# University of Baghdad

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<tr>
<th>Department</th>
<th>Petroleum Engineering</th>
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<tr>
<td>Thesis Title</td>
<td>Geostatistical Study of Mishrif Reservoir in Oil Field</td>
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## Abstract
A 3D Geostatistical modeling for Mishrif formation in Noor field has been carried out by using well logs of eight wells and the conventional core analysis data of two wells to achieve this study.

The available log graphs were digitized by Didger software. The environmental corrections and the interpretations were achieved by Interactive Petrophysics Program V3.5.

Pickett plot method was used to determine Archie’s parameter, the tortuosity factor (a) ranging between 1.2 to 2.5, the saturation exponent (n) between 1.89 to 1.97, and the cementation exponent (m) between 1.96 to 2.11. Archie’s parameter results indicates that the main pore system of the Mishrif formation is primary pore system, consist of four types of pore distributed between Macro, Meso, Micro, and Nano ports according to the pore throat radius analysis.

Neutron-Density cross plot and M-N cross plot indicates that the main lithology of the Mishrif formation is Limestone with a few of Dolomite exist especially around MC units, most of the data centered on calcite area but the extension toward secondary porosity area was due to borehole enlargement which affected on density log.

The permeability of Mishrif formation have been estimated in un cored wells/ units by F2I method after giving a good correlation between core and F2I derived permeability comparing with the conventional method.

The rocks type of Mishrif formation has been identified by cluster analysis technique, four different of limestone rocks were identified. Rock type-1, represent the bad one where the effective porosity less than (7%), water saturation greater than (60%) and permeability very low. Rock type-2, the effective porosity reaches to (23%) and the water saturation greater than (60%) with low permeability. Rock
type-3, represent a good type of limestone rock where the effective porosity ranging between (7-30) % and water saturation between (15-50) % with good permeability reach to (275.5) md. Rock type-4, represent a very good rock where the effective porosity between (13-30) % and water saturation less than (15%) with high permeability.

The surface contour maps of Mishrif formation units were constructed and transformed into eight zones (MA, MB11, MB12, MB21, MB22, MC1, MC2, MC3) compatible with formation units and each zone was subdivided into layers by using PETREL software.

Frequency distribution histogram and its summary statistics were made for characterizing the distribution behaves of the petrophysical properties in each zone of Mishrif formation to investigate the symmetry and the spread of the data. The results indicate that most of the formation units have a symmetrical distribution of porosity while the distribution of water saturation was negatively skewed and the distribution of permeability was positively skewed.

Cox-Box transformation technique was applied for improving the distributions behave of the petrophysical properties of Mishrif formation in Noor field toward the normal distribution.

Exponential model was applied to represent the variogram model of the rock type, porosity, and permeability, while spherical model was the best fitted for modeling the experimental variogram of water saturation in Mishrif formation.

Rock type model that has been built for the eight zones showed that the crest of Mishrif formation has good properties in MA, MB11, and MB12 units especially the area that falls between wells No-2 and No-5.

The distribution of petrophysical properties in space has been done in two ways, one is based on the distribution of rocks type where the spatial entities was filled with porosity, permeability, and water saturation values following the corresponding spatial behavior (variogram model) in each rock type, while the second way has been built by using the Sequential Gaussian Simulation technique to interpolate data without the consideration of the rock type parameters as a possible guide.