Assignment on Ultrafiltration

Submitted To

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Ultrafiltration

Introduction:

Ultrafiltration (UF) is a membrane filtration process similar to Reverse Osmosis, using hydrostatic pressure to force water through a semi-permeable membrane.

- The pore size of the ultrafiltration membrane is usually 103 - 106 Daltons.
- Ultrafiltration (UF) is a pressure-driven barrier to suspended solids, bacteria, viruses, endotoxins and other pathogens to produce water with very high purity and low silt density.

Ultrafiltration (UF) is a variety of membrane filtration in which hydrostatic pressure forces a liquid against a semi permeable membrane. Suspended solids and solutes of high molecular weight are retained, while water and low molecular weight solutes pass through the membrane. Ultrafiltration is not fundamentally different from reverse osmosis, microfiltration or nanofiltration, except in terms of the size of the molecules it retains.

- Ultrafiltration (UF) is used to remove essentially all colloidal particles (0.01 to 1.0 microns) from water and some of the largest dissolved contaminants.
- The pore size in a UF membrane is mainly responsible for determining the type and size of contaminants removed.
- In general, membrane pores range in size from 0.005 to 0.1 micron.

UF membrane manufacturers classify each UF product as having a specific molecular weight cutoff (MWC), which is a rough measurement of the size of contaminants removed by a given UF membrane. A 100,000 MWC UF membrane means that when water containing a given standard compound with a molecular weight of around 100,000 daltons is fed to the UF unit, nearly all of the compound will not pass through the membrane.

UF membranes are used where essentially all colloidal particles (including most pathogenic organisms) must be removed, but most of the dissolved solids may pass through the membrane without causing problems downstream or in the finished water. UF will remove most turbidity from water.

Utilization of ultrafiltration:

Ultrafiltration processes are largely confined to aqueous media, and most of what follows relates to aqueous systems. There are, however, no fundamental reasons why ultrafiltration cannot be performed with non-aqueous solvents (utilizing, of course, solvent resistant membranes); as a matter of fact, there are numerous commercially important petroleum and petrochemical purifications which can and ultimately will be performed by ultrafiltration with suitably constituted membranes

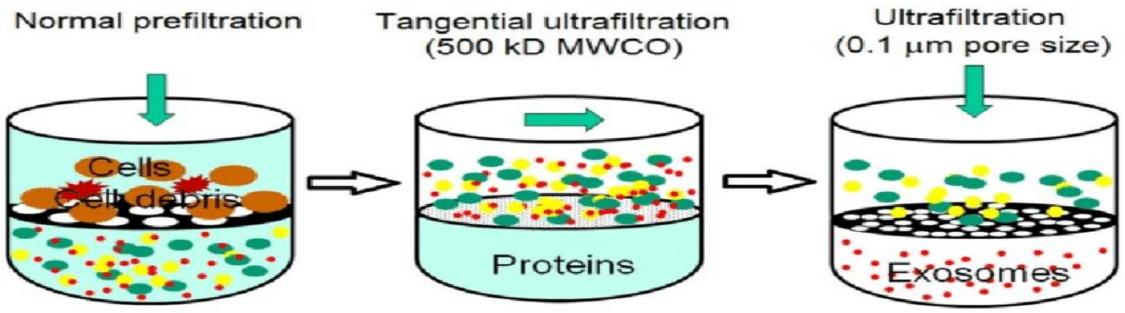
Ultrafiltration can be utilized to accomplish one or more of the following:

- concentration of solute by removal of solvent;
- purification of solvent by removal of solute;
- separation of Solute A from Solute B by ultrafiltration through a membrane permeable to A but not to B (or vice versa); and
- analysis of a complex solution for specific solutes to which the membrane is permeable.

While each of these procedures can be performed by alternate means (e.g., evaporation, dialysis, ultracentrifugation, chemical precipitation, etc.), ultrafiltration is usually the method of choice from the point of view of speed, efficiency, and cost, particularly when thermally unstable or biologically active materials are involved, or when large volumes of dilute solutions are to be processed.

How It Works!

Ultrafiltration uses hollow fibers of membrane material and the feed water flows either inside the shell, or in the lumen of the fibers. Suspended solids and solutes of high molecular weight are retained, while water and low molecular weight solutes pass through the membrane. Ultrafiltration is not fundamentally different from reverse osmosis, microfiltration or nanofiltration, except in terms of the size of the molecules it retains. When strategically combined with other purification technologies in a complete water system, UF is ideal for the removal of colloids, proteins, bacteria, pyrogens, proteins, and macromolecules larger than the membrane pore size from water.



What does ultrafiltration remove?

- Endotoxins
- Plastics
- Proteins
- Silica
- Silt
- Smog
- Viruses

Benefits:

- No need for chemicals (coagulants, flocculates, disinfectants, pH adjustment)
- Size-exclusion filtration as opposed to media depth filtration
- Good and constant quality of the treated water in terms of particle and microbial removal
- Process and plant compactness
- Simple automation
- Environmently friendly

Maintenance:

Ultrafiltration systems contain extremely fine membrane filters which need to be properly cleaned. The cleaning process used depends on whether a UF system is being used to remove organic or inorganic contaminants, or even both. To remove organic contaminants the general cleaning protocol for the cleaning of tubular membranes is to use a low foam, medium alkaline detergent at 0.6% to 1% for a maximum of 40 to 60 minutes. To remove inorganic contaminants the best treatment is with citric acid at a maximum concentration of 3.0 %. The

acid should circulate for 1 to 3 hours. Hydrochloric acid can also be used to clean membranes, as can oxalic, sulfuric and nitric acid.

References

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Thank You