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Seawater desalination through natural temperature difference: an experimental, theoretical, and place case study

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ABSTRACT

Sub-atmospheric vapor pipeline (SAVP) transfer is a new trend for water desalination that transports vapor from a warm area to a cold area, with many benefits. The theory, experiments, and field calculations of SAVP transfer for seawater desalination have been studied. The theory of this study has been based on the transmission line and mass and energy balance of a compressible fluid. In the laboratory section, equipped with a heating and an evaporating system for saline water (three salinities levels), a transmission line (three diameters) with different temperatures of the warm and the cold sources were employed on vapor transfer experiments. In the field section, vapor transmission with 1, 2, and 4 m diameters were studied with respect to the city of Bandar Abbas and Geno elevations at a distance of 30 km. It was determined that diameter, temperature difference, and salinity were the three factors affecting the efficiency of the SAVP transfer, respectively. The results of this study were presented in the mass outlet flow of condensed water at the destination. Given the margins of confidence and technical guaranty in calculations and implementation, it has been scientifically proven that the results of this study were significantly higher than previous studies.

Keywords: Seawater desalination; Vapor pipeline; Natural temperature difference; Sub-atmospheric vapor pipe line (SAVP); Compressible flow

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