Salvaging Dipmeters Using an Oil Field "Dinosaur"

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Although state-of-the-art methods such as 3-D seismic and formation imaging tools are widely used, the advantages of the old standard dipmeter should not be forgotten.

Accurate, directly measured dip data are critical. A good dipmeter provides a direct measurement of dip at the wellbore. Seismic dip and even apparent dips from well to well are not necessarily representative of the true geologic picture. Seismic dip is remotely sensed and is subject to velocity errors, and dips between wells can be obscured by unseen faulting. In view of the huge cost of obtaining and working 3-D seismic, it is prudent to integrate as many reliable dipmeter data into these projects as possible.

Dipmeters are unique among the other well-logging tools in the amount of interpretation and processing which is done between the time the data are measured at the wellbore and the time a scientist receives his tadpole plot. In a certain sense, a dipmeter is like a seismic line, because the appearance of the tadpole plot is dependent upon the quality of the raw data and how they are processed, in other words, how it is correlated and computed.

It is important to remember that a tadpole plot is merely one particular INTERPRETATION of the dipmeter data. The true raw data from a dipmeter run are the correlation curves recorded by each of the tool's pads.

When dipmeter technology was in its infancy, a 60"=100' (1:20 scale) playback was the standard product from a dipmeter logging run. It was created at the time of logging, to be hand-correlated later, away from the wellsite. With the advent of computer correlation technology, the 1:20 scale playback came to be viewed as extraneous, and now this oil field "dinosaur" is nearly extinct.

What most of today's explorationists do not realize is that, far from being extraneous, the 1:20 scale playback can be of significant value for many reasons. First, it is the most reliable "hard copy" of the raw dipmeter data. Most dipmeter data are stored on digital tapes which degrade over time or all too often are discarded, lost, or mislabeled. Second, the 1:20 scale presentation has at least five to ten times more data density than the standard 5"=100' or (1:200) scale presentation (which is sometimes displayed on a field log or tadpole plot). Increased data density, i.e., more data points per inch, means increased formation detail, and this detail translates to a wealth of sedimentological information.

At the 1:20 scale one can often see or at least infer:

-- Bedding features such as crossbed sets, and determine their thickness
-- Disrupted bedding
-- Formation textures such as laminations
-- Fractures which cut across bedding
-- Bed boundary types

The 1:20 scale playback could aptly be renamed the "poor man's formation imaging tool."

The 1:20 scale playback can be used by a geologist for archiving and stratigraphy purposes, but its greatest value is in assessment of correlation quality. The correlations made between the different resistivity curves are the heart of the dip computation. A visual inspection of the 1:20 scale playback is not necessarily time-consuming, and can provide critical information as to the reliability of any tadpole plot that might be generated from the data.

In this poster session, many examples of Gulf Coast 1:20 scale data will be displayed, illustrating both good-quality data and data which has been adversely affected by tool and hole problems. Additionally, a comparitor, used for measuring displacements in optical correlation, will be available, providing an opportunity to try optical correlation and to see how subtle variations in pad-to-pad correlations can affect final calculated dip results (Figs. 1 and 2).

