Application of Petrophysical Principles to the 'Hunt' for Overlooked Carbonate Pay

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The mystery of evaluating pay and predicting performance of complex carbonate reservoirs can be mitigated by integrating log, core, test and pressure data into a petrophysical reservoir model. A diagnostic process is required to identify the dots, then to connect them using appropriate models for pore type and Sw distribution. The process includes:

• asking appropriate questions of the data and geology • documenting relevant pore geometry models applicable to carbonates • defining flow units based on intervals of uniform gamma ray, porosity and resistivity • integrating the data and the models • relating the results of data and model integration to performance history.

The process is best illustrated by examining cases histories from Mid-continent carbonate reservoirs such as the Hunton or the Kansas City-Lansing. Some of the key questions important to the diagnostic process are;

1 What is valid Rw for the project? 2. Is core data available to document the relevant pore types responsible for hidden pay, and how do we use it? 3. How many flow units define the zone of interest, and what is their net thickness? 4. What is the best transform for converting porosity and Rt to Sw? 5. Does the Sw-depth profile (by flow units) reflect variation in pore type? 6. What is the amount of net feet of pay by pore type? 7. Where, oh where, is the aquifer?

This diagnostic process, in the context of the geological and engineering constraints of the carbonate reservoir system, can be utilized to predict the hidden pay candidates and predict their performance. Recognizing that subtle hydrocarbon accumulations exist as part of a continuous system yields several basic carbonate reservoir models that optimize the application of data available from a well bore.