows and Practices and how they can underdeliver on Estimates of Well Productivity.

Permeability, be it absolute or relative, gas or liquid, at ambient or overburden stress, is a primary measurement taken on core data and for good reason. It is a critical building block for dynamic modelling to predict well and field-scale production, and that in turn underpins economic analysis to determine cash flow and profitability.

However, a number of important issues arise that can confound our prediction models. Core permeability data is typically discrete point data as core plugs are taken at specific depths in a reservoir interval. One plug on the inch scale has to represent other data on the foot scale. The full range of facies is rarely plugged, and thus both scale and statistics combine to make the prediction of permeability out with the plugs and the averaging and upscaling of said predictions to, say, a comparison to a dynamic well test very challenging. And this is before corrections to reservoir stress, fluids present and other geological features that might not be present at the plug scale, such as vugs and fractures.

This talk will illustrate how porosity and permeability can be measured and predicted at the core scale, then upscaled to log and reservoir scales. Statistical tests and corrections of log means will be discussed to show how standard workflows to predict permeability from core data can often underestimate well-scale dynamic flow characteristics if such corrections are not made. A case study for a North Sea Jurassic Fulmar sand reservoir will be presented to illustrate the challenges of getting permeability-thickness right if one doesn't understand the limitations of porosity-permeability transforms and other typical approaches.

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