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Experimental Study of Settling of Spherical Particles in Unbounded and Confined Shear Thinning Viscoelastic Fluids MUKUL M. SHARMA, SAHIL MALHOTRA, The University of Texas at Austin — An experimental study is performed to understand and quantify settling velocity of spherical particles in unbounded and confined surfactant-based shear thinning viscoelastic fluids. Experimental data is presented to show that elastic effects can increase or decrease the settling velocity of particles, even in the creeping flow regime. A significant drag reduction occurs with increase in Weissenberg number. This is followed by a transition to increasing drag at higher Weissenberg numbers. A new correlation is presented for the sphere settling velocity in unbounded viscoelastic fluids as a function of the fluid rheology and the proppant properties. The wall factors for sphere settling velocities in viscoelastic fluids confined between solid parallel plates are calculated from experimental measurements made over a range of Weissenberg numbers. Results indicate that elasticity reduces the effect of the confining walls and this reduction is more pronounced at higher ratios of the particle diameter to spacing between the walls. Shear thinning behavior of fluids is observed to reduce the retardation effect of the confining walls. A new empirical correlation for wall factors for spheres settling in a viscoelastic fluid confined between two parallel walls is presented.

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