Summary

For shale reservoirs, a strong correlation is observed between Estimated Ultimate Recovery (EUR) and Productive-SRV (P-SRV), the part of the Stimulated Rock Volume (SRV) that contains proppant filled fractures. This case study assesses the correlation between microseismic derived P-SRV and EUR estimates obtained from decline curve analysis. We evaluate EUR estimates using both Arps and Duong’s methods to study the correlation between EUR and P-SRV.

Introduction

Over the last decade, microseismic monitoring has become an accepted industry practice and, some might say, a standard when fracking unconventional reservoirs. Contrary to the bi-wing type textbook example, fractures that are created in shale plays during hydraulic stimulation are extremely complex and accurate imaging is necessary to understand the formation and enable completions optimization to maximize asset value and recoverable reserves. The success or failure of a fracturing treatment can be judged by the amount of hydrocarbons produced from the treated well. However it can take several months of production to reliably estimate the EUR potential of a well, resulting in significant delays in evaluating the effectiveness of the treatment. A tool is needed immediately after stimulation to assess the effectiveness of the treatment. Advanced analysis of microseismic data provides such a tool to reliably estimate the long term production potential.

Microseismic monitoring is often used as a completions diagnostic tool to map hydraulic fractures to evaluate the success of a completions program. Microseismic events located within the reservoir can help assess completions in a number of ways. The distribution of microseismic events can help in quantifying fracture half-lengths and height growth, evaluating stage spacing for horizontal wells, and well spacing on multilateral pads. Microseismic data can be used to model a Discrete Fracture Network (DFN) that serves as an important input for quantifying the SRV and estimate proppant distribution. A magnitude calibrated discrete fracture network (DFN) can be modeled taking into account the seismic energy of the events, rock properties, injected fluid volume and efficiency (Neuhaus et. al., 2014). The model allows the estimate of total rock volume affected by the treatment. This can be taken a step further by a novel proppant transport modeling technique to selectively fill fractures within the DFN (McKenna et al., 2014), to help identify the part of the SRV that likely contains proppant and should therefore be productive. This type of analysis using microseismic data allows operators to understand where the proppant went and what proportion of the reservoir is actually productive.

Despite the obvious coincidence of hydraulic fracture locations and mapped microseismicity, few positive correlations have been made between microseismic data and production to date. Zeynal et al. (2014) showed a 90% correlation between production and stimulated reservoir volume (SRV) estimates derived from microseismic data recorded in the Horn River Basin, in Northeast British Columbia, Canada. Snelling Pet al. (2014) explored bivariate correlations between production and microseismic parameters in the Horn River Basin. In this paper we explore the impact of EUR estimation, using Arps and Duong’s methods, on the correlation between production and proppant filled Productive SRV.