Abstract

Porosity estimation of a reservoir bears considerable uncertainty, often making hydrocarbon exploration very expensive. Even with substantial petrophysical and geophysical data available, porosity prediction is a delicate and difficult task that needs to be carefully designed to produce successful drilling. However, exploration risk can be reduced by the use of Machine Learning algorithms. This study presents a method for porosity prediction using Artificial Neural Networks, based on available well and seismic data from the Khurmala field in Kurdistan (Iraq). Using 3D seismic data (Post stack time migration) and well log (sonic, density, and porosity) records, this method tries to predict porosity values, especially for undrilled wells in the Avanah formation. A two-stage process was employed to analyze the 3D seismic data, first inverting it to produce an acoustic impedance model, and then using the model as input for an artificial neural network. The porosity predictions obtained with the neural network modeling for the blind well, which does not participate in the neural network training the value of correlation coefficient was (0.9) comparing to the actual porosity, where the value of correlation coefficient for porosity from the upscaled porosity log model was (0.75). This highlights the value of this method in the determination of the porosity and the use of artificial intelligence for exploration risk reduction.

Keywords: neural network, porosity, seismic inversion, machine learning