## Theme 6-1: Water and Wastewater Treatment - 2023

| Title | Name of the PI | List the Names of the Co-Is | Department | Abstract | Starting Date | Ending Date | Funding | Amount of Funding |
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| Experimental Study of Membrane Biological Reactor for Domestic Wastewater Treatment: Operating Conditions, Optimization and Performance | Sameer Al-Asheh | Ahmad Aidan | CHBE | Membrane Biological Reactor (MBR) turned to be one of the desirable technique for treatment of domestic wastewater and industrial wastewater. The high efficiency of MBR in treating and producing high quality effluent made it an attractive alternative to be used in municipal wastewater facility (Sharjah station, UAE). The use of efficient MBR can be advantageous in addressing the above mentioned challenges associated with conventional treatment. However, membrane fouling formed over the different membrane types, such as ceramic flat sheet, rotary disks, and hollowfiber is a complex phenomenon that causes a sharp decline of the permeate flux, increase in trans-membrane pressure, and biodegrade the membrane. Many researchers studied membrane fouling phenomena for the purpose of minimization and control of the fouling effects. Different techniques were suggested to minimize membrane fouling such as, operating in fed batch mode by applying intermediate suction in which foulant are allowed to diffuse away from the membrane when suction is stopped. | 01/06/2021 | 31/05/2023 | FRG | 246,250 |
| Microfluidic Electrochemical Desalination of Saline Water Using Novel Permselective Membranes | Naif Darwish | Raed Hashaikeh and Nidal Hilal (NYAD) | CHBE | The microfluidic approach to desalination offers several advantages over macrofluidic desalination. The operational parameters of a microfluidic cell can be controlled in a precise manner and a microfluidic platform is perfectly suitable for monitoring the performance of the system electrochemically. This research proposal addresses miniaturized electrochemical desalination using microfluidic devices, whereby the core concentration is on electrode/membrane fabrication and membrane material in the electrochemical setup.<br><br>We propose a miniature electrochemical system for desalination involving rapid NaCl removal using novel electrode and permselective membrane materials involved in the electrochemical reaction. Chloride ions will be removed through oxidation of the electrode material, while sodium will be transported across the permselective membrane material. Apart from the membrane material, cell configurations will be sought, such as planar, and tubular ones for optimum performances. Overall, an optimum condition will be sought for fast electrolysis time and maximum efficiency in terms of NaCl removal. Electrochemical desalination through this method will offer several advantages such as simple hardware, low input power (which can be coupled to renewable energy source), little capital investment, and serving as a sample treatment step to detect other micro-pollutants, which are otherwise difficult to detect in the presence of highly concentrated NaCl solutions. | 01/06/2021 | 10/03/2023 | FRG | 150000 |
| Batch Vacuum Pump Desalination | Mohammad Hamdan | Kareem Morsi | MCE | This work main objective is to improve vacuum pump water desalination (VPWD). Water desalination is an essential process to provide clean drinking water. Scarcity of clean drinking water is one of the most critical challenges that are facing humanity, which is directly affecting political and economic developments. In this proposal, an innovative cost-effective system for water desalination is proposed. The proposal aims to model, design and construct the innovative design. The proposed system will be design to compete with the currently used water desalination techniques such as Reverse Osmosis (RO). Most countries are suffering from limited fresh water resources. Around two thirds of the world's population experiences severe water scarcity for at least one month each year [1]. The main benefit of a vacuum pump desalination is that it reduces the cost of water purification significantly through a simple technique that relies on the wonderful thermodynamic concept; namely, that evaporation temperature depends on the saturation pressure. By reducing the pressure below the atmospheric pressure, using a vacuum pump, one can significantly decrease the evaporation temperature, hence requires less exergy to evaporate water. The system performance can be improved by implementing heat regeneration and co-generation. Regeneration allows recycling the heat removed at the condenser back to the evaporator, while the cogeneration allows the use of VPWD system as a refrigeration cycle. | 29/11/2022 | 10/06/2023 | URG | 4000 |
| Application of Mass Integration Network Technology for Wastewater Treatment Processes | Nabil Abdel Jabbar | Sameer Al-Asheh | CHBE | Due to water scarcity in the region, new technologies and new ideas can be adopted. These may include water recycling, reuse and regeneration. Implementation of these would save in water use and reduce effluent discharge with less environmental pollution. Effluent water from some processes can be used as feed material for other process uses under certain constrains. These constrains are normally related to the flow of water and level of contaminants in the required feed that should be carefully monitored. Pinch technology and process integration is one of the methods, which can target such a problem. It is a systematic approach for reducing water consumption and contaminant discharge through an integration of water network of certain facility. Therefore, this project aims at application of process integration to water or wastewater network of a facility in the UAE. A recommendation will be provided on the optimum scenario of operating the considered network. The project will focus on the chlorination disinfection unit and optimum chlorine dosage upon application of pinch technology. | 01/06/2019 | 31/05/2020 | FRG | 2500 |