

Two-Channels Thermal Energy Storage Tank: Experiments and Short-Cut Modelling

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Abstract : This paper presents the experimental results and the related modeling of a thermal energy storage (TES) facility, ideated and realized by ENEA and realizing the thermocline with an innovative geometry. Firstly, the thermal energy exchange model of an equivalent shell & tube heat exchanger is described and tested to reproduce the performance of the spiral exchanger installed in the TES. Through the regression of the experimental data, a first-order thermocline model was also validated to provide an analytical function of the thermocline, useful for the performance evaluation and the comparison with other systems and implementation in simulations of integrated systems (e.g. power plants). The experimental data obtained from the plant start-up and the short-cut modeling of the system can be useful for the process analysis, for the scale-up of the thermal storage system and to investigate the feasibility of its implementation in actual case-studies.

Keywords : CSP plants, thermal energy storage, thermocline, mathematical modelling, experimental data

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