

## HyConSys

### Hydrogen control in solar thermal parabolic through heat transfer fluid systems

*Project duration: from 01.2018 to 12.2020*

*Report submitted: 11.2021*

#### **Publishable Summary**

The project aimed at controlling hydrogen (H<sub>2</sub>) in the heat transfer fluid (HTF) of solar thermal parabolic trough plants within acceptable limits. H<sub>2</sub> is slowly formed by the HTF that is currently used in the plants and which is based on aromatic hydrocarbons. The formation rate depends on the operating temperature and the condition of the fluid. Aged qualities reveal higher formation rates. H<sub>2</sub> permeates through the steel pipes of the heat collecting elements (receivers). If the gas would accumulate inside the annular gap of the receivers the insulating vacuum would be lost and unacceptable heat losses would result as a consequence.

In order to prevent this condition, getter materials are located inside the annular gap. The getters absorb H<sub>2</sub> and therefore maintain the vacuum insulation. If the design conditions in terms of H<sub>2</sub> concentration in the HTF are maintained, the getters will be saturated not before the specified lifetime of the receivers. A problem is caused if the H<sub>2</sub> concentration is larger than specified at the maximum operating temperatures. This would cause unacceptably low useful lifetimes of the receivers.

The HyConSys project aimed at testing measures against H<sub>2</sub> accumulation in the HTF like removal of H<sub>2</sub> by nitrogen exchange from the system and by processing steps. This was guided by detailed lab analysis in order to provide in-depth understanding of the relevant processes. Hereby economic measures for H<sub>2</sub> removal were identified and optimized.

The results were integrated within a computer model together with cost models to develop a tool for identification of the most economic H<sub>2</sub> control strategy for specific CSP systems.

This approach was supported by developing new catalysts for H<sub>2</sub> removal and by easy to use techniques for H<sub>2</sub> analysis.

It is expected that this combination of analysis, development and improving knowledge will significantly help to overcome the currently upcoming H<sub>2</sub> problems in CSP systems.

## Project consortium

Coordinator and all contact details:

Full name of organisation:	Deutsches Zentrum für Luft- und Raumfahrt e. V.
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Participating countries and financing:

Country	Number of organisations involved	Project costs in EUR	Public funding in EUR
Germany	2	679'608	579'358
Spain	2	311'119	186'672
<i>Total</i>	<i>4</i>	<i>990'727</i>	<i>766'030</i>

## Funding agencies involved and contracts

Funding Agency	Contract N° and Title
PtJ	0324235A, Untersuchungen zur Wasserstoffbildung im Wärmeträgermedium und zur Wasserstoffpermeation in die Receiver 0324235B, Entwicklung von Sensoren zur kostengünstigen Analyse und von nanostrukturierten Katalysatoren zur Entfernung von Wasserstoff
CDTI	EXP - 00108705 / SERA-20181009, control de hidrógeno en los circuitos de fluido térmico de centrales termosolares con colectores cilindroparabólicos

*Acknowledgement: The project "HyConSys" was supported under the umbrella of SOLAR-ERA.NET Cofund by PtJ and CDTI. SOLAR-ERA.NET Cofund was supported by the European Commission within the EU Framework Programme for Research and Innovation HORIZON 2020 (Cofund ERA-NET Action, N° 691664).*