Computational Rheology for Pipeline and Annular Flow: Non-Newtonian Flow Modeling for Drilling and Production, and Flow Assurance Methods in Subsea Pipeline Design

Wilson C. Chin PhD

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Computational Rheology for Pipeline and Annular Flow: Non-Newtonian Flow Modeling for Drilling and Production, and Flow Assurance Methods in Subsea Pipeline Design Wilson C. Chin PhD Computational Rheology for Pipeline and Annular Flow develops and applies modern analytical and computational finite difference methods for solving flow problems in drilling and production. It also provides valuable insights into flow assurance analysis in subsea pipeline design. Using modeling techniques that simulate the motion of non-Newtonian fluids, e.g., power law, Bingham plastic, and Herschel-Bulkley flows, this book presents proven annular flow methodologies for cuttings transport and stuck pipe analysis based on detailed experimental data obtained from highly deviated and horizontal wells. These methods are applied for highly eccentric borehole geometries to the design of pipeline bundles in subsea applications, where such annular configurations arise in velocity and thermal modeling applications.

Also covered extensively are the design and modeling of pipelines having non-circular cross-sections, where deviations from ideal circular geometries arise from plugging due to wax deposition and the presence of hydrates and asphaltenes. As in the case of annular flows, the new algorithms apply to fluids with general rheological description; for example, the methods show very precisely how flow rate and pressure gradient vary nonlinearly in practical problem situations.

* Includes Windows-based software that contains highly integrated, user-friendly color-graphics algorithms (available via the Gulf Professional Publishing website at www.gulfpp.com)

* Provides valuable insights into flow assurance analysis.

* Contains new algorithms on annular flows and fluids with general rheological descriptions supply solutions to practical problems.

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