

VPF8 submission for poster presentation

Vertical heterogeneity in a drilling fluid measured using T-bar rheometry

Elizabeth Jamie (SCR)*, Gerald Meeten (SCR, QMUL)

While drilling an oil well, the drill-bit produces rock cuttings which are removed continuously to the surface by a drilling-fluid pumped down the drill pipe, through the bit, and returning up through the annulus. This fluid gels sufficiently to prevent the sedimentation of cuttings when pumping ceases. Here we study an oil-based drilling fluid comprising a complex formulation of surfactant-stabilized brine-droplets, clays, additives, and particles of a dense weighting-agent, all suspended in the oil-continuous external phase. The drilling operation may fail if these components do not remain well-dispersed throughout the fluid.

The T-bar rheological tool (Brookfield) is a thin rotating vertical spindle with a slender horizontal bar at its lower end. Fitted to a conventional rheometer, this tool allows a series of torque measurements to be made at increasing depths into a visco-plastic fluid sample, minimally disturbing the material beneath. We describe its use to investigate the evolution of vertical heterogeneity within a model drilling-fluid sample. Our results suggest that the sample undergoes a process resembling delayed gel-collapse rather than a sedimentary phase-separation.

*Corresponding author: ejamie@slb.com