Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Large eddy simulations of swirl-promoted turbulent flow QIBO LI, JORGE ALVARADO, Texas A&M Univ, TAMU ALVARADO TEAM — Swirlers are used in applications such as furnaces and boilers, due to their ability to enhance fluid mixing in confined spaces. However, the origins and nature of swirler-induced instabilities of recirculating flow and vortex breakdown are still not well understood. Furthermore, the effects of swirl-promoted turbulent flow on sprays still need to be studied to be able to design proper swirler-spray systems. Recent studies have revealed that the large eddy simulation (LES) technique is capable of capturing the unstable features of swirling flows. In this study, the flow dynamics behavior on the downstream side of a swirler is explored using LES by considering two swirl numbers. The effects of swirl number (SN) on biofuel blend sprays and atomization are also discussed. The simulations have been validated using experimental data in terms of mean flow velocity profiles. This work presents insight into several features of swirling flows including recirculating flow generation and vortex breakdown. Results show that high SN at lower flowrate leads to greater turbulence kinetic energy and more compact of recirculation zone than at higher flowrate and lower SN. Moreover, the results also show that the shape of spray is affected by Swirl Number significantly.

Jorge Alvarado
Texas A&M Univ

Date submitted: 01 Aug 2014 Electronic form version 1.4