CHL332 (Fluidization Engineering)

Max. Marks: 35 | **Minor – I** | 2. 9. 2015

Total Time: 60 min | **(Part B)**

1. A packed bed has 20 kg of solid particles of density 2200 kg/m^3 that occupy a height of 0.3 m in a cylindrical column of diameter 0.252 m. The bed is then fluidized by water (density 1000 kg/m^3 and viscosity 0.001 Pa.s) at a flowrate of 1.80 m^3/hr to form an expanded bed of height 0.33 m. **[9]**

   Assuming Richardson-Zaki eqn (with n = 3.5) to apply for the fluidized state, find :

   (a) the minimum fluidization velocity u_{mf}

   (b) the bed height, if water flowrate is doubled

   (c) the total pressure exerted on the distributor plate at the above velocity [in (b)]

2. 60 kg of Geldart A particles of size 100 μm and density of 2600 kg/m^3 are fluidized by air (ρ = 1.2 kg/m^3 and μ = 1.8x10^{-5} Pa.s) to give a bubbling bed in a column of diameter 0.32 m. The operating volumetric flow rate of air is 100 m^3/hr. Average bubble rise velocity may be taken to be 1.1 m/s. **[9]**

   Assuming simple 2-phase model to apply, find :

   (a) u_{mf} (take laminar flow, ϕ_s = 1, ε_{mf} = 0.45)

   (b) bubble fraction in the bed and bed height at the operating conditions

   (c) Is any assumption involved in the above, w.r.t. Geldart A fluidization ?