Chemical Engineering Department

Filter System for Water Treatment

Supervised
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Graduation Project
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Project's Abstract
many ways to get a better quality of drinking water to avoid the diseases caused by the contaminants in water We chose Ultrafiltration membrane out of many other options as reverse osmosis and Nanofiltration as it's more economic and has high removal rate of turbidity and organic matters And also we used the UV lamp that can convert organically combined phosphorous to orthophosphate and degrade natural organic matter By passing the feed water through the connected ultrafiltration membrane and the UV lamp, then by comparing the water chemistry analysis of feed water and product water we found out that the product water is of a better quality. This new filtration unit treats the water from the harmful biological and organic matters, preserving the level of minerals in water unaffected for human needs.

Nanoparticles Removal by Coagulation and Ultrafiltration

Supervised

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Graduation Project

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Project's Abstract

Nanoparticles are of great scientific interest as they are, in effect, a bridge between bulk materials and atomic or molecular structures, they have a lot of applications and important industries but they have harmful effect of human and environment. Nano filtration has high cost and Operates at high pressure, also cause high fouling.

So in our project we remove nanoparticles from water by ultrafiltration and use coagulation as a pretreatment. Ultrafiltration is used to prevent disadvantages of nanofiltration and reduce the cost as it use 20% only of energy consumption of nanofiltration.

Investigating the Effect Of Cell Hydrodynamics In Desalination of Saline Water by Sweeping Air Pervaporation Technicque Using Innovated Membranes

Supervised

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Graduation Project

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Project's Abstract

Scarcity of potable water nowadays, presents a serious problem all over the world. Environmental changes are taking place at a rapid pace, resulting in greenhouse effects, desertification and lack in fresh water. Accordingly, scientists are working hard toward inventing new techniques for desalinating seawater, which presents the only alternative solution to this problem. In this regards, desalination techniques are mainly divided into thermal and membrane techniques. In the present work, desalination by a novel membrane separation technique, the so-called sweeping-air pervaporation (PV), which has been very sparsely applied to desalination of seawater, has been conducted in our laboratory. The technique is simple, straightforward, cost-effective and does not suffer from limitations as regards low water recovery, such as reverse osmosis. Two pervaporation cells of different configurations and aspect ratios were designed and constructed, in order to investigate the effect of hydrodynamics on membrane performance. Numerous variables were applied, to study their effect on the pervaporate flux (J) and % salt rejection (%SR), and these were: initial salt solution concentration (C_i), pervaporation temperature (T_{pv}) and condensation water temperature (T_{cw}). It was found that the flux obtained was directly proportional to T_{pv}, and inversely proportional to T_{cw}, and that the flux was almost independent of C_i, and that much higher fluxes were obtained under the same conditions in case of the PV cell of higher aspect ratio. The activation energy for permeation through the membrane in both cells was computed from the Arrhenius equation, and was found to be 28 and 30 kJ/mole, for the cell with higher aspect ratio and lower aspect ratio, respectively, which were much lower than those reported in the literature, denoting easier permeation of water through the membrane, for the two cell designs, in particular that with higher aspect ratio. The results indicate that at all C_is tested, the product, after a once-through operation, was exceptional potable water with very low salinity even when C_i was 120.8 g/l, and maximum flux obtained was 5.575 l/m^{2}h at T_{pv}=70°C and Tcw=0°C. The separation factor (α), enrichment factor (β), pervaporation separation index (PSI), mass transfer coefficient (kov), and diffusion coefficient (D) through the membrane were all calculated and their values are stated

inside the thesis text. Nevertheless, α varied between0.975736and 1793.411 and PSI reached 4605.213, which are very high and much higher than those reported in the literature.