

## Modeling of Lithological Heterogeneity in Relation to the Rock's Textural Properties in a Heavy Oil Reservoir, NE Alberta.

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### Summary

The distribution of reservoir fluids and their flow through the pore network is strongly controlled by the texture (grain to grain relationship) of the reservoir rock. The nature of pores and their connectivity depends on many factors, such as grain size and shape and their packing (function compaction, cementation etc.), sorting, presence/absence of clay minerals and their nature of distribution in the pores etc. The evaluation of this micro-heterogeneity (textural heterogeneity) is primarily a microscopic job (rock's thin section and SEM study) and qualitative and therefore it is limited in generating 3D models.

However, tortuosity, and the Archie's parameters "a" and "m" which are commonly known as "tortuosity exponent" and "cementation factor" respectively, can be regarded as the textural parameters because of their dependency on the size and shape of the grains and pores, clay content, presence of specific clay minerals, specific surface area etc. All of these parameters are quantitative and in most of the petrophysical calculations a fixed value for the respective parameter is used for a particular lithology. In this presentation all these parameters are presented in the form of continuous logs which vary with lithology. 3D models of these parameters are created which are highly comparable with the other 3D models ( $V_{sh}$  & facies models from  $V_{sh}$ , porosity, grain size etc).

The derived parameter(s) are used in various permeability models (Kozeny-Carman, Berg and Van Baaren models) and the obtained results are compared with the permeability model resulting from the equation developed from the laboratory measured data (from a porosity-permeability relationship). A very strong correlation coefficient is found for each of the models with the laboratory derived permeability.