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Department of Chemical and Petroleum Engineering

## Predicting Permeability of Carbonate Reservoirs using NMR, Core Analysis, and Well Logging Data: a Case Study

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Fluid flow through porous media is a function of permeability for petroleum and gas reservoirs. This study investigated the distribution of permeability in the Mishrif formation in the Nasiriya oilfield, south of Iraq. The value of effective porosity was obtained from well log data and used to predict permeability using three methods: applied empirical correlations using interactive Petrophysics (IP) software (Version 3.5), core data measurements, and nuclear magnetic resonance (NMR). Nasiriya oil field is one of the large oil fields in southern Iraq, and the Mishrif formation, the area of the case study, consists of the following units from top to bottom: a cap rocks unit; the Upper Mishrif (unit 1); a shale unit; the first reservoir unit (2), a Barrier rocks unit; and the second reservoir unit (3). A 3D model was built by using Petrel software (2009), and the LAS files used to digitize the contour map of the reservoir layers were obtained from Didger3 software. The total number of 3D grids in the model was 5,394,480, with 336 grids in the I direction, 169 in the J direction and 95 in the k direction. Scaling up was done by using the geometric method for permeability, and sequential Gaussian simulation was used in the distribution of petrophysical properties. The results of distribution showed the importance of each zone and the best permeability value was recorded in the second reservoir layer, which varied from 1 md to 100 md.

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