An Open-Source Single-Phase Turbulent Flow Wax Deposition Software: SP-Depo

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The open-source version of the single-phase paraffin deposition software was developed and released in GitHub (<https://github.com/epmmko/SP-Depo-Single-Phase-Flow-V0.9>). This software is based on Lee (2008) and Panacharoensawad (2012) paraffin deposition software. The graphical user interface, the core calculation, and the graphical output were coded in C#, C++ and Python, respectively. The theoretical maximum and minimum limits for wax deposition are based on the equilibrium model (Venkatesan (2004)) and the heat and mass transfer analogy approach (Singh et al. (2000)). The partial precipitation model of Lee (2008) and the maximum tolerable shear stress limit terms (Panacharoensawad (2012)) were incorporated to allow a better tuning of wax deposition model with the experimental result. The backward finite difference scheme in time and central scheme in space were used to solve the coupled heat and mass transfer PDEs to estimate the temperature and concentration profile in the pipe. The non-uniform radial grid spacing was estimated by solving the one-seventh power law velocity profile with Dormand-Prince method. The non-uniform flowing area along the pipe length (due to wax deposition) was simplified with groups of constant flowing area. The shear stress variation within each group was limited to be less than 5%. The fitting parameter search was performed by Levenberg-Marquardt algorithm to ensure a fast converging solution. A generic function object was created to take a user-defined fluid property function at the run-time. This project was developed as the public domain dedication software (The Unlicensed) for the hope of a better world in terms of the global education in engineering and computation. The authors encourage the use of these codes for any purposes suitable for users.