Raising the Lifetime of Functional Materials for Concentrated Solar Power Technology

Edition: July 2017

Dear Reader,

Our newsletters focus on raising the lifetime of key functional materials for concentrated solar power (CSP) technologies. In this second edition of our newsletter we look in more detail the approach of the RAISELIFE project on the assessment and improvement of the primary reflector coatings in Section *Special Topic "Improving service lifetime prediction methodology"*. In addition we introduce to you specific News from our partners.

We address this newsletter to stakeholders who are active in the field of Concentrated Solar Power Plants, from power plant developers / operators and technology suppliers to the scientific community as well as governmental bodies. Members from the general public who are interested in topics related to the RAISELIFE project, such as concentrated solar power, and material durability will also gain from our newsletter.

Enjoy reading!

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 686008.

Special topic: Improving service lifetime prediction methodology

Partners involved

CIEMAT, Spain
FLABEG FE GmbH, Germany
DLR, Germany
MASCIR, Morocco
BrightSource Industries (Israel) Ltd., Israel

Importance of topic

Accelerated lifetime prediction procedures for solar mirrors are fundamental for mirror manufacturers for quality control and the development of new materials, as well as for plant developers to make decisions on material selection. Due to the fact that the solar field presents a major part in the investment for any CSP plant project and the sheer number of employed mirrors, improved materials with lower costs can directly lead to lower electricity prices.

Current state of art

Standard tests adopted from other industry sectors, but no specifically designed for CSP, are usually conducted. Small reflector samples are therefore tested in climatic chamber and environmental stresses like high temperature, humidity, UV radiation or particle erosion are artificially applied. A first standard was recently published to standardize the test parameters which serve as a set of minimum requirements for the mirrors [1].

The RAISELIFE approach

As it is being proved that standard tests are not able to reproduce the degradation adequately, an improved testing methodology is being developed within the project. The in-service degradation is analysed based on an extensive outdoor campaign and at the same time advanced test procedures are investigated. For the outdoor campaign small mirror samples of different types are exposed on representative sites for CSP (Photo: site in the Atacama desert, Chile, with very high irradiance values), covering conditions ranging from desert, coastal, industrial to high altitude. The natural degradation mechanisms are analysed in detail and a comparison of the different materials is conducted. These mechanisms also serve

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as an input for the accelerated test procedure. Under natural conditions the different environmental stresses act together and with varying strength. The new advanced procedures are based on a more realistic application of stresses, combining a higher number of stresses and using non-constant cyclic application. The goal is to develop a procedure that provokes the degradation mechanisms in a realistic way and thus allowing the prediction of the service lifetime of tested materials depending on the foreseen outdoor conditions.

Possible impact

With a realistic lifetime prediction tool, manufacturers will be able to develop more competitive new products in a shorter time, at lower costs and with higher reliability. The higher reliability will improve the bankability for project developers and help them to choose the proper solution as a reflector for their respective conditions.

References:

[1] Sallaberry, F., Fernández-García, A., Lüpfert, E., Morales, A., San Vicente, G., Sutter, F. Towards standardized testing methodologies for optical properties of components in concentrating solar thermal power plants. 22nd SolarPACES 2016. Abu Dhabi (United Arab Emirates). October, 11-14, 2016.

News

Project PEGASUS: Storing Solar Energy in Sulphur

DLR solar researchers together with European research partners develop a novel process for CO_2-free power generation based on the combustion of sulphur allowing to store solar energy in the form of sulphur. For this purpose, a CSP concentrating solar power tower plant with particle receiver technology is integrated in a sulphur cycle. Sulphur can permanently store solar energy with low energy losses and 30 times higher energy density as conventional molten salt storage systems. The long-term storage of solar energy is an important prerequisite to completely replace fossil power plants with renewable energy sources. Furthermore, sulphur can be easily transported as solid or liquid by ship, train or truck.

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In the framework of the project, the solar centrifugal receiver developed by DLR with its integrated thermal storage concept will be combined with a newly developed moving bed particle reactor for sulphuric acid decomposition. The demonstration of this pilot plant is planned for the last year of the project at the DLR large-scale facility Juelich Solar Power Tower.

Author: DLR – Institute of Solar Research, Dennis Thomey

Link to news: http://www.dlr.de/sf/en/desktopdefault.aspx/tabid-10436/20662_read-49193/

CIEMAT organised the first joint WASCOP & MinWaterCSP workshop on water consumption in CSP plants

On 29th November 2016, CIEMAT organised a joint conference at the Plataforma Solar de Almeria with representatives of CSP plants and the partners of two European H2020 Projects to minimise water consumption at these plants. Partners of the MinWaterCSP and WASCOP project discuss with CSP plant stakeholders about their solutions to reduce water consumption in the steam cycle and in cleaning, soiling and water treatment in solar fields. CSP plant operators expressed a positive feedback about the workshop and the relevance of the project activities. Delegates confirmed their interests in the R&D content and methodologies which will be potentially integrated in the current or new CSP plants. Stakeholders provided important inputs for both consortiums which will be taken into consideration during the next implementation phase of the project tasks.

About the projects

MinWaterCSP is a research and development project which aims at reducing water consumption and improving cycle efficiencies of Concentrated Solar Power plants. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 654443.

WASCOP is a project funded by the European Union's Horizon 2020 research and innovation programme (GA No. 654479), which aims to develop a revolutionary innovation in water management of Concentrating Solar Power Plants, a more flexible

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integrated solution comprising different innovative technologies and optimized strategies for the cooling of the power-block and the cleaning of the solar field optical surface.

Link to news: 2016-11-30_MinWaterCSP-WASCOP_press-release_joint-event

Author: CIEMAT, Arantxa Fernández

Meet us at Events

SolarPaces 2017 Conference in Santiago de Chile (Chile), 26–29 September 2017, represented by DLR, CIEMAT, UCM and INTA.
http://2017.solarpaces-conference.org/home.html

High Temperature Materials- EERA workshop in Prague (Czech Republic), 21-22 November 2017, represented by DLR.

https://www.eera-set.eu/high-temperature-materials-eera-workshop-materials-for-high-temperature-application-in-energy-technologies-eupro-ii-seminar-in-prague/

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