Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Monodisperse and Polydisperse Particle Flow over a Backward Facing Step Preceding a Porous Medium FRANK CHAMBERS, ALOK DANGE, Oklahoma State University — Computational Fluid Dynamic predictions were performed for the flow of monodisperse and polydisperse particles over a backward facing step with and without a porous medium downstream. The carrier fluid was air and the particles had a density of 500 kg/m3. Monodisperse particles with diameters of 10 and 40 microns and polydispersed particles from 1 to 50 microns with a Rosin-Rammler size distribution were used. The step had an expansion ratio of 2 and the step Reynolds numbers were 6550 and 10000. The k-epsilon RNG model with standard wall functions was used with FLUENT's discrete phase model for the particles. Velocity and particle residence time tracks were examined. The placement of the medium at 4.25h from the step was found to control the velocity profiles and the length of the recirculation zone while placement at 6.75h had negligible effects. The particle tracks show that more particles with lower Stokes number enter the recirculation zone while the particles with higher Stokes number tend to bypass the recirculation zone and move directly to the filter. The results for the monodispersed and the polydispersed particles appear virtually the same at low particle concentrations, but the polydispersed results provide a very good view of the phenomena.

Frank Chambers
Oklahoma State University

Date submitted: 11 Aug 2011 Electronic form version 1.4