

**Definition of Filtration** "At its core, filtration can be defined as a process of separating solids from a fluid by passing the mixture through a porous medium. This medium retains the solids, allowing the fluid to pass through. The resulting clear liquid is referred to as the 'filtrate.'"

Sometimes filtration and clarification are used interchangeably. But clarification is defined as separation of particles when concentration of solids is less.

## 1. Types of Filtration

- **Batch Filtration:** Performed intermittently. The system is filled with the slurry (mixture of solid and liquid), and filtration is carried out until the filter cake forms. After that, the cake is removed.
- **Continuous Filtration:** The filtration process continues without interruption. The solid-liquid mixture is continuously fed into the system, and filtered liquid is constantly removed.

## 2. Filtration Methods

- **Surface Filtration:** Particles are retained on the surface of the filter medium. This method is used for relatively larger particles.
- **Depth Filtration:** In this method, particles are trapped within the depth of the filter medium, which allows for higher dirt-holding capacity and finer filtration.

## 3. Factors Affecting Filtration

- **Nature of the Feed:** The viscosity, particle size, and concentration of solid particles influence filtration rate.
- **Filter Medium:** The type and pore size of the filter material determine the efficiency of the filtration.
- **Pressure or Vacuum:** The application of pressure or vacuum determines the flow rate of the liquid and the efficiency of filtration.
- **Temperature:** Higher temperatures reduce the viscosity of the liquid, improving the filtration rate.

## 4. Filter Media

- **Cloth Filters:** Made of materials like cotton, nylon, or polyester. These filters are used for larger particles.
- **Paper Filters:** Used for finer filtration, typically in laboratory applications.
- **Membrane Filters:** Used for sterilization and ultra-filtration applications, typically in pharmaceutical and biotechnology processes.
- **Granular Filters:** Consist of sand or other granular materials, used in large-scale water treatment processes.

## 5. Applications in Pharmaceutical Engineering

1. Production of sterile products:- (HEPA) filters (or) laminar air bench provide sterile environment during manufacture of sterile products.

2. Production of bulk drugs:- Filtration is an essential step in the removal of impurities from the products.

4. Production of liquid orals: - Filtration is very important in the production of liquid orals and other for obtaining clear solutions. Eg. In aromatic water preparations, syrups, elixirs, and eye drops, where removal of foreign impurities is very important.

5. Effluent and waste water treatment

## **6. Filter Media-**

The surface upon which solids are deposited in a filter is called the "Filter medium"

### **Properties of ideal filter medium:**

It should-

- 1) be capable of delivering a clear filtrate at a suitable production rate.
- 2) have sufficient mechanical strength.
- 3) be inert.
- 4) retain the solids without plugging at the start of filtration.
- 5) Not absorb dissolve material.

Selection of filter media depends on followings:

- 1. Size of particle to be filtered.
- 2. Amount of liquid to be filtered.
- 3. Nature of product to be filtered.
- 4. Purpose of filter