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CEMENTING DISPLACEMENT FLOWS OF SHEAR-THINNING FLUIDS IN HORIZONTAL WELLS, WITH AND WITHOUT CASING ROTATION

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ABSTRACT

Results from a laboratory experimental study of displacement flows in an eccentric horizontal annulus are presented. The fluids are shear-thinning or Newtonian, with density differences. The scenario represents a typical horizontal well cementing setup. In general terms, we find that having a viscosity stable configuration (more stable fluid displacing less stable fluid) produces better displacements. However, now the effective viscosity ratio between fluids can vary at different locations around the annulus and with the imposed flow rate. Thus for example, we demonstrate how a flow rate increase can improve displacement by shear-thinning the displaced fluid. Casing rotation (i.e. rotating the inner cylinder), has been found to be effective at improving the displacement, but in the case of adverse viscosity ratios, displacement from the annulus walls remains poor. Lastly, it is noted that these reported effects of fluid rheology are mostly secondary to the dominant competition between eccentricity and buoyancy.