Abstract No: 305 ***ICT, Mathematics and Statistics***

VOLUMETRIC FLOW RATE OF PARTICLE SUSPENSION FLOW OVER POROUS MEDIA

T. Rajendran[1], A.N.S. Ambegedara[2] and U.G.I.G.K. Udagedara[2*]

[1]Department of Mathematics and Statistics, Faculty of Science, University of Jaffna, Jaffna, Sri Lanka
[2]Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka
[*]gayaniclark@gmail.com

Transport of particles in suspension over porous media occurs in many industrial and environmental processes such as filtering and sedimentation. For instance, sedimentation is used in industry for separation of dust particles from air streams, and filtering is used during the process of water treatment and food processing. In this study, the fundamental physics of suspension of particles is presented at various suspension concentrations over porous layers. Here, the flow of mono-disperse, non-colloidal suspensions over a porous medium has been quantitatively examined by developing an analytical framework to model the flow in a channel, where the lower surface is replaced by various porous media. The diffusive flux model is used to model the suspensions over the porous media. Darcy-Brinkman equation is used to solve the velocity and shear stress distribution of the porous media. The velocity profile, shear stress profile, and the concentration profiles in the channel were obtained for a steady-state, fully developed flow. The model has been validated by comparing the predictions of the flow at low suspension concentrations with the flow of pure Newtonian fluid over a porous layer. It is shown that the volumetric flow rate induced by the presence of the porous media depends on the values of the permeability parameter, the thickness ratio, and the concentration of the suspension in the flow.

Keywords: Darcy-Brinkman equations, Permeability, Porous media, Suspension, Volumetric flow rate