SNS COLLEGE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

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DEPARTMENT OF FOOD TECHNOLOGY

COURSE CODE & NAME: 23AGT207 & ENGINEERING PROPERTIES OF AGRICULTURE PRODUCE

II YEAR / IV SEMESTER

UNIT : III THERMAL PROPERTIES

TOPIC 6 : Aerodynamic Properties

Aerodynamic Properties

Hydraulic transport and handling as well as hydraulic sorting of agricultural products basic data for the development of equipment for sorting and sizing of agro commodities

The two important aerodynamic characteristics of a body are its terminal velocity and aerodynamic drag.

Drag Coefficient:-

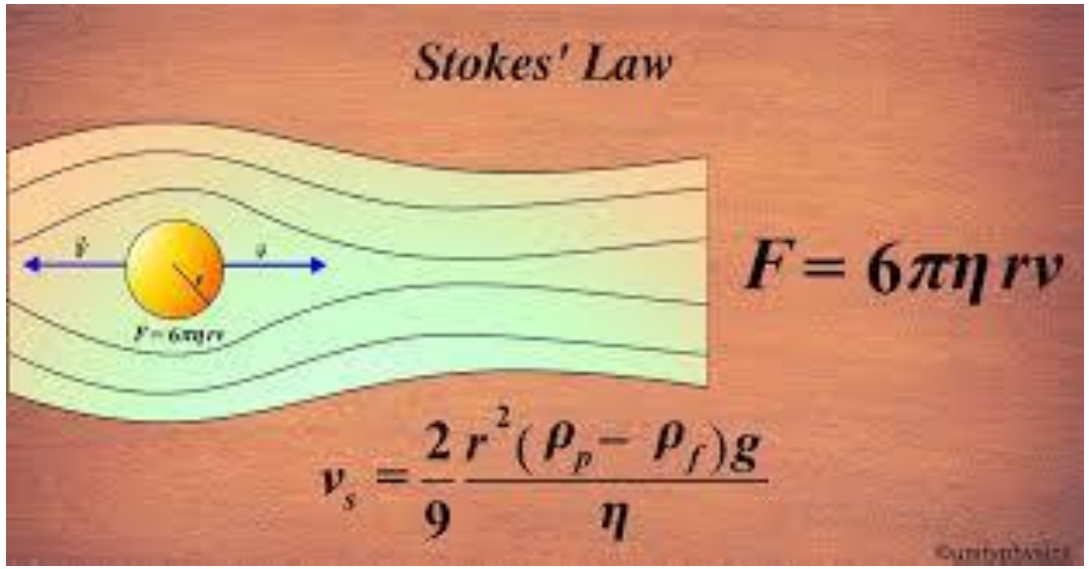
It is used to quantify drag or resistance of an object is a fluid environment such as airor water. It is a dimensionless quantity.

Drag coefficient is always associated with surface area:

Profile or Pressure Drag:
When a blunt object, known as sphere is placed in a fluid flow, the frictional drag can be neglected because of the small surface area on which frictional effects can work.

The exception is the case of flow at very low Reynolds number is less than unit, where stokes law is applicable. Here inertia force may be neglected & those of viscosity alone considered, the flow closes behind a sphere like object & profile drag is composed primarily of frictional drag.

Stokes' Law describes the drag force experienced by a small sphere moving through a viscous fluid, stating that the drag force (F) is directly proportional to the fluid's viscosity (η), the sphere's radius (r), and its velocity (v), represented as F = 6πηrv.



viscous drag force acting on a small sphere moving through a fluid under the influence of gravity.

•Where:

- **F**: is the drag force (in Newtons)
- **η**: is the fluid's dynamic viscosity (in Pa·s or N·s/m²)
- **r**: is the radius of the sphere (in meters)
- **v**: is the velocity of the sphere (in m/s)

- **Key Concepts:**

- **Viscous Drag:** Stokes' Law describes the frictional force between an object and a fluid that opposes the object's motion.

- **Laminar Flow:** The law is most accurate when the fluid flow around the sphere is laminar (smooth and not turbulent).

- **Terminal Velocity:** When the drag force equals the gravitational force, the sphere reaches a constant velocity called terminal velocity.

•**Applications:**

•**Sediment Settling:** Stokes' Law is used to understand how particles settle in water or other fluids.

•**Fluid Viscosity Measurement:** It can be used to determine the viscosity of a fluid by measuring the settling speed of particles.

•**Microorganism Movement:** It helps in understanding the movement of small organisms and cells in fluids.

•**Fog and Rain Formation:** It explains why small water droplets or ice crystals can remain suspended in air until they grow large enough to fall as rain or snow.

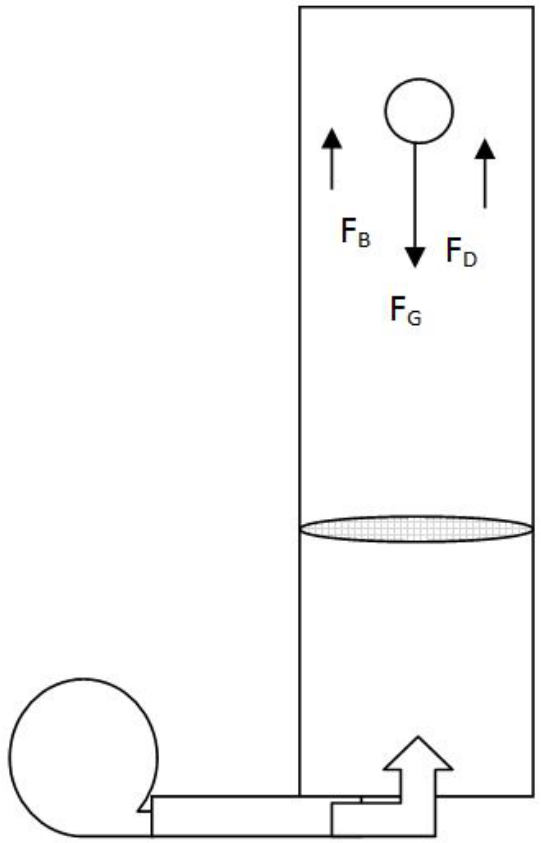
Measurement of terminal velocity:

Most scientists and researchers employ air column to find out the terminal velocity of grains.

The set up usually consists of a vertical air column, which is blown from the bottom and passes through the screen.

The screen uniformly distributes the air velocity. The air column is also attached with velocity measuring device. The blowe rmaintains variable speed.

When grains are allowed to drop into the column, initially they attains acceleration, once the velocity is adjusted they fall to the bottom with a constant velocity. This constant velocity is termed as terminal velocity



Factors affecting aerodynamic properties of agricultural produce

Frontal area (frontal area of grains" refers to the area of the grains that is projected perpendicularly to the direction of airflow or force.)

Particles size orientation(In turbulent region particles assumes position of maximum résistance)

THANK YOU...