THE USE OF DOWNHOLE GRAVITY DATA IN FORMATION EVALUATION

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ABSTRACT

It has been shown by Smith (1950), McCulloh (1968) and others that the downhole gravity meter is a high precision, large volume, bulk density tool. It is unique in that bulk densities can be measured directly, i. e. no calibration, and in place. The large rock volume measured insures that the measurements are relatively unaffected by mud cake, infiltrated zones, washouts or casing. The use of large volume density measurements have literally added a new dimension (depth) to some formation evaluation problems.

Bulk densities measured with the borehole gravity log in wells in the Gulf Coast area show considerable deviation from densities measured with the gamma-gamma log. Moreover, they do not show a density change in the over-pressured shale zone. These results suggest that although the physical parameters measured by small volume tools may be quite accurate, they may not be representaitve of true formation characteristics.

Densities from a borehole gravity log in a carbonate-shale sequence agree, with only one exception, closely with densities measured with the gamma-gamma log. This difference in densities of .18 g/cc is attributed to either porosity lateral to the borehole, a lateral change in lithology or a fault.

The high precision and large rock volume measurement capabilities of the borehole gravity meter make it especially useful in measuring low porosities, as for example, that of a fractured quartzite in Libya, and fluid density behind casing, for example, gas in Texas.

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