

Submitted By
Farjana Akther
ID:171-34-630



Topic: Ultrafiltration

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Introduction

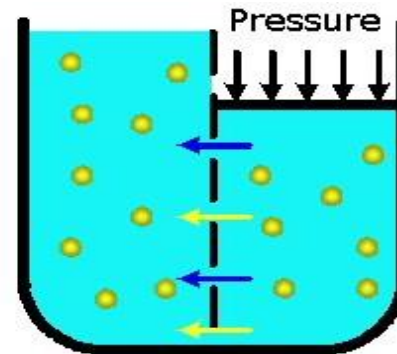
- ❖ Ultrafiltration (UF) is a variety of membrane filtration in which forces like pressure or concentration gradients lead to a separation through a semipermeable membrane .
- ❖ Ultrafiltration (UF) is used to remove essentially all colloidal particles (0.01 to 1.0 microns) from water and some of the largest dissolved contaminants.
- ❖ In general, membrane pores range in size from 0.005 to 0.1 micron.



Introduction

Ultrafiltration will remove :

- ❖ Endotoxins
- ❖ Plastics
- ❖ Proteins
- ❖ Silica
- ❖ Smog
- ❖ Viruses



Ultrafiltration

(Solution moves by pressure gradient)

Continue

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.

Applications

Animal Products Industry

- ❖ Red meat production
- ❖ Gelatin recovery
- ❖ Egg poultry
- ❖ Fish industry



Applications

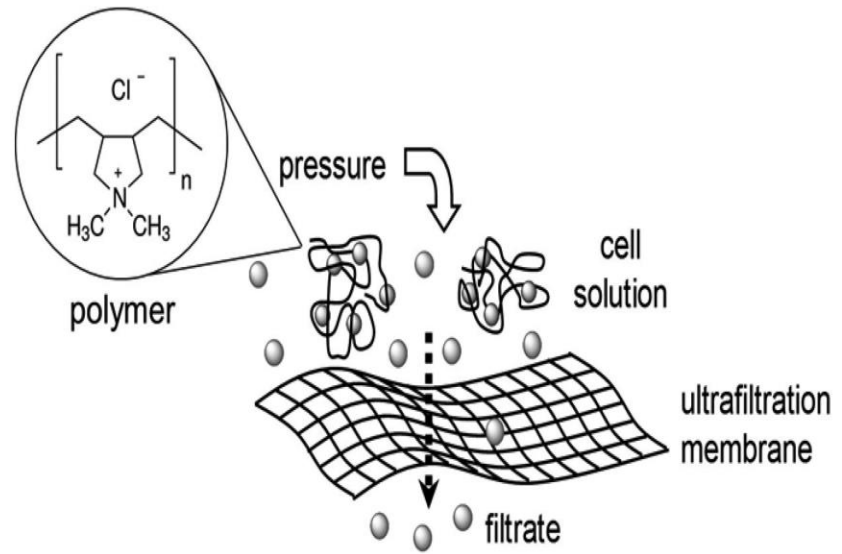
Water treatment

- ❖ Process water (remove oxides, acids/bases, pathogens, inorganic salts etc from raw water)
- ❖ Drinking water (viruses and various microorganisms are removed)
- ❖ Waste water (Remove pollution and reduction of waste from water)

Applications

Biotechnological Application.....

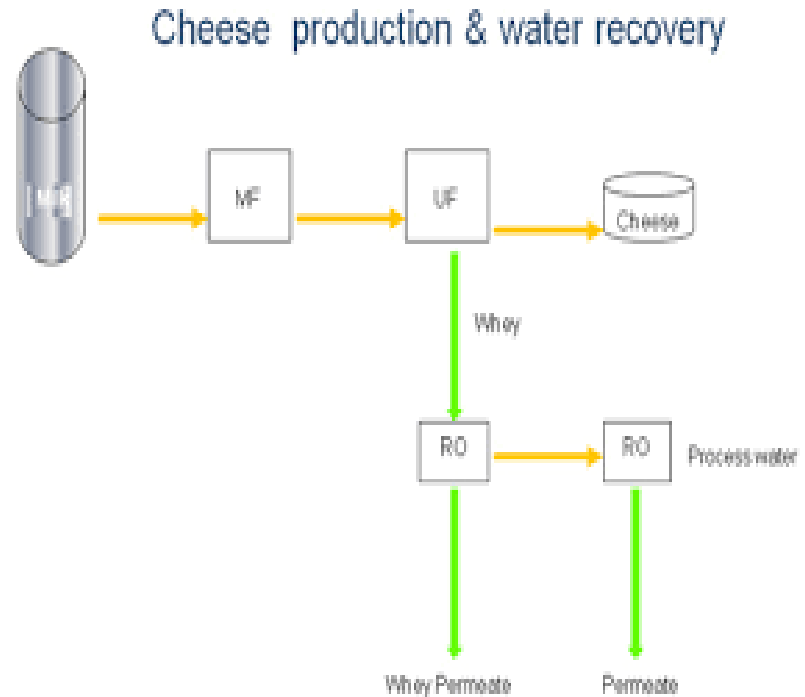
- ❖ Separation of microbial cells
- ❖ Recovery of enzymes
- ❖ Cell washing
- ❖ Product purification



