Abstract Submitted
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Exchange flow of two immiscible Newtonian fluids in a vertical tube PRISCILLA VARGES, FERNANDA NASCENTES, BRUNO FONSECA, PAULO ROBERTO DE SOUZA MENDES, MONICA NACCACHE, PUC-Rio — Plug cementing is an essential operation performed under a variety of well conditions. The cement plugs are rarely placed at the intended depth because the cement slurry usually is heavier than the well fluid. Failures are due primarily to migration of the denser fluid downward through the drilling fluid at the top of which it is discharged. The aim of the research is to better understand the process of plugging operation in vertical wells. To this end, we performed an experimental and theoretical study of the buoyancy-driven flow of two immiscible Newtonian fluids in a vertical tube such that the heavier and more viscous fluid is placed on top. Since both fluids are Newtonian, the situation is always unstable, i.e. the fluid on top will always flow downward and displace the bottom fluid upwards, so that the relative positioning tends to invert. The influence of the governing parameters on the speed of inversion was investigated. Flow visualization was performed with a digital camera, and inversion velocities were obtained through image analysis. Preliminary results show that inversion speed decreases as the tube diameter is increased, increases as the viscosity ratio is increased, and also increases as the density ratio is increased.

Priscilla Varges
PUC-Rio

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