Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Determining the Discharge Rate from a Submerged Oil Leaks using ROV Video and CFD study[1] PANKAJ SAHA, ORISE-Postdoc Fellow, National Energy Technolgy Laboratory, FRANK SHAFFER, MEHRDAD SHAHNAM, USDOE National Energy Technology Laboratory, OMER SAVAS, U.C. Berkeley, Department of Mechanical Engineering, DAVE DEVITES, OHMSETT Mar Inc, TIMOTHY STEFFECK, DOI Bureau of Safety and Environmental Enforcement — The current paper reports a technique to measure the discharge rate by analyzing the video from a Remotely Operated Vehicle (ROV). The technique uses instantaneous images from ROV video to measure the velocity of visible features (turbulent eddies) along the boundary of an oil leak jet and subsequently classical theory of turbulent jets is imposed to determine the discharge rate. The Flow Rate Technical Group (FRTG) Plume Team developed this technique that manually tracked the visible features and produced the first accurate government estimates of the oil discharge rate from the Deepwater Horizon (DWH). For practical application this approach needs automated control. Experiments were conducted at UC Berkeley and OHMSETT that recorded high speed, high resolution video of submerged dye-colored water or oil jets and subsequently, measured the velocity data employing LDA and PIV software. Numerical simulation have been carried out using experimental submerged turbulent oil jets flow conditions employing LES turbulence closure and VOF interface capturing technique in OpenFOAM solver. The CFD results captured jet spreading angle and jet structures in close agreement with the experimental observations.

[1]The work was funded by NETL and DOI Bureau of Safety and Environmental Enforcement (BSEE)

Pankaj Saha
ORISE-Postdoc Fellow, National Energy Technolgy Laboratory

Date submitted: 01 Aug 2016 Electronic form version 1.4