SHORT ABSTRACT

Helical coiled tubing service is one of the fastest growing technology in chemical, petrochemical, food and pharmaceutical industries. The helical coils also improve the performance of equipment like heat exchangers, coil steam generators, boilers, evaporators, reverse osmosis units, nuclear reactors, etc. due to its inherent secondary flow generation capability. Secondary flow increases the turbulence leading to greater heat and mass transfer coefficients. The behavior of two-phase gas-liquid flow through curved tubes was practically much more complex than single phase flow. In two-phase flow through curved tubes, the heavier phase, which is accountable to a larger centrifugal force, moves away from the center of curvature, whereas the lighter phase flows toward the center of the curvature.

Based on the present status of research, this work was undertaken with the following objectives:

(i) Study the flow pattern and its map in helical coil. Model to predict the flow pattern transitions.
(ii) Study the two-phase frictional pressure drop in helical coil. Development of mechanistic model based on the plug/slug formation, drag at interface and wettability effect of the Newtonian and non-Newtonian fluids.
(iv) Study the convective heat transfer of two-phase gas-non-Newtonian flow in vertical helical coil. Development of correlation to interpret the heat transfer performance in the helical coil.