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Applying the Artificial Neural Network to Laboratory and Well Logging Data for TOC Prediction and Model Verification Using TOC Application (GeoWin)

Abstract

The main goal of the study was to predict total organic carbon, TOC content in shale formations. In this work authors focused on: firstly, TOC prediction and secondly, characterisation the shale gas formations. In both cases Artificial Neural Network, ANN were used on standard lab data e.g. velocity, density, resistivity, porosity, permeability, radioactivity and on well logs data e.g. resistivity, gamma ray, density, velocity, neutron. Two ANN algorithms, MLP (Multilayer Perceptron) and RBG (Radial Basis Function) were used for TOC prediction. We tested MLP and RBG firstly for TOC prediction but secondly for methods comparison. As a results of applying both of them, activation functions were chosen for TOC prediction. For analysed shale formation the best results were obtained for MLP, but both neural networks gives good prediction results. This approach offers possibility to define zones of interests based on the lab and well logs even if data are incomplete. We verified obtained from ANN model using new GeoWin Application (TOC Application). The new TOC Application allows users to calculate TOC based on Passey, Schmoker and Carbolog methods. Using ANN gives the answer about total organic carbon contents in unconventional formation even if we have no possibility to measure it directly.

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