Mapping Hydrocarbon Trends with a New Approach To Temperature Modelling - Bottom Hole Temperature Datasets in the Utica

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Abstract

Temperature data within a basin may be used to identify where favourable gas-to-oil ratios (GOR) exist for shale gas formations. However, a consistent and reliable dataset that covers an entire basin at all levels of interest is often not read-ily available. A new methodology for basin temperature model-ling has been developed that utilizes large volumes (~10,000 points) of properly indexed and QC'd bottom-hole temperature (BHT) data for an onshore basin or area.

It is important to honour the theory that borehole temperatures equilibrate, increasing towards formation temperature with elapsed time since fluid circulation. We thus use the maximum BHTs recorded in a layer (normalized for depth) or cell, rather than a corrected average or regression based model.

Present day temperature volumes (cubes) have been constructed with two methodologies. In the MaxG cube, we first define a depth varying interval geothermal gradient (IGG) function that models the maximum envelope of the BHT cloud for each major lithostratigraphic unit. We then construct the cube by stacking the IGGs for all the units in the basin. With sufficiently dense data, in the second method (MaxBHT), we use the maximum BHT in each cell of the cube, with some back-ground infill of the voids using MaxG. The concept is illustrated with examples from the Utica trend.