APPLICATION OF REVERSE OSMOSIS TO IMPROVE REMOVAL OF RESIDUAL SALT CONTENT IN ELECTRODIALYSIS PROCESS

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Salt is the most important source of industrial wastewater. Electrodialysis (ED) is a common technology for desalination. Pretreatment is necessary to prevent membrane damage. The article presents a critical review of using reverse osmosis (RO) to improve removing of residual salt from ED process.

Industrial wastewater is one of the most important sources of pollution affecting human life. The main discharged components of industrial wastewater are heavy metals, oils, dyes, aromatic hydrocarbons, pesticides, and salts [1]. A large number of inorganic salts with low or high concentration, such as sodium chloride, sodium phosphate, sodium bicarbonate and sodium carbonate are discharged into water bodies every year as a result of various industrial activities. Sodium chloride is usually a higher concentration of wastewater. In addition, due to the different content of organic and inorganic substances in industrial wastewater, a pre-treatment process based on traditional membrane separation is used. Microfiltration membrane (MF) is a traditional method for removing large particles of organic and inorganic compounds from wastewater, and then ED process is an efficient and economical method of desalination, especially at low salt concentrations.

Application of ED in industrial wastewater treatment was limited due to the fact that structure of ion-exchange membranes (IEMs) was initially heterogeneous, which had high surface resistance and poor selective permeability. However, with the development of homogeneous membranes, this problem was solved [2]. ED has a number of advantages, such as no osmotic pressure required, no additional chemical requirements, high product quality, long lifetime, environmental friendliness, and operated at elevated temperatures up to 50 oC. The driving force used in ED is electrical potential, which leads to ion transport (cations pass through the cation exchange membrane and anions pass through the anion exchange membrane) and reduces the concentration of ions such as salts, while the remaining components, such as organic materials and residual salt content are discharged as a dilute stream. Thus, the diluted solution may require additional processing when reused as water for industrial use. In fact, electrodialysis process requires two sources of energy: one is the energy required to transfer ionic components from one solution through the membranes to another solution, and the other is energy required to pump solutions through electrodialysis unit.

Reverse osmosis is approved worldwide for large-scale industrial applications such as desalination of seawater, brackish water, and industrial wastewater. Reverse osmosis

(RO) is pressure driven membrane separation processes can be used to remove salinity and dissolved organic matter, while reducing total organic carbon (TOC), chemical oxygen demand (COD) and biological oxygen demand (BOD). Schematic diagram in (Fig. 1) shows the design of the ED/RO process to improve removal of wastewater from industry and reuse it for further use.

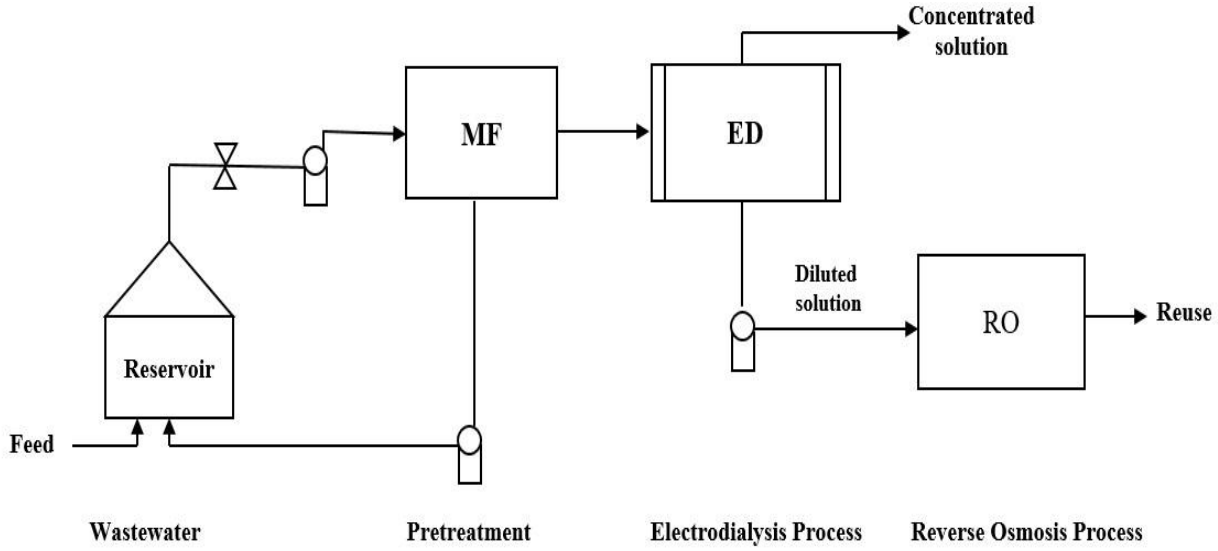

Fig. 1. Schematic diagram of RO/ED processes for industrial wastewater

Overall, combination ED/RO process is expected to significantly increase recovery rate of industrial wastewater after pretreatment with traditional membrane technology.

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