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**Identification of sedimentary-diagenetic facies and reservoir property prediction: An example from the Eocene beach-bar sandstone in the Dongying Depression, China**

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Reservoir porosity and permeability are critical parameters for the economics of any endeavour in oil and gas exploration and production [1]. The accurate prediction of reservoir porosity and permeability is the key to prospect the hydrocarbon reserves and petroleum production capacity [2, 3]. A new reservoir porosity and permeability prediction method is presented in this paper based on the identification of sedimentary-diagenetic facies. The combination of lithofacies and related diagenetic facies are defined as sedimentary-diagenetic facies. The lithofacies of the Eocene beach-bar sandstone in the Dongying Depression are classified into fine sandstone, siltstone, and argillaceous siltstone based on grain size analysis, sorting, and matrix content. The major diagenetic processes that influence the porosity and permeability of Eocene beach-bar sandstones are compaction, carbonate cementation and feldspar dissolution. The diagenetic facies were classified into five types based on the porosity compaction loss rate, porosity cementation loss rate and porosity dissolution increment rate. Seven types of sedimentary-diagenetic facies were identified in the Eocene beach-bar sandstones based on the combinations of lithofacies and diagenetic facies. The variation ranges of porosity and permeability (log K) of these sedimentary-diagenetic facies are typically less than 6% and 1.2, respectively. The porosity and permeability of trend lines have function relationships with depth. The sedimentary-diagenetic facies can be identified effectively by logging data through the use of Bayes discriminant analysis and corresponding cross-plots. The porosity and permeability (log K) of the well evaluated in the study were predicted with error in the range of  $\pm 3\%$  and  $\pm 0.6$ , respectively, based on the distribution and the fitting equation of the trend lines for the seven types of sedimentary-diagenetic facies. The predicted porosities and permeability of the different types of sedimentary-diagenetic facies match the measured porosities and permeability well.

*References:*

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