Combination of Nuclear Magnetic Resonance and Density Log for Evaluation of a Gas Reservoir in South of Iran

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Abstract
Conventional log based reservoir characterization of a gas reservoir in the Kangan and Dalan formations have recently been improved by the application of the nuclear magnetic resonance (NMR) log.
The problem of NMR measurements in gas reservoirs is that in Gas-bearing zones, total NMR porosities read much less than density-derived porosities.
Porosity derived from NMR alone suffers from the low hydrogen index of the gas and the long T1 polarization time of the gas when the data is acquired with insufficient wait time.
To provide a robust estimate of porosity, a method called Density-Magnetic Resonance (DMR) that combines density porosity and total NMR porosity was successfully applied to the 4 wells logged with NMR.
The DMR technique was able to produce a very good porosity estimation comparable to that measured on conventional cores. Improved porosity calculation lead to better core independent permeability estimation on the wells logged with NMR. Permeability derived from NMR was involved to an electrofacies modeling as an associated log to predict facies base permeability on 20 wells without NMR log.
To test the permeability prediction, estimated permeability was compared with core derived permeability on 5 cored wells to see how well, estimated permeability fitted the actual core permeability.

Key words
NMR, DMR, Porosity, Density, Signal amplitude, T2 distribution , T1 polarization