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## Clarification:

Removing of the suspended unwanted material (unwanted) with might come from raw material, equipment, vehicles or others.

There are many methods of clarification and choosing of the suitable method will depend on many factors like:

1. Particle size of the unwanted suspended materials some of the particles are so large that it could be seen by eye and can easily remove while some other may be small that it could be seen or removed only by special devices.
2. Physical properties of the unwanted suspended material like for example the removal of the excess volatile oils from liquid preparation.
3. Quantity of the unwanted suspended material. the choice of the method will depend on the amount of foreign particles for example for small quantity of such particles we can use filtration but if there is large quantity of suspended material which are called it slurry then filtration cannot be used and other material should be used .
4. Characteristic fluid media: we should consider the liquid viscosity whether we can use high temperature or not it is affected by exposure to air and light.
5. The speed of the method: faster method is more preferred than slow methods.

## Method of clarification:

### 1. Setting method :

It is simple and primitive method by which the product is allowed to stand still until it is separated or settle.

Setting are of two types either upward or downward setting depend on specific gravity or of both density of the suspended materials and the liquid if specific gravity or density of the suspended material is less than liquid media it will settle upward and the reverse is true . The factor affecting settle is determined by stokes equation:

$$V = \frac{dX}{dt} = \frac{d^2 \langle p_1 - p_2 \rangle g}{18\eta}$$

- $dX/dt$  = rate of setting
- $d$  = diameter of particles
- $p_1$  = density of particles.
- $p_2$  = density of media.
- $g$  = gravitational constant.
- $\eta$  = viscosity of media.

Gravitational constant can be change by increase the centrifuge to facilitate the setting which is called (centrifuge clarification) .

## **2. Filtration and percolation:**

Percolation is very simple methods that involve filtration though a piece of cotton or cloth whiles the more advanced technique (filtration) involve passing through a filter media like filter paper.

The rate of filtration is affected by many factors the viscosity of liquid media , size and the shape of suspended particles and the aim of the filtration whether is to get clear liquid or to get the

filtering media which is called cake . Other factors that are affecting the rate of filtration can be summarized by Darcys equations .

**Darcys equations:**

$$V = \frac{dV}{dt} = \frac{K A \Delta P}{\eta l}$$

- $dX/dt$  = rate of setting
- $K$  = constant.
- $A$  = surface area.
- $\Delta P$  = difference in pressure.
- $\eta$  = viscosity of media.
- $l$  = thickness of cake layer.

Change in pressure can be used to accelerate the process by a supplying the filtration equipment with increase pressure from the up or section pump from the down.

We have different type of filtration and equipment's depend on size and quantity of suspended material and on filter media:

- Sheet of woven material: where these sheet are made of cotton, wool or other material like filter paper.
- Porous plates: we can mad it from different substance like stones, ceramic and glass which are made as plates with different pore size.

- Membrane filter which are made from cellulose or its pores or its derivative these filter will form channels like pores of different size.
- Un woven fibrous material like glass cotton and special asbestos these type needs physical supported and are used for simple filtration or clarification.
- Granules or powder material, like small granules, sand, charcoal or any other inert material its also need support because some of the material pass with filtration.

### **3. Absorption method:**

- 1/ the foreign particles are soaked up or trapped within the media.
- 2/ filter media which act by absorption have high degree of porosity.

### **4. Adsorption method :**

- 1/ foreign particles adhere to the surface of the media.
- 2/ filter media act by adsorption present a large surface area to the liquid to be clarified.

Both of these processes are particularly important to remove finally divided solid and insoluble liquid material from solution.

These process need to add special particle help in clarification which is called **Filter Aides** which are finally divided materials

or ,in stances fibrous material which deposit in filter material  
example / talc, flutters earth ,bone black .

It may be added directly to the liquid which is to be filtered or  
used in the form of slurry in the solvent to precoate the filter.

Characteristic properties of filter aid:

- Chemically inert.
- Should have high absorptive properties.
- Should be of such of particle size that can be readily filtered out of the solution.