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Drag Reduction by Additives for Two-Phase Oil-Water Flow in and around 180° Bends

Paul Onubi Ayegba
Ahmadu Bello University, Nigeria

Abstract

This study investigates the effect of U-bend on polymer drag reduction (DR) and flow patterns for oil-water flows. The test section consisted of 19-mm ID clear polyvinyl chloride (CPVC) straight pipes and U-bend (R = 100 mm). Measurements were carried out under different flow conditions at hydrodynamically developed flow section before the bend, in the bend and at two redeveloping flow sections after the bend. Observed flow patterns at various test sections were similar though mixture velocities at transition sometimes varied between the test sections. In general, the addition of polymer imposed partial or complete flow stratification. Pressure losses differed at the various test sections and this difference was strongly related to the superficial velocity of the phases and flow patterns. DR at all test sections generally increased with water superficial velocity and reduced with oil fraction in the region of strong turbulence. At high mixture velocities, DR upstream of the bend was highest while the least was recorded at the bend. A reverse behaviour was recorded at low mixture velocities. The highest DR upstream of the bend, in the U-bend and at the two downstream redeveloping sections were 40% (USO = 0.12 ms-1), 34% (USO = 0.48 ms-1), 28% (USO = 0.12 ms-1), and 29% (USO = 0.12 ms-1) respectively.

Biography:

Paul O. Ayegba is a PhD student at Ahmadu Bello University Zaria and a Fulbright Scholar at University of California Berkeley. He completed a Masters and Bachelor's degree in Engineering from the Federal University of Technology Minna. He has published more than 5 papers in reputed journals.

Speaker Publications:

1. "Drag Reduction by Additives in Curved Pipes for Single-Phase Liquid and Two-Phase Flows: A Review"; Vol 01, 2020.
2. "Experimental and Neural Network Modelling of Polymer Drag Reduction in 180o Bends"; Results in Materials / Vol 01, 2019, 100012
3. "Applications of Artificial Neural Network (ANN) method for performance prediction of the effect of a vertical 90o bend on an air–silicone oil flow"; Journal of the Taiwan Institute of Chemical Engineers / Vol 17, 2017, 02.005.
4. "Prediction of average void fraction and pdf of void fraction in vertical 90 o bend for air–silicone oil flow using multilayer perceptron (mlp) codes"; Journal of the Taiwan Institute of Chemical Engineers 2017.
5. "Production of fatty acid ethyl and methyl esters (biodiesel) from nigeria indigenous palm kernel oil"; Universiti Teknologi Malaysia / 2016.

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