Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Jet-mixing of initially-stratified liquid-liquid pipe flows: experiments and numerical simulations[1] STUART WRIGHT, ROBERTO IBARRA-HERNANDES, ZHIHUA XIE, CHRISTOS MARKIDES, OMAR MATAR, Imperial College London — Low pipeline velocities lead to stratification and so-called phase slip in horizontal liquid-liquid flows due to differences in liquid densities and viscosities. Stratified flows have no suitable single point for sampling, from which average phase properties (e.g. fractions) can be established. Inline mixing, achieved by static mixers or jets in cross-flow (JICF), is often used to overcome liquid-liquid stratification by establishing unstable two-phase dispersions for sampling. Achieving dispersions in liquid-liquid pipeline flows using JICF is the subject of this experimental and modelling work. The experimental facility involves a matched refractive index liquid-liquid-solid system, featuring an ETFE test section, and experimental liquids which are silicone oil and a 51-wt% glycerol solution. The matching then allows the dispersed fluid phase fractions and velocity fields to be established through advanced optical techniques, namely PLIF (for phase) and PTV or PIV (for velocity fields). CFD codes using the volume of a fluid (VOF) method are then used to demonstrate JICF breakup and dispersion in stratified pipeline flows. A number of simple jet configurations are described and their dispersion effectiveness is compared with the experimental results.

[1]Funding from Cameron for Ph.D. studentship (SW) gratefully acknowledged

Omar Matar
Imperial College London

Date submitted: 28 Jul 2016 Electronic form version 1.4