Study On Oil Reservoir Productivity Performance Via Combination of Taguchi and BEM Analyses

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Abstract

The application of Taguchi Robust Design Technique (TRDT) coupled with the Boundary Element Method (BEM) in analyzing the productivity performance of an oil reservoir is presented in this paper. Several reservoir rock and reservoir fluid properties; i.e. permeability, thickness, porosity and viscosity, were chosen in this study. The BEM allows the overall simulation of reservoir performance to be made; whereas the use of TRDT allows us to rank the most influencing factor (property) that affects the productivity performance of the reservoir. Numerical values obtained from the BEM analysis will be used as input data for the TRDT statistical analysis. Results indicate that oil viscosity is the most important factor that affects the productivity performance of the oil reservoir followed by the thickness of the pay zone, the rock permeability and the rock porosity. Results of this study can be used by reservoir engineer in making the right choice of Enhanced Oil Recovery techniques that is the most suitable for the reservoir.

Keywords: Taguchi method, Boundary Element Method, reservoir rock properties, reservoir fluid property, oil reservoir productivity

1. Introduction

Depleting reserves and the ever-increasing demand for oil necessitate the need for increasing drilling activities. The demand for oil keeps increasing despite uncertainties in the world economy. This is not surprising since hydrocarbon fuels remain relatively cheap and practical as compared with other fuel sources such as electricity and nuclear. Therefore, the hunt for new oil fields prompts drilling of new wells. Drilling operation starts only when the prospect for hydrocarbon is commercially justified. This is due to the expensive drilling cost that may hit as high as USD 10 million per well.

Besides drilling new wells, most oil companies develop the existing wells that are no longer capable of producing profitable amounts of oil through natural reservoir drives by