



## Mini-Frac Analysis in Oilsands and Their Associated Cap Rocks using PTA Based Techniques

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### Abstract

The Alberta Energy Regulator (AER) requires mini-frac tests to be performed on thermal or polymer injection projects as part of the licensing process. Mini-fracture closure stress in the cap rocks is the key item used in determining the maximum operating injection (MOP) pressure for injection wells. The MOP has a significant impact on the economics of the project. No consistent interpretation process exists within the industry for determining closure pressure. This paper will establish a physics based interpretation method that covers all injection/fall-off mini-frac tests.

In the field, mini-frac tests are typically performed with multiple injection/fall-off cycles on the same zone. 5 to 7 cycles is the norm for one zone. Multiple zones are tested in a well. Each cycle is analyzed for closure events and hopefully a consistent stress is found for each zone. Industry currently faces a conundrum as there is no agreement among analysts as to how to interpret these tests. As a result, reports submitted to the AER follow different methodologies. This may partially explain the wide range of closure stresses reported in various basins.

This paper will show using actual field mini-frac data where traditional interpretation techniques can lead to ambiguities/incorrect interpretations. These issues can be overcome by using a pressure transient analysis (PTA) based interpretation approach. PTA has a long history of analyzing injection/fall-off and production/build-up tests where the rock fabric does not change during the test. The PTA interpretation methodology has remained remarkably consistent over the past 25 years. It can be summarized as follows: first identify flow regimes and secondly calculate formation properties. This paper will show that PTA can now also handle dynamic fracturing (i.e. mini-fracturing) and all of its associated special cases; which include pressure dependent leak-off, height recession/transverse storage and tip extension.

Mini-frac analysis is now just a sub-set of the larger PTA methodology. It has the added advantage in that a rules based procedure can be established for the entire interpretation workflow.