A study of pressure transients in naturally fractured reservoirs

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Abstract

In naturally fractured reservoirs, pressure transient experiments frequently show non-uniform responses. In order to appropriately characterise reservoir parameters, many methodologies can be utilised to examine pressure behaviour in dual porosity reservoirs. Traditional semi-log analysis, type curve matching (using commercial software), and Tiab's Direct Synthesis (TDS) techniques were used to analyse pressure transient testing in naturally fractured reservoirs in this paper. In the event of a naturally fractured formation with a vertical hydraulic fracture, the TDS approach was also used. Under pseudo steady state matrix flow, these techniques was stu was s
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to the transition period between the early time linear flow regime and the infinite acting radial flow regime. The characteristics of the linear, radial, and pseudo steady state flow periods are the same as illustrated earlier in the case of uniform flux fracture.

Conclusions

The use of pressure derivative plots improved the analysis of well test data. Different flow regimes can be identified on the derivative log-log plots. Type curve matching can give good results in case all of the flow regimes are identified. In this study, Tiab direct synthesis technique was shown to be accurate and simple. It gave direct estimates of reservoir parameters and fracture characteristics by using a log-log plot of pressure and pressure derivative data without type curve matching. In case of high wellbore storage, the conventional semi-log analysis gives inaccurate results and cannot estimate all naturally fractured reservoir parameters. When not all the flow regimes are identified, type curve matching gives non-unique solution. However, the direct synthesis technique gives accurate results of the naturally fractured reservoir parameters and fracture properties. The direct synthesis method, showed accurate results compared to commercial software matching. It can be used to calculate the reservoir and fracture properties in case of a well crossed by a uniform flux or infinite conductivity fracture. In case of naturally fractured reservoirs with a vertical fracture, if the transition period occurs during the linear flow, two parallel straight lines of slope 0.5 appear on the pressure derivative plot. This pressure derivative behaviour can be used in calculating different reservoir parameters.