Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Numerical investigation of adhesion effects on solid particles filtration efficiency[1] AMIRA SHAFFEE, PAUL LUCKHAM, OMAR K. MATAR, Imperial College London — Our work investigate the effectiveness of particle filtration process, in particular using a fully-coupled Computational Fluid Dynamics (CFD) and Discrete Element Method (DEM) approach involving poly-dispersed, adhesive solid particles. We found that an increase in particle adhesion reduces solid production through the opening of a wire-wrap type filter. Over time, as particle agglomerates continuously deposit on top of the filter, layer upon layer of particles is built on top of the filter, forming a particle pack. It is observed that with increasing particle adhesion, the pack height build up also increases and hence decreases the average particle volume fraction of the pack. This trend suggests higher porosity and looser packing of solid particles within the pack with increased adhesion. Furthermore, we found that the pressure drop for adhesive case is lower compared to non-adhesive case. Our results suggest agglomerating solid particles has beneficial effects on particle filtration. One important application of these findings is towards designing and optimizing sand control process for a hydrocarbon well with excessive sand production which is major challenge in oil and gas industry.

[1]Funding from PETRONAS and RAEng UK for Research Chair (OKM) gratefully acknowledged

Omar Matar
Imperial College London

Date submitted: 26 Jul 2017 Electronic form version 1.4