THREE DIMENSIONAL VISUALIZATION OF BOREHOLE IMAGES

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ABSTRACT

The challenge in the interpretation of petrophysical data is to produce a picture which is sufficiently comprehensive to accurately describe complex geology; yet in a format sufficiently simple to be easily assimilated by the human eye-brain network. Most geophysical problems are three dimensional in nature, yet until recently wireline solutions to these problems have been limited to two dimensions. Current imaging tools such as the Circumferential Acoustic Scanning Tool (CAST) describe the formation in much greater detail than conventional wireline tools. It is now possible to produce realistic 3-D color images and interact. With these images in real-time, just as you might manipulate a core sample in your hand. Vast quantities of numerical data gathered by imaging devices can be transformed into easily understood images.

Imaging tools represent a new generation of logging tools which can solve problems without the benefit of traditional assumptions. Historically, wireline logging techniques have been premised on two fundamental assumptions: firstly the formation is layered, and secondly the layering is roughly normal to the borehole axis. Correlatable features on seismic sections and wiggles on wireline logs represent the layering phenomena. As a result of the borehole wall mapping approach, these devices provide a much more detailed description of the borehole and geological features. These descriptions are not necessarily bound by a dependence on the layered nature of sedimentary rocks.

3-D visualization derived by combining the Time-Of-Flight (TOF) and Amplitude (AMP) from the CAST is highlighted in this paper. A comprehensive set of examples demonstrates various enhancement techniques which the user may apply interactively while viewing the image on a workstation. The accurate description of the borehole wall allows the user to solve petrophysical problems beyond the capabilities of conventional tools.

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