AN EVALUATION OF THE SIGNIFICANCE OF THE ACCURACY OF A STARTING MODEL IN COMPUTER-AIDED VERTICAL ELECTRICAL SOUNDING (YES) INTERPRETATION

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ABSTRACT

The aim of this research was to evaluate the degrees of accuracy of the starting model parameters of the conventional partial curve matching, the asymptote/inflection points and the type curve controlled guess techniques of Vertical Electrical Sounding (VES) preliminary interpretation. The study involved both model studies and field data tests.

Thirty multilayered (3-5 layers) model Schlumberger VES curves were generated using a forward modeling software (BABRES 1.0) while field Schlumberger VES data were acquired from ten borehole sites located within a basement complex terrain. The theoretically generated and field acquired VES data were interpreted using the three aforementioned interpretation techniques. The interpretation parameters (layer resistivities and thicknesses) from each of the three techniques were used as starting models in the RESIST version 1.0 computer-aided final interpretation. The final interpretation results (resistivities and depths) were compared with the theoretical model parameters while only the depth parameters obtained from the parametric VES curves were compared with the borehole log derived depths. Percentage deviations of the starting model parameters from the actual (model and borehole) layer parameters were analyzed using histograms and frequency curves for er^{r}or margins inherent in the interpretation techniques. Composite plots of the model depths versus depth parameters obtained from each of the interpretation techniques / borehole logs were used to also evaluate deviations in depths.

The results showed that error margins in each of the conventional partial curve matching, asymptotes/inflection points and type curve controlled guess respectively were between ±10%; -30 and +40% and -30 and + 10% in resistivity estimates; ±10%; -10 and +130% and -40 and +100% in depth estimates. The error margins in depth in the field data trial were between -35 and +5% for partial curve matching , -90 and +20% for asymptotes /inflection points and -85 and -10% for type curve controlled guess technique.

It was concluded that the partial curve matching interpretation technique gave the most consistently low percentage deviation error margins amongst the three VES preliminary interpretation techniques. There was consistent increase in depth prediction error, with depth, in all the interpretation techniques.