Applications

Dairy Industry.....

- ❖ Cheese manufacturing
- ❖ Cheese whey UF
- ❖ Milk
- ❖ Fermented products



Applications

Other applications include:

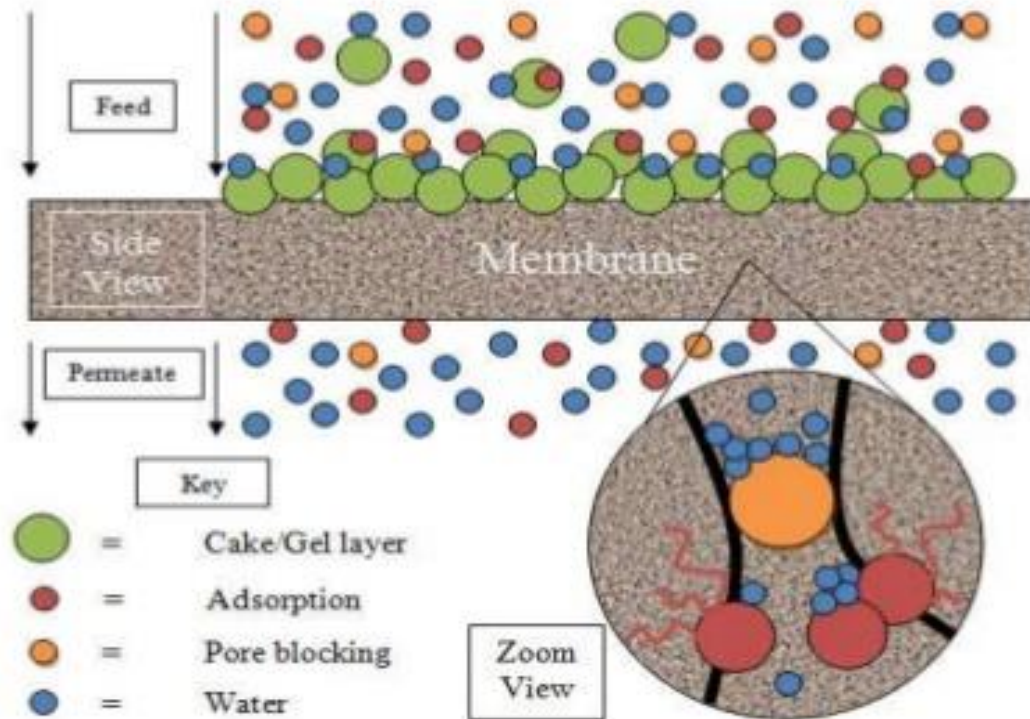
- ❖ Filtration of effluent from paper pulp mill
- ❖ Removal of pathogens from milk
- ❖ Fruit juice concentration and clarification
- ❖ Alcohol beverage industry
- ❖ Vegetable oils
- ❖ Sugar industry

Membrane Fouling

- ❖ Overtime the filtrate will accumulate on the membrane surface and clog the pores
- ❖ Greatly reduces membrane effectiveness and efficiency
- ❖ This reduces the effective TMP of the system ,therefore reducing permeation rate .The increase in concentrated layer at the membrane wall decreases the permeate flux,due to increase in resistance which reduces the driving force for solvent to transport through membrane surface

Membrane Fouling

Membrane Fouling (Continue..)



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.

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
- ❖ Environmentally friendly

