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It’s Important to Know!

BP304T — Pharmaceutical Engineering

B.Pharm Semester 3 · Unit 4 — Filtration and centrifugation

Unit IV: Filtration and centrifugation

Filtration

Filtration separates solids from fluids through a porous medium. The driving force may be pressure difference, vacuum, gravity or centrifugal force. Cake filtration forms a layer of retained solids; depth filtration captures particles within the medium. Darcy-type relationships show that rate depends on pressure, viscosity, area and resistance.

Filter media may be woven, non-woven, porous ceramic, membrane or other compatible material. Filter aids can improve cake permeability and reduce blinding. Plate-and-frame, leaf, cartridge, rotary drum and membrane systems serve different duties. Integrity testing, compatibility, adsorption and extractables matter for pharmaceutical filtration.

Centrifugation

Centrifugation accelerates sedimentation by applying a centrifugal field. Separation depends on particle size, density difference, fluid viscosity, rotor speed and path length. Perforated basket centrifuges retain solids while liquid drains through openings. Non-perforated baskets may handle liquid-liquid or fine separation. Semi-continuous and supercentrifuges provide higher throughput or force. Exact equipment classification should be checked against the prescribed text.

Selection and validation

Filter or centrifuge selection should consider feed properties, desired clarity, solids loading, shear, temperature, cleaning, containment and scale. A filtration or centrifugation endpoint must be linked to a quality attribute such as clarity, bioburden, particle count or yield.

Unit IV: Frequently asked questions

Q: What is filter-cake resistance?

A: It is the resistance to fluid flow created by the deposited solids layer, which usually increases as the cake builds.

Q: Why are filter aids used?

A: They can form a more permeable cake and reduce clogging or blinding of the primary medium.

Q: What controls sedimentation in a centrifuge?

A: Particle size, density difference, fluid viscosity, centrifugal acceleration and residence time are major factors.

Unit IV: Key takeaways

- Filtration separates by flow through a porous medium.
- Cake and medium resistance both affect filtration rate.
- Centrifugation increases the effective settling force.
- Integrity and compatibility are essential for pharmaceutical filters.
- Equipment should be selected against a defined quality endpoint.

Unit IV: Practical correlation

Practical correlation: sterile filtration. A sterile filtration process requires validated filter compatibility, integrity testing, controlled connections and an appropriate bioburden strategy. The required pore size and validation package are set out in the validated procedure for the product.