



## SUSTAINING MEMBER

# UNITED ARAB EMIRATES UNIVERSITY

## UAEU's National Water and Energy Center conducts innovation research addressing water and energy sustainability

The UAE University at United Arab Emirates is the first and most comprehensive research university in the country and among the most prestigious universities in the region. It has the most advanced research and computational facilities that support its ambitious research and innovation strategy. During the last few years, the university has witnessed a rapid improvement in its research productivity and quality. The scholarly outcomes of the university have doubled during the period 2019-2022. According to THE Young Universities Ranking, the UAE University is ranked 38 globally. The University has also been ranked 90 globally based on the number of patents that have been granted from the US Patents and Trademark Office in 2021. A new initiative "Patents Accelerator Project" has been launched to support faculty members and inventors to protect their intellectual property and convert their inventions to commercial products to benefit the industry and community. The project aims to reduce the gap between academia and industry. While the United Arab Emirates, as a country, is regarded as a land for innovation, discovery and prosperity, the UAE University is the destination for top-scientists and inventors from around the globe. It represents the home of more than 650 faculty and researchers from more than 75 countries covering all the seven continents.

The UAEU's National Water and Energy Center (NWECC) is involved in cutting-edge research and innovation activities aiming at solving real-life water and energy problems that are of specific interest to the country and the region. Researchers from the NWECC have received several patents related to desalination technologies that aim to resolve the shortage of freshwater resources in arid and semi-arid regions. Recently, researchers of the NWECC received a patent on "Low Energy Desalination Systems." Unlike the current thermal and membrane technologies that are energy intensive, the proposed desalination technology deploys the basic principles of thermodynamics and law of conservation to evaporate the seawater and then condensate the vapor as freshwater. Utilizing a venturi device, the velocity of the seawater is increased causing a reduction in the pressure and achieving the vapor pressure of the liquid. The separation of the vapor from the fluid under high velocity and turbulent conditions remain as a challenge that the researchers of the NWECC are trying to resolve using small scale models in laboratories. This invention has further been developed to reduce the energy requirement for desalination of seawater. A sub-ambient solar desalination system is proposed including a solar pond and a pressure reducing structure. The solar pond is adapted for receiving saltwater and heating the saltwater through direct exposure to solar radiation at atmospheric pressure. The pressure reducing structure is in fluid communication with the solar pond for receiving heated saltwater therefrom. The pressure reducing structure is configured such that pressure of the heated saltwater within a central portion of the pressure reducing structure is at sufficiently reduced sub-ambient pressure to undergo a phase change to produce pure water vapor and a concentrated brine solution. The pressure reducing structure has a vapor outlet for releasing the pure water vapor, which is collected in a fresh water tank and condensed into pure liquid water. The solar pond is in fluid communication with an outlet portion of the pressure reducing structure for recycling the concentrated brine solution back to the solar pond.

The proposed desalination technology of the NWECC at UAE University represents a breakthrough in the desalination industry and might lead to a significantly low energy desalination system with minimum maintenance requirements.