

Membrane Bioreactor for Wastewater Treatment and Reuse

Authors : Sarra Kitanou

Abstract : Water recycling and reuse is an effective measure to solve the water stress problem. The sustainable use of water resource has become a national development strategy in Morocco. A key aspect of improving overall sustainability is the potential for direct wastewater effluent reuse. However, the hybrid technology membrane bioreactors (MBR) have been identified as an attractive option for producing high quality and nutrient-rich effluents for wastewater treatment. It is based on complex interactions between biological processes, filtration process and rheological properties of the liquid to be treated. Currently, with the evolution of wastewater treatment projects in Morocco, the MBR technology can be used as a technology treating different types of wastewaters and to produce effluent with suitable quality for reuse. However, the energetic consumption of this process is a great concern, which can limit the development and implementation of this technology. In this investigation, the electric energy consumption of an ultrafiltration membrane bioreactor process in domestic wastewater treatment is evaluated and compared to some MBR installations based on literature review. Energy requirements of the MBR are linked to operational parameters and reactor performance. The analysis of energy consumption shows that the biological aeration and membrane filtration are more energy consuming than the other components listed as feed and recirculation pumps. Biological aeration needs 53% of the overall energetic consumption and the specific energy consumption for membrane filtration is about 25%. However, aeration is a major energy consumer, often exceeding 50% share of total energy consumption. The optimal results obtained on the MBR process (pressure $p = 1.15$ bar), hydraulic retention time (15 h) showed removal efficiencies up to 90% in terms of organic compounds removal, 100% in terms of suspended solids presence and up to 80% reduction of total nitrogen and total phosphorus. The effluent from this MBR system could be considered as qualified for irrigation reuse, showing its potential application in the future.

Keywords : hybrid process, membrane bioreactor, wastewater treatment, reuse

Conference Title : ICWTWCQ 2023 : International Conference on Wastewater Treatment, Water Cycle and Quality

Conference Location : Barcelona, Spain

Conference Dates : August 10-11, 2023