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Investigation of nano composite heat exchanger annular pipeline flow using CFD analysis for crude oil and water characteristics

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Abstract

This study focuses on the dual-core annular process of crude oil and water. The crude oil exhibits non-Newtonian behavior with high viscosity. The heat transmission flow in pipeline locations is complex. In this process, the cooled water passes through the annular core, experiencing turbulence effects, while the crude oil flows in a laminar manner. The influence of the non-Newtonian behavior is investigated in terms of pipe angles and deformations. In the valve, the inlet velocity flow is set at 1.75 m/s. The flow is executed in downhill orientations in high-velocity locations. The simulation results show CFD variations with a velocity of 3.5 m/s, pressure of 2.33 MPa, pressure gradients of 1.33 MPa, and Reynolds numbers of 1.38 MPa. This study is being conducted for a horizontal pipeline. The CFD solution solvers investigate the volumetric flow characteristics of the fluid as well as the temperature effects. The maximum heat energy has been reduced, resulting in unique flow directions. © 2023 The Authors

Author Keywords

Ansys; Composite annular core; Crude oil; Pressure; Temperature; Velocity; Water

Index Keywords

Computational fluid dynamics, Nanocomposites, Non Newtonian flow, Pipelines, Reynolds number; Ansys, CFD analysis, Composite annular core, Core-annular, Dual-core, High viscosities, Nano composite, Non-Newtonian behaviors, Oil characteristics, Water characteristics; Crude oil

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