Study the effect of brine salinity concentration and confining pressure on both static and dynamic Rock Mechanical

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Abstract. In drilling operations and well trajectory planning, one of the key factors is the rock mechanical properties. The objective in this study is to have a better understanding of the effect of brine salinity and concentration on rock mechanical dynamic elastic properties. Therefore, compressional and shear velocities are measured to predict the mechanical properties of rocks under the different conditions. To carry out the experiment, three Berea sandstone sister plugs and three types of concentrated brines were used. In the first stage, the three Berea samples were tested in dry conditions to measure the compressional and shear velocities. Later, each sample was saturated with brine of a specific salinity concentration (25,000, 75,000, and 150,000 ppm) at ascending saturation level (25%, 50%, 75% and 100%), and the velocities were measured at each stage and the mechanical properties were calculated. The resulted data showed different relations between the level of fluid saturation percentage with different brine concentration and the rock mechanical properties measured in the lab. In some cases, the velocities were increasing as the fluid saturation increases and in some other cases the velocities were decreasing as the fluid saturation increasing. The experimental data also showed that in some cases the velocities were changing as a function of changing brine concentrations. This work will help in understanding the relationship between the mechanical properties of the rock measured in the lab and the data generated in the field. Also, it will help in predicting the changing of the mechanical properties near the wellbore with high mud filtration compare to zones away from the wellbore that has no mud filtration effects and in between the two zones.