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## Archimede Solar Energy molten salt parabolic trough demo plant: a step ahead towards the new frontiers of CSP

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### Abstract

Since July 2013 the first stand-alone Molten Salt Parabolic Trough (MSPT) plant, located adjacent to the Archimede Solar Energy (ASE) manufacturing plant in Massa Martana (Italy), is in operation.

After one year of operation, the management of the ASE demonstration plant has shown that MSPT technology is a suitable and reliable option. Several O&M procedures and tests have been performed, always with very good results confirming that this approach can be easily scaled up to realize standard size CSP plants without any concern, if the plant design takes into account molten salt peculiarities.

In this paper a brief description of the plant and the overall and main plant operation figures will be presented.

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## Nomenclature

ASE	Archimede Solar Energy
CSP	Concentrating Solar Power
LCOE	Levellized Cost Of Electricity
MS	Molten Salt
MSPT	Molten Salt Parabolic Trough
O&M	Operation and Maintenance
SCA	Solar Collector Assembly
HCE	Heat Collecting Element

## 1. Introduction

Since July 2013 the first stand-alone Molten Salt Parabolic Trough (MSPT) demo plant, located close to the Archimede Solar Energy manufacturing plant in Massa Martana (Perugia), is in operation.

The MSPT demo plant aims to be a showcase for the Molten Salt technology and the Italian supply chain and, at the same time, to demonstrate the manageability, the efficiency and the robustness of such kind of plants that several CSP experts consider to be one of the best ways to decrease Concentrating Solar Power (CSP) plant's Levellized Cost Of Electricity (LCOE) [1,2,3,4,5].

Achieving such significant points has been possible thanks to both ASE and his shareholder Chiyoda's strong commitment and to the important support and contribution given by the other partners, here represented as co-authors.

The present paper will neither cover any aspect related to performance of the entire system nor the single subcomponents (further scientific papers dealing with these matters will be published). It will focus, however, on the management and reliability of the system trying to debunking the negative myths generally associated with MSPT technology such as the heat transfer fluid freezing and the operation complexities.

## 2. Demonstration plant description

The ASE MSPT demo plant is composed of a single loop made by six SCAs, each one having a collecting surface of roughly 600 square meters equipped with high temperature solar receivers. The solar loop is connected to a molten salt storage system constituted of two tanks of about 25 cubic meter each in which the salt (roughly 50 tons) is located.

For the first year of operation, the collected heat has been dispersed into the environment by mean of a molten salt to air heat exchanger; but in the summer of 2014 a steam generating unit will be realized and operated on the plant.

The next figures show a simplified scheme of the plant (Fig.1), a 3D drawing of the plant's main equipment (Fig.2) and a picture of the solar loop in operation (Fig.3).

For the MS management the plant is provided with suitable preheating systems, based on two different approaches: all the solar field piping, including the 144 receiver tubes and the interconnecting flex hoses, as well as the air cooler are heated up by Direct Joule effect; the piping connecting the solar collectors to the molten salt tanks as well as all the valves are heated up by means of mineral insulated cables.

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