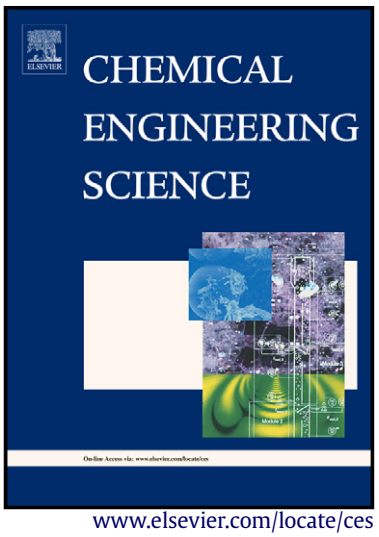

www.elsevier.com/locate/ces

High-pressure Visual experimental Studies of oil-in-water dispersion droplet size

Zachary M. Aman, Claire B. Paris, Eric F. May, Michael L. Johns, David Lindo-Atichati

PII: S0009-2509(15)00087-1
DOI: http://dx.doi.org/10.1016/j.ces.2015.01.058
Reference: CES12151

To appear in: *Chemical Engineering Science*

Received date: 24 September 2014
Revised date: 20 January 2015
Accepted date: 24 January 2015

Cite this article as: Zachary M. Aman, Claire B. Paris, Eric F. May, Michael L. Johns, David Lindo-Atichati, High-pressure Visual experimental Studies of oil-in-water dispersion droplet size, *Chemical Engineering Science,* http://dx.doi.org/10.1016/j.ces.2015.01.058

High-Pressure Visual Experimental Studies of Oil-in-Water Dispersion Droplet Size

Zachary M. Aman[1], Claire B. Paris[2], Eric F. May[1],*

Michael L. Johns[1], David Lindo-Atichati[2]

1. Centre for Energy, School of Mechanical and Chemical Engineering, The University of Western Australia, 35 Stirling Highway, Crawley WA, 6009, AUSTRALIA **2.** University of Miami, Rosenstiel School of Marine and Atmospheric Science, 4600 Rickenbacker Causeway, Miami, Florida 33149, UNITED STATES

The formation of oil-in-water dispersions is a critical step during the blowout of coastal and deepwater oil and gas production systems, and is a determining factor in the vertical and lateral migration of oil through the associated adjacent water column. In this study a high-pressure sapphire visual autoclave apparatus was used to measure the size of crude oil droplets that were saturated with gas and dispersed in an aqueous phase as a function of mixing speed. Oil-in-water droplet size distributions were measured at pressures of 11 MPa, for autoclave stirring rates of 200-1000 RPM ($1076 \leq Re_{stirred\ vessel} \leq 5378$). Arithmetic mean droplet diameters decreased monotonically from 344 to 125 μm over this range, with maximum droplet sizes decreasing from 708 to 441 μm. A model tuned to the measured oil-in-water data was used to predict a mean droplet size on the order of 80 μm for Deepwater Horizon conditions; when incorporated into far field blowout simulations, this droplet size data enables quantitative assessment of the impact of dispersant injection at the blowout site.

Keywords: droplet size, mixing, deepwater blowout, multiphase flow

Corresponding author: zachary.aman@uwa.edu.au, +61 8 6488 3078