

## **Borate Crosslinked Fracturing Fluids: Laboratory Determination of Rheology**

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**Abstract :** Hydraulic fracturing has become an essential procedure to break apart the rock and release the oil or gas which are trapped tightly in the rock by pumping fracturing fluids at high pressure down into the well. To open the fracture and to transport propping agent along the fracture, proper selection of fracturing fluids is the most crucial components in fracturing operations. Rheology properties of the fluids are usually considered the most important. Among various fracturing fluids, Borate crosslinked fluids have proved to be highly effective. Borate in the form of Boric Acid, borate ion is the most commonly use to crosslink the hydrated polymers and to produce very viscous gels that can stable at high temperature. Guar and HPG (Hydroxypropyl Guar) polymers are the most often used in these fluids. Borate gel rheology is known to be a function of polymer concentration, borate ion concentration, pH, and temperature. The crosslinking using Borate is a function of pH which means it can be formed or reversed simply by altering the pH of the fluid system. The fluid system was prepared by mixing base polymer with water at pH ranging between 8 to 11 and the optimum borate crosslinker efficiency was found to be pH of about 10. The rheology of laboratory prepared Borate crosslinked fracturing fluid was determined using Anton Paar Rheometer and Fann Viscometer. The viscosity was measured at high temperature ranging from 200°F to 250°F and pressures in order to partially stimulate the downhole condition. Rheological measurements reported that the crosslinking increases the viscosity, elasticity and thus fluid capability to transport propping agent.

**Keywords :** borate, crosslinker, Guar, Hydroxypropyl Guar (HPG), rheology

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