

UNIT OPERATION

The velocity of particles moving in a fluid

Under a constant force, for example the force of gravity, particles in a liquid accelerate for a time and there after move at a uniform velocity. This maximum velocity which they reach is called their terminal velocity (V_m).

It's depends upon the **size**, **density** and **shape** of the particles , and upon **viscosity** and **density** of the fluid.

When a particle moves steadily through a fluid, there are **two** principal forces acting upon it ,

1. The external force causing the motion
2. The drag force resisting motion which arises from frictional action of the fluid .

$$F_s = Vg(\rho_p - \rho_c)$$

Where

F_s is the net external accelerating force on the particle

V is the volume of the particle,

g is the gravity acceleration

ρ_p is the density of the particle,

ρ_c is the density of the fluid .

The drag force on the particle (F_D) is obtained by multiplying the velocity pressure of the flowing fluid by the projected area of the particle

$$F_D = \frac{1}{2} C \rho_c V_m^2 A_p$$

Where

C is the drag coefficient

A_p the cross section area of the particle.

If these forces are acting on a spherical particle so that