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Experimental validation of MED forward feed steady-state model

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Abstract

This work presents the adaptation of a simple model to evaluate the physical performance of Multi-Effect-Distillation (MED) forward feed plants and its validation by comparing the results with real data. It is intended to use this model in the future in conjunction with simulation tools for Concentrated Solar Thermal Power (CSP) plants. The convergence criterion is based on the maximum difference between the heat transfer areas. The major internal thermodynamic losses and losses to the surroundings are assumed constant for all effects. The real data was obtained using the experimental MED plant at Plataforma Solar de Almeria (PSA) under steady-state operation near design conditions. The results indicate that the model can be used to make a first analysis on these type of systems.

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1. Introduction

Water stress is becoming an ever growing concern in many parts of the world, with implications not only in the access of general population to this resource but also on several different types of economic activities that depend directly on its availability. The established technologies used to produce clean water are very energy demanding making water production directly tied to other global issues such as energy security and availability, carbon emissions and sustainability [1].

The thermal desalination processes have been used for more than half a century now, with the Multi-Effect-Distillation (MED) and Multi-Stage-Flash (MSF) processes being the most relevant. These together with Reverse Osmosis (RO) represent the "work horses" in the clean water production industry worldwide.

As zones with water scarcity normally present high levels of solar irradiance, clean water production powered by solar technologies have the potential to be economically feasible and environmentally sustainable [2].

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