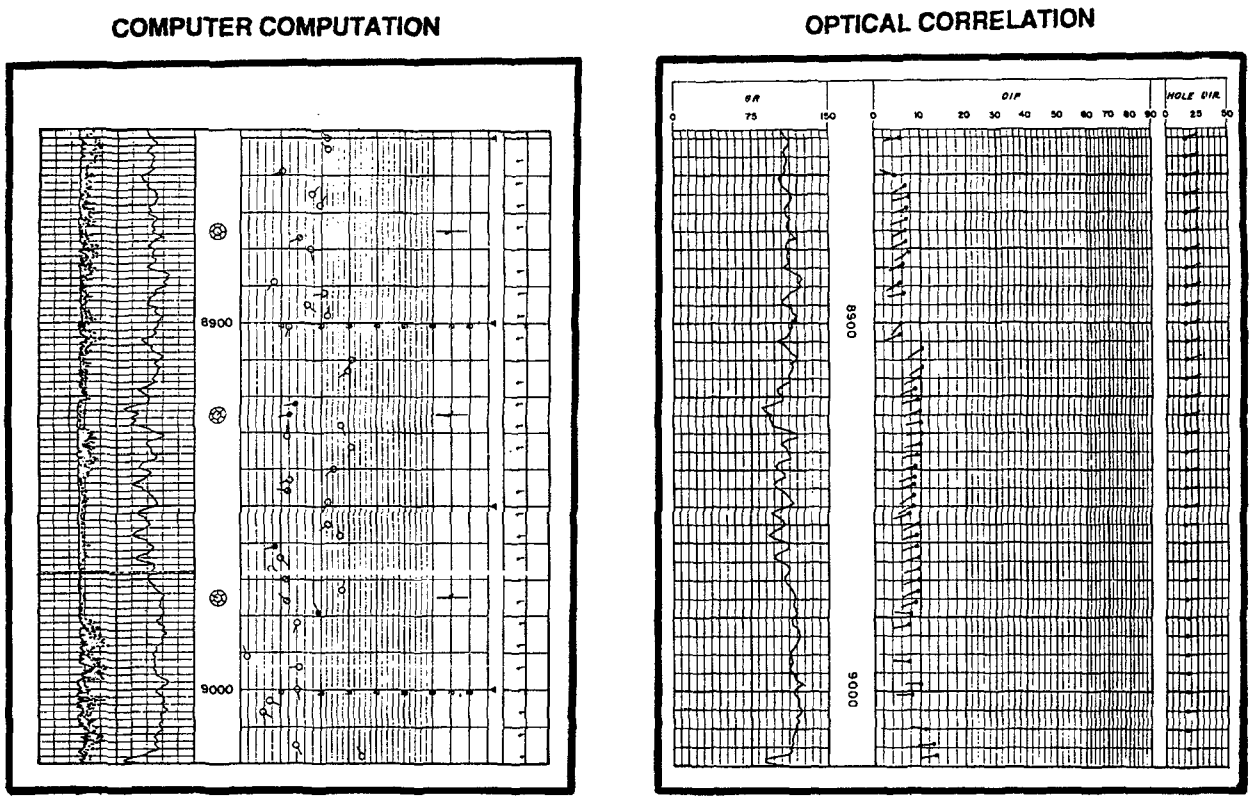

Figure 1. Hole rugosity and oil based mud produced poor quality correlation curves, which resulted in a poor quality computer generated tadpole plot. By understanding the raw data, a usable tadpole plot was salvaged through optical correlation.

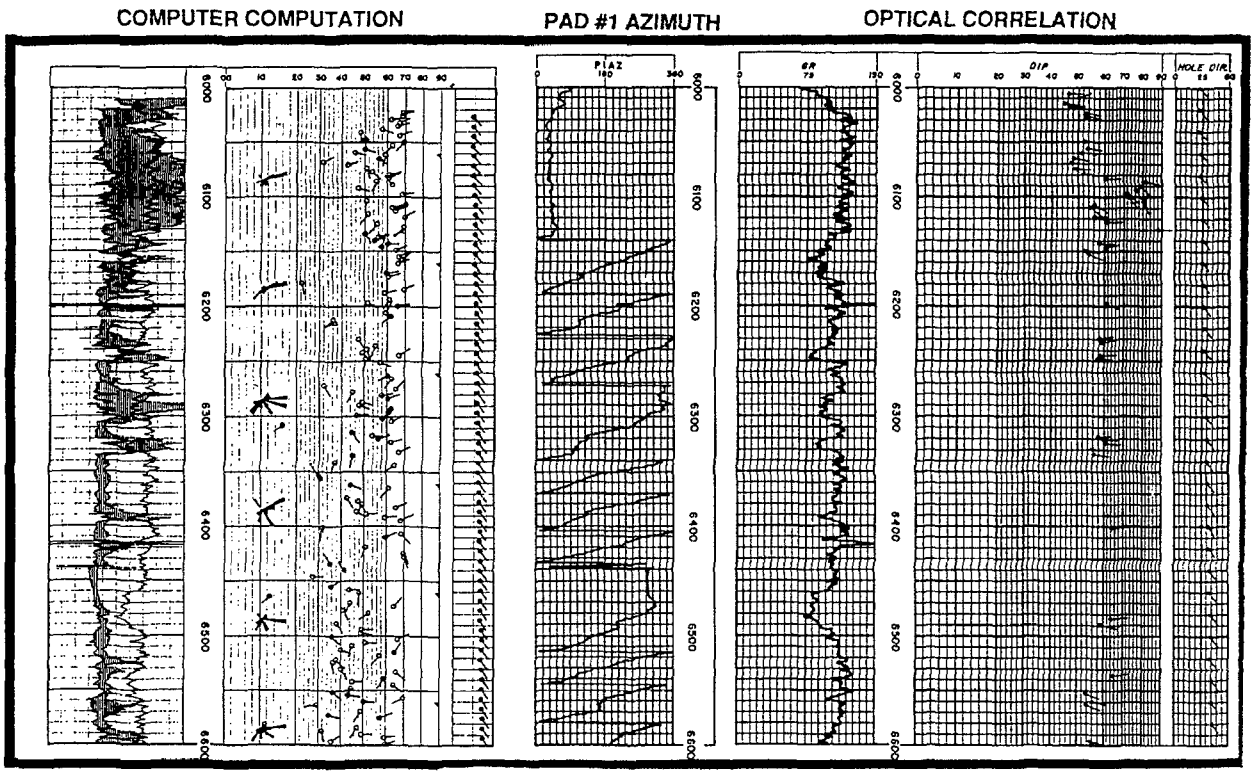

Figure 2. Due to rapid tool spin, hole rugosity, and high angle bedding, the computer generated log contained many scattered, invalid tadpoles. The trained optical correlator will use only the reliable correlations and continuously compensate for these adverse conditions to produce a more accurate tadpole plot.