FACIES, DIAGENESIS AND POROSITY RELATIONSHIPS OF THE BUDA, GEORGETOWN, McKNIGHT AND WEST NUECES CARBONATES OF THE MAVERICK BASIN

Alonzo D. Jacka[1]

ABSTRACT

Throughout much of Dimmit and northern Webb Counties, the Buda and Georgetown limestones are remarkably homogeneous and both consist of very dense algal calcisphere, *Globigerina, Inoceramus*, echinoderm wackestones and packstones; calcispheres constitute the predominant biotal component in both.

In central and western Dimmit County dolomitization produced secondary intercrystalline porosity in several Georgetown intervals; these voids are filled with what is now solid hydrocarbon. In this area gas is produced in the Georgetown Formation from tertiary voids which were formed when fresh groundwaters dissolved replacement anhydrite after hydrocarbons had accumulated in secondary intercrystalline voids. The Buda Limestone has no reservoir potential throughout this area.

Westward from eastern Dimmit County the McKnight and West Nueces Formations exhibit changes in facies from oobiograinstones and packstones to biopelgrapestone grainstones and packstones to biopelwackestones in western Dimmit County. The McKnight Formation exhibits well developed depositional and diagenetic cycles. These cycles record interaction of the following: 1) eustatic fluctuations in sea level; 2) regional progradation of supratidal, intertidal and subtidal facies during stillstands of sea level; 3) changes in climate from arid to semiarid or subhumid; 4) continuous subsidence. Consequently, the McKnight Formation has been subjected to highly complex multicycle diageneses that include: fresh water diagenesis; dolomitization; anhydritization; silicification; and dedolomitization. Anhydrite layers of the upper and lower "anhydrites" were formed by replacement of carbonates. Secondary intercrystalline porosity in dolostone layers has been filled by what is now solid hydrocarbon which accumulated at shallow depths. Gas production in the McKnight Formation throughout the area, is from tertiary anhydrite molds which were created after solid hydrocarbons had accumulated in secondary voids. Much dickite cement also occurs in secondary voids in the McKnight Formation.

The West Nueces Formation apparently contains no anhydrite but tertiary anhydrite molds were abundantly formed and then largely filled by carbonate cements, as were primary and secondary voids. Reservoir potential of the West Nueces Formation has not been properly evaluated.

Because mechanisms of anhydrite emplacement are so poorly understood, the distribution of porosity, formed by its dissolution, is unpredictable.

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[1]Geosciences Department, Texas Tech University, Lubbock, Texas 79409