

Reservoir Geomechanics

Homework No. 5 – Analyzing Natural Fractures

Due 8:00 UTC March 23rd, 2020

If you want to see the current time in UTC, please google: current time in UTC

In this homework assignment, you will analyze natural fracture data interpreted from an FMI image log in a vertical well from the Barnett shale. This image log has been processed using the software GMI Imager, in which fractures were picked as abrupt contrasts in the electrical resistivity image of the borehole wall. The interpreted fracture data from the image log can be downloaded by clicking the right tab on the top of this page. An applet from <http://app.visiblegeology.com/stereonetApp.html> may be helpful.

I. Answer the multiple choice questions on the page below

Which of the following depth intervals contains the highest number of fractures?

Less than 5400 feet

5400 feet to 5600 feet

5600 feet to 5800 feet

5800 feet to 6000 feet

Greater than 6000 feet

Which of the following strike intervals contains the highest number of fractures?

0° to 90°

90° to 180°

180° to 270°

270° to 360°

Which of the following dip intervals contains the highest number of fractures?

0° to 15°

15° to 30°

30° to 45°

45° to 60°

60° to 75°

75° to 90°

Which of the following dip direction intervals contains the highest number of fractures?

0° to 90°

90° to 180°

180° to 270°

270° to 360°

Which of the following aperture intervals contains the highest number of fractures?

0 mm to 4 mm
4 mm to 8 mm
Greater than 8 mm

Which of the following aperture intervals contains the highest number of gently dipping fractures of which the dip is less than 45° ?

0 mm to 4 mm
4 mm to 8 mm
Greater than 8 mm

Which of the following aperture intervals contains the highest number of nearly north-south striking fractures of which the strike is either between 0° and 15° , or between 75° and 105° , or between 345° and 360° ?

0 mm to 4 mm
4 mm to 8 mm
Greater than 8 mm

From the discussion on mini-frac or extended leak-off tests, choose the correct statement,

Fracture Breakdown Pressure (FBP) is the best estimate of the least principal stress (S_3) magnitude, even if Instantaneous Shut In Pressure (ISIP) measurement is available.

Correctly interpreted Instantaneous Shut In Pressure (ISIP) is a reasonable estimate of the least principal stress (S_3) magnitude.

Why is the leak-off pressure a reasonable approximation of the magnitude of the least principal stress?

The slight decrease in the rate of wellbore pressurization is caused by a decrease in the system volume as a result of the onset of hydraulic fracturing.

The pressure-volume curve has reached its summit where the pressure is high enough to propagate a hydraulic fracture.

The noticeable change in the rate of wellbore pressurization is caused by propagation of a hydraulic fracture, which increases the system volume.