Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Anisotropy and Non-Maxwellian behavior of particle velocity fluctuations in circulating fluidized beds CHENG LI, AVINASH VAIDHEESWARAN, National Energy Technology Laboratory, BALAJI GOPALAN, Saint-Gobain Northboro RD, XIONGJUN WU, ROWAN STEVEN, BRYAN HUGHES, WILLIAM A. ROGERS, National Energy Technology Laboratory —
This study focuses on comparing the distribution of fluctuation velocity of solid particles in the circulating fluidzed bed (CFB). Experiments have been conducted in two CFBs with one order of magnitude difference in size but similar superficial gas velocity. The lab-scale system uses Zeolite particles with a mean diameter of 793 micron, which are tracked using digital inline holography (DIH) in the standpipe region of the bed. Additionally, 10 - 40 micron fine particles presumably resulting from attrition are detected and tracked as well. In the industrial-scale system, 81 micron mean diameter fluid catalytic cracking (FCC) particles are tracked at multiple radial locations in the riser section using a borescope. Results highlight the anisotropy and non-Maxwellian distribution of velocity fluctuations due to Levy flight of particles stemming from complex inter-particle and inter-phase interactions. Furthermore, the transverse component exhibits symmetry while streamwise component is asymmetric in both the systems.

Cheng Li
National Energy Technology Laboratory

Date submitted: 03 Aug 2020 Electronic form version 1.4