Saturation-Height Model of the Amin formation in Oman tight gas reservoir

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Abstract

A deep tight gas condensate reservoir with very low permeability and porosity of Amin Formation was under study. The usual complexity of the tight gas reservoirs is not well-defined fluid saturations distribution.

Main objectives of this thesis is to develop a model for the Saturation Height Function (SHM) using Mercury Injection Capillary Pressure (MICP) analysis and core data of three wells that can best fit to the water saturation calculated by logging data. In order to describe the relation between saturation obtained by MICP analysis and height, the hyperbolic function was used. To introduce rock properties, the J-functions and porosity dependent function were attempted. The permeability-porosity relations were described by correlation lines drawn by eyes and by applying the concept of Hydraulic Flow Unit HFU. The porosity-based model and Leverett J-function were attempted, of which J-function showed poor match.

The SHM proposed for tight gas reservoir of Amin Formation in this study adequately simulate saturation curves obtained by logging data for three examined wells located in two different blocks. The simple equation is based upon an expression, which depends on power function of porosity. The use of only porosity has a significant advantage compared to the models that use permeability requiring in its turn the correlation with porosity. The calibration of SHM with logging data allowed obtaining coefficient in the basic equation and evaluating Free Water Level (FWL). The acquired SHM worked well for all three wells located in different Blocks of the field. The SHM can be used as a tool for saturation evaluation independent from electrical rock properties obtained by logging method.