

Some Perspective on the Use of Vintage Dipmeter Logs for Seismic Interpreters

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One of the principal objectives of seismic interpretation is to develop a 3-D view of regional geologic structure. Well logs and correlations, where available, are important to help in calibrating and tying the interpretation. Structural Dip from Dipmeters or their modern descendants, the Image logs, can be particularly useful in locating faults, unconformities, and providing a reality check on seismic interpretations. It may not always be recognized that Dip results are also an interpretation, subject to quality problems, processing assumptions, time limitations, and human error. These factors are generally poorly documented, if at all.

Most Dip logs are based on resistivity technology and consist of several Micrologs recorded on tool pads spaced around the borehole. As tool design advanced and data collection and processing power increased, additional curves were added. For oil-based muds, Image log technology based on both electrical induction or also an acoustic signal was introduced. To judge the accuracy and usefulness of the results, it is important to understand the vintage of the original log and the technology used to capture and interpret the Dip data.

Dips were first picked by hand on very large-scale plots, 5 ft = 100 ft, then later by computer correlation, based on the observation that a Dipping feature occurs at a slightly different depth on one side of the hole than on the other. In sections with moderate Dips and well-defined bedding, almost any vintage and type of log and either computer Auto-Dip (aka Auto-Pick) routines or hand-picking features will yield reasonable results. However, in steep Dips, structurally- and stratigraphically-complex sections, or poorly defined bedding, it may be necessary for an experienced analyst to re-interpret the logs, working closely with the seismic interpreter and the geologist. If faults or unconformities are expected based on the seismic data, these features can be validated and more precisely located by searching for them in Dipmeter and/or Image logs, where they may not have been identified during the original interpretation.

Many wells from the late 1970's through the mid 1990's have four-arm Dipmeters (or early Image logs run in Dipmeter mode) for which the only available interpretation is from a computer-processed Auto-Dip routine. The parameters for the Auto-Dip program were usually set by default for low to moderate Dips (documentation for the parameters may be unavailable), and if the actual Dips are high, the available results from the computer processing are very likely to be wrong. In many wells, the only record of the log available is a 5-in = 100 ft check plot. We have been successful in digitizing these 5-inch plots and re-interpreting them for the true higher-angle Dips in structurally-complex areas. Often, these are the areas that require the most support from well data for an accurate seismic interpretation. Attempts to reconcile the interpretation to faulty Auto-Dip results could lead to an incorrect structural picture, or to rejection of the well information because it does not fit the seismic data. Instead, we propose that the Dip data be reinterpreted in light of a new structural interpretation.