An Eulerian-Eulerian CFD Study of Surface Wetting at Different Richardson Numbers in Dispersed Oil-Water Pipe Flow

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An Eulerian-Eulerian CFD Study of Surface Wetting at Different Richardson Numbers in Dispersed Oil-Water Pipe Flow JAKOB ROAR BENTZON, JENS HONORE WALTHER, Technical University of Denmark — An Eulerian-Eulerian two-phase CFD model has been employed to investigate the variation of dispersion and liquid holdup in the horizontal section of wells used for oil production under operating conditions with water-cuts ranging from 25–75 %. The employed model uses a S-gamma droplet distribution model to estimate droplet sizes based on statistical moments with breakup and coalescence models. The model has been validated against experimental measurements with good accuracy on phase distribution but challenges obtaining correct droplet sizes. Consequently, the model is used to study different flow conditions, namely at varied Richardson numbers through changing the Froude number and the Atwood number separately. From the results, it is observed that similarly to what is seen in the Kelvin-Helmholtz instability, a higher Richardson number reduces mixing of the interface and thus decreases the rate of dispersion. Slight differences in the results from varying the Atwood number and the Froude number to same Richardson numbers are observed on both dispersion and liquid holdup

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