Laboratory study of hydraulic refracturing possibility

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The results of laboratory experiments will be considered, that are carried out in a laboratory setup that differs from the standard ones in the shape and size of the test samples. The setup consists from two disks and wide ring between them, which form a high-pressure chamber, and it is capable to produce true 3D stresses in the samples. Laboratory experiments are performed on saturated artificial porous samples created according to similarity criteria using gypsum with Portland cement added as a model material. The samples are created directly in the high-pressure chamber and have the forms of disks with diameters of 430 mm and heights of 70 mm. This sample is saturated with water gypsum solution and loaded with vertical and two horizontal stresses using special chambers. In the upper, lower and lateral parts of the installation there are pressure sensors, ultrasonic transducers and generators. The first fracture was created by viscous fluid (mineral oil) injection through a cased borehole preliminary created in the center of the sample. After the first fracturing, the principal maximal and minimal stress axis orientations were changed, and refracturing was carried out. We failed to create two fractures oriented along the borehole, but we succeeded in creation one fracture perpendicular to the borehole and the second fracture along the borehole. Comparison of the ultrasonic wave amplitude changes during the fracturing with the fracturing pressure variations allowed us to distinct the fracture propagation and the fracture fill-up by the fracturing fluid. It was also found that for an adequate calculation of the minimum compressive stresses from the characteristic parameters of the pressure change in the well, it is necessary to take into account the plastic properties of the rock, the diffusion of the fluid pore pressure in the vicinity of the well and the hydraulic fracture, the lag of the filling of the fracture with the fluid.