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Case Studies in Quantitative Flowback Analysis (Based on SPE 175983)

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Summary

Recently, several authors have explored new methods for quantitatively analyzing multi-phase flowback data from multi-fractured horizontal wells (MFHW) to extract both fracture and reservoir parameters. These techniques provide much of the same information as long-term rate-transient analysis (RTA), although in a much shorter period of time. Flowback analysis is complicated by a rapidly changing fracture network and wellbore environment, multi-phase flow in the fractures (and possibly the reservoir), completion heterogeneity, as well as other effects which are often not present, or are ignored, when analyzing long-term (online) production data.

For quantitative flowback analysis, the current authors have previously presented data-driven, pseudo-analytical methods for estimating key fracture properties (i.e. conductivity and half-length) from high-frequency, short-duration production test data. Models have been developed for both oil and gas wells representing a variety of reservoir and operating conditions. In this work, the models and procedures are extended to apply to more challenging reservoir/completion scenarios and are used in the analysis of several case studies from Western Canada. Each of the case studies demonstrate either the potential value add of the developed techniques, or a unique extension to the basic analysis methods.

The case studies analyzed herein focus on light tight oil plays and consider layered reservoirs, multi-well flowback, and oil fracs in oil reservoirs. Further, the potential capital savings associated with conducting quantitative flowback analysis of early-time production test data is demonstrated. Each case study therefore presents a unique set of challenges that are often encountered in the real world. Numerical simulations are also used to validate the sequence of flow-regimes depicted in the analytical models.

The methods presented in this paper will serve to partially satisfy the demands of industry to develop new methods for characterizing hydraulic fractures and forecasting production, particularly early in the well life. Through the use of several unique case studies, the wide-spread applicability and versatility of the techniques are demonstrated.

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