Defence Seminar

Seminar Title : Hydrodynamic Studies of the Non-Spherical Particles Settling in Annular and Non-Annular Channels Filled with

Newtonian and non-Newtonian Fluids

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Abstract : The wall factor (f) and

: The wall factor (f) and drag coefficient (C_D) of hollow cylinders, hollow frustum, clusters, solid and hollow disks, and solid cylinder, frustum, hemi-cylinder, and hemi-frustum settling in cylindrical annular (A) and non-annular (NA) channels were investigated. For hollow cylindrical particles, f and C_D were estimated in the NA and A channels. The estimated C_D using the Newtonian fluids was 0.782 &le C_D &le 3249.75 and 39.62 &ge C_D &ge 0.8 for 0.064 &le Re &le 101.34 and 1.22 &le Re &le 100.21. The same was estimated in the range of 0.73721 &le C_D &le 125507 and 3104 &ge C_D &ge 1.27 for 0.0017 &le Re &le 64.07 and 0.054 &le Re &le 47.67 for the settling the particle in the non-Newtonian fluid. For hollow frustum particles, C_D varied in the range of 0.80 &le C_D &le 15.49 and 0.82 &le C_D &le 7.12 for 2.798 &le Re &le 90 and 5.29 &le Re &le 89.97 while settling in Newtonian fluids in the NA and A channels, respectively. The same was varied over 0.983 &le C_D &le 1292.47 and 1.48 &le C_D &le 191.55 for 0.168 &le Re &le 50 and 0.1506 &le Re &le 20 while settling in non-Newtonian fluid. For the cluster particles the terminal velocity of polyhedron particles was higher than the planar and chain-shaped particles. The estimated C_D was varied in the range of 1.66 &le C_D &le 43.30 and 1.92 &le C_D &le 36.67 for 0.76 &le Re &le 22.09 and 0.74 &le Re &le 20.51 while settling in Newtonian fluids. The same was varied for non-Newtonian fluids over 2.84 &le C_D &le 4002 and 2.21 &le C_D &le 1638 for 0.028 &le Re &le 10.14 and 0.052 &le Re &le 11.6 for the settling of the particles in the NA and A channels, respectively. For disk/cylinder particles settling in NA and A channels, the terminal velocity and the wall factor increased with the sphericity. The estimated C_D appeared in the range of 1.56 &le C_D &le 503.88 and 0.851 &le C_D &le 133.65 for 0.20 &le Re &le 46.75 and 0.40 &le Re &le 63.44 for the settling of the disk/cylinder in Newtonian fluids. The same was varied in the range of 1.35 & le C_D & le 31934 and 0.69 & le C_D & le 1203.91 for 0.005 &le Re &le 30 and 0.05 &le Re &le 43.02 for the settling the particle in the NA and A channels, respectively in the non-Newtonian fluid. For hollow disk particles, the V and f increased with H/d_o (Height/Outer diameter) ratio. The experimental C_D varied over 3.061 &le C_D &le 106.29 and 3.11 &le C_D &le 34.41 for 0.463 &le Re &le 16.30 and 0.81 &le Re &le 16.16 while settling in the NA and A channels, respectively in Newtonian fluids. The same varied in the range of 6.81 &le C_D &le 57293 and 6.93 &le C_D &le 12952 for 0.0042 &le Re &le 6.23 and 0.011 &le Re &le 6.17 while settling in the non-Newtonian fluids.