



**Sharif University of Technology**  
**Department of Chemical & Petroleum Engineering**

**Master of Science Dissertation**  
**Hydrocarbon Reservoir Engineering**

**Title:**

**Reservoir Characterization through Differential  
Evolutionary Optimization Method using  
Production/Injection History**

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## **Abstract:**

Reservoir characterization methods using static and dynamic data by the help of computer programming are one of the modern techniques for parameter estimation of oil and gas reservoirs. The basis of parameter estimation is the error minimization between actual dynamic data and simulated ones. The dynamic data is in the form of field measurements from well testing, production history, 4D seismic information and other data such as correlations between permeability and porosity. Optimization parameters include the distributions of porosity and permeability in the reservoirs. Because of the complexity of the problem and also the large number of independent parameters, reaching the global minimum using classic optimization algorithms is unlikely. Therefore, optimization methods based on evolutionary techniques such as genetic and differential evolution algorithms are appropriate choices. Because these reservoir characterization methods need many number of forward simulations, particularly in real cases, it is a time consuming process therefore convergence rate is an important factor in these problems and a performance index in the evaluation of optimization algorithm. This project deals with the problem of estimating the distributions of permeability and porosity in an artificial petroleum reservoir using a modified differential evolution optimization method. The outputs of the problem are the distribution of absolute permeability and porosity, on the other hand the reservoir characterization. The main issues of this method are simple structure, robustness and rapidity in convergence.

## **Key words:**

Reservoir Characterization, Dynamic Data, Production/Injection History, Global Minimum, Distribution of Permeability and Porosity, Differential Evolution Algorithm