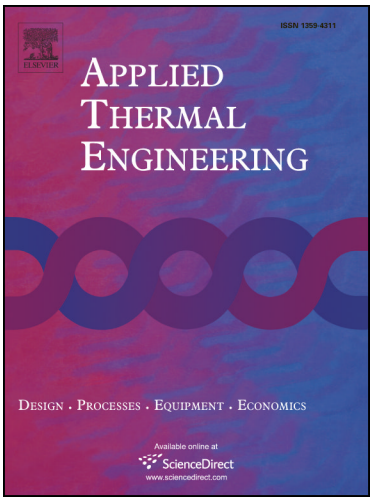

Natural and by-product materials for thermocline-based thermal energy storage system at CSP plant: compatability with mineral oil and molten nitrate salt

Yaroslav Grosu, Iñigo Ortega-Fernández, Juan Miguel López del Amo, Abdessamad Faik

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Natural and by-product materials for thermocline-based thermal energy storage system at CSP plant: compatability with mineral oil and molten nitrate salt

Yaroslav Grosu, Iñigo Ortega-Fernández, Juan Miguel López del Amo and Abdessamad Faik**

CIC Energigune, Albert Einstein 48, Miñano (Álava) 01510, Spain.
ygrosu@cicenergigune.com, afaik@cicenergigune.com

Abstract

The use of thermal energy storage (TES) systems at concentrated solar power (CSP) plants is one of the main ways of increasing the dispatchability and hence the competitiveness among other renewable energies. The thermocline packed bed TES technology is particularly attractive in terms of cost-effectiveness. This is due to the single-tank configuration and the possibility of using low cost filler materials as TES working body. One of the main concerns for packed bed TES systems is the thermal and chemical stability of a filler material in direct contact with the heat transfer fluid. With this regards, the compatibility of previously evaluated filler materials with paraffinic mineral oil and with molten HitecXL salt heat transfer fluids is reported in this work. The most promising material will be selected for its implementation in the packed bed TES unit deployed at the 1 MW_{el} pilot CSP plant and its 1/100 scale prototype constructed in the framework of the H2020 ORC-Plus project.

Key words: Thermal energy storage, thermocline, compatibility

1. Introduction

Global energy consumption trends, as well as global CO_2 emissions predictions [1], are strong indicators of the urgent and mandatory need to shift to renewable energy. Efficient energy storage systems that allow improving the power dispatchability are one of the main challenges on the way of making the use of renewable sources market competitive. Concentrated solar power (CSP) is a