

Utah Division of Oil, Gas and Mining Guidance Document



June 2017

Prepared By:

Ammon McDonald
Environmental Scientist

Step-Rate Test Guidance Document (re: Utah Oil & Gas Conservation General Rules R649-5-2.9 Requirements for Class II Injection Wells)

This document is intended to aide in conducting a Step-Rate Test. Utah Administrative Code R649-5-2.9 pertaining to requirements for Underground Injection Control of Recovery Operations and Class II Injection wells should be used in conjunction with this guidance.

FOR FURTHER INFORMATION CONTACT:

Division of Oil, Gas and Mining
1594 West North Temple, Suite 1210
P.O. Box 145801
Salt Lake City, Utah 84114-5801
Telephone: (801) 538-5340

Our Mission

The Utah Oil and Gas Program within the Division of Oil, Gas and Mining:

- Promote the exploration, development and conservation of oil and gas resources*
- Foster a fair economic return to the general public for those resources*
- Maintain sound, regulatory oversight to ensure environmentally acceptable activities*

Introduction

Step-rate injection tests are performed on wells to determine maximum injection pressure at which a well can operate below formation fracturing (parting) pressure. Tests on wells which have been previously fractured will determine pressure at which fractures will re-open or be extended. It is important to stay below the parting pressure during normal operation of injection wells to prevent out of zone fluid and energy loss.

Testing Procedures

Step-rate tests are run by injecting fluid at a series of increasing rates or pressures with each step being of equal time length. Injection pressures, rates, and times are recorded for each step. Plans should be made to assure an adequate water supply is available for the entire test.

Steps should be long enough to allow for adequate stabilization of the reservoir. A minimum of 15 minutes is required, and 30 to 60 minutes is recommended if injection zone has low permeability.

A minimum of 7 steps is recommended to define parting pressure; 4 steps below parting pressure and 3 steps above parting pressure.

Either rate or pressure must be held constant during each step.

Steps must be of equal time length.

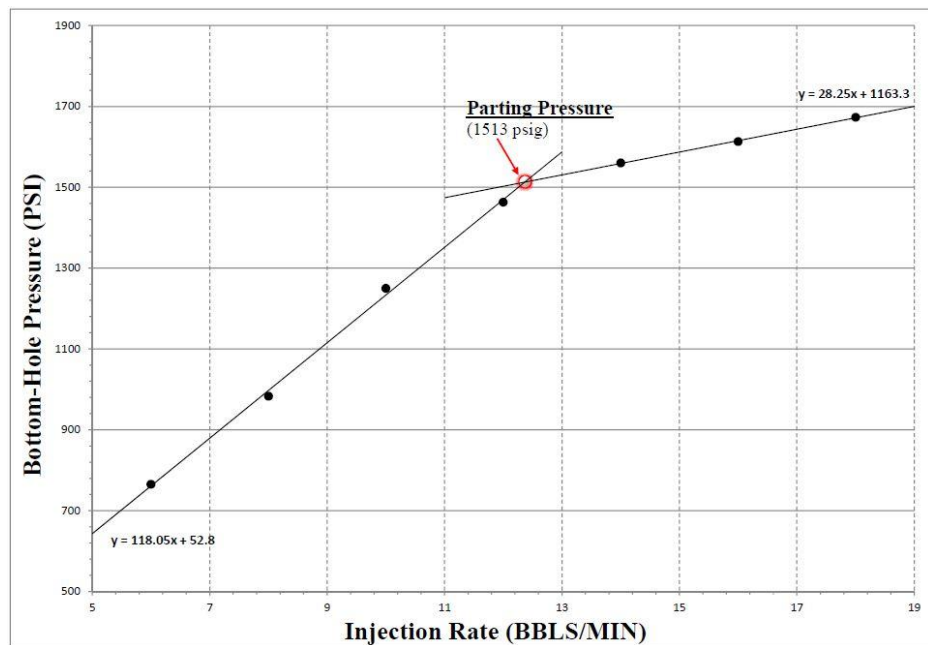


Figure 1

Plot test results. Pressure versus rate should be plotted using bottom hole or surface pressure data (pressure type shall be noted on the plot). A break in slope should indicate parting pressure of the formation, as shown in Figure 1.

Pressure fall-off tests can be run to verify if a break in a pressure-rate plot is actually caused by fracturing. Short term fall-off tests can be run above and below the apparent parting pressure and analyzed for fracture length. If the calculated fracture length from the high pressure test is much longer, the break probably represents fracturing.