409b Power and Flow in Stirring Viscoelastic Fluids

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The study of power required to stir highly viscoelastic fluids is continued. First efforts were reported at the June 2005 meeting, Mixing XX, in Parksville, British Columbia. Those preliminary data showed that "cavern flow" effects were greatly enhanced by the viscoelastic character of some polymer solutions as compared to non-Newtonian shear thinning solutions which were not very viscoelastic. Those data showed that as impeller rotation rates were decreased the turbulence suppression caused by the viscoelasticity brought about significant reductions in power requirement, probably because very little flow was being produced. New measurements show the degree of flow reduction. Comparisons are made to CMC solutions used by Metzner and Otto (1957), which were very shear thinning but which showed very little of the viscoelastic response of poly(ethylene oxide), which was used for the new measurements. Correlation of the data with an approximate Deborah number is attempted.