EUR Prediction for Unconventional Reservoirs: State of the Art and Field Case

Omar Mahmoud, Omar Mahmoud, Mazher Ibrahim, Chester Pieprzica, Shane Larsen

Faculty Member at the Department of Petroleum Engineering

Abstract
Forecasting future production and estimating ultimate recovery (EUR) in supertight reservoirs and shale plays has long been problematic. Developing a reliable and more accurate production forecast have always been a main goal of any petroleum operation. Effectively assessing the reservoir volume and well producing life is instrumental for creation of development scenarios and strategies to maximize the value to the company. Different models have been introduced and used for reserves estimation and production forecast of unconventional reservoirs. This work is intended to review and compare the methods and models currently used in the industry.

Reserves estimation is a process that is constantly updated during the life of a reservoir. Its accuracy depends on the amount of data available and the method of forecast. Analytical models or rate transient analysis (RTA) methods are widely used for history matching and production forecast of unconventional reservoirs. Numerical simulation is also used for estimating ultimate recovery. Different relations have been introduced to model the rate/time behavior in unconventional plays as an alternative to the Arps’ decline curve analysis to address shortcomings when matching production history. Modified hyperbolic decline, power-law exponential decline (PLED), stretched-exponential decline (SEPD), Duong’s method, and logistic-growth model (LGM) are developed for forecasting the production in shale reservoirs, but all are based on empirical observations of a particular scenario.

In this study, different methods of history matching the production of hydraulically fractured unconventional reservoirs were investigated by forecasting future production and predicting EUR's to quantify the differences between them. The traditional Arps’ decline for low permeability reservoirs over-forecasts reserves. PLED, SEPD, LGM, and Duong’s method were intended to represent the character of rate/time production data for the standard well completion in a multiple-fractured horizontal well in a shale play. These methods provide different forecasts as they have different equation forms. Unfortunately, all of them are not satisfactorily sufficient to forecast production for all unconventional reservoirs. The RTA analytical models required certain modifications of the reservoir and fracture parameters to provide optimistic EUR when compared to the numerical simulation.

Different methods for forecasting unconventional well data have been reviewed and compared in this work based on the production forecast and EUR prediction. Field case production data has been used to reveal the accuracy of the models, the similarity of reserves estimation, and the relationship to the reservoir theory.

*SPE Trinidad and Tobago Section Energy Resources Conference, Port of Spain, Trinidad and Tobago - 2018, June*