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STATIC AND DYNAMIC TESTING OF COAL SPECIMENS

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ABSTRACT

Substantial public domain information exists, documenting discrepancies in measured values of elastic properties determined from static and dynamic measurements made on conventional reservoir rocks. There is relatively limited public domain information available for coal, especially the relationship between static and dynamic properties as stress conditions are changed. In studying coal mechanical behavior, one difficulty arrises because of the extremely friable nature of coal. In searching for "optimal" sample preparation procedures, several techniques have been used. These techniques have included coring samples using nitrogen, stepwise grinding to the desired dimensions, and, water-saturated freezing and subsequent coring to avoid disintegration of the coal. The most effective procedure attempted to date is the stepwise grinding. To understand static-dynamic mechanical behavior characteristics in coal, ultrasonic wave velocities were measured on relatively "undisturbed" coal samples concurrently with triaxial and hydrostatic compression. Effects of saturation on coal static-dynamic behavior were also examined. Dynamic bulk and Young's moduli and Poisson's ratio were calculated from the wave velocities. The dynamic moduli of the tested samples were greater than the static moduli and increased with increasing effective confining stress. This increase was greatest during initial increments of effective confining stress. P-wave velocity increased with an increase in pore pressure. However, S-wave velocity decreased with an increase in pore pressure. Such a decrease in S-wave velocity resulted in an increase in dynamic Poisson's ratio as calculated from elastic relationships.