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Mixing liquid-liquid stratified flows using transverse jets in cross flows[1] STUART WRIGHT, OMAR K. MATAR, CHRISTOS N. MARKIDES, Imperial College London — Low pipeline velocities in horizontal liquid-liquid flows lead to gravitationally-induced stratification. This results in flow situations that have no point where average properties can be measured. Inline mixing limits the stratification effect by forming unstable liquid-liquid dispersions. An experimental system is used to measure the mixing performance of various jet-in-cross-flow (JICF) configurations as examples of active inline mixers. The test section consists of a 8.5-m long ETFE pipe with a 50-mm diameter, which is refractive index-matched to both a 10 cSt silicone oil and a 51 wt% glycerol solution. This practice allows advanced laser-based optical techniques, namely PLIF and PIV/PTV, to be applied to these flows in order to measure the phase fractions and velocity fields, respectively. A volume of a fluid (VOF) CFD code is then used to simulate simple jet geometries and to demonstrate the breakup and dispersion capabilities of JICFs in stratified pipeline flows by predicting their mixing efficiency. These simulation results are contrasted with the experimental results to examine the effectiveness of these simulations in predicting the dispersion and breakup.

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