

## 2020 HIGHLIGHTS

# Task 62 – Solar Energy in Industrial Water & Wastewater Management

### THE ISSUE

The change to a sustainable, resource- and energy-efficient industry represents a significant challenge for the coming years. The efficient supply of energy, the best possible integration of renewable energy sources and the recovery of resources in the sense of a circular economy must go hand in hand. The use of solar process heat represents a large, but so far largely unused, potential in industry. Innovative and concrete solutions are needed for the long-term and successful introduction of solar thermal energy. The integration of solar process heat to supply technologies for wastewater treatment represents a new field of application with excellent technical and economic potential for solar thermal energy. The efficient interaction, the nexus between solar energy, water and industry opens up new and innovative approaches.

### OUR WORK

SHC Task 62 is developing and providing the most suitable and accurate information on the technical and economical possibilities for effectively applying solar thermal energy and solar radiation to disinfect, decontaminate and separate industrial process water and wastewater. This Task is supporting specifically the solar energy industry, the water technology sector and the producing industry in identifying new technologies, innovative fields of application and business opportunities.

The main objective of Task 62 is to improve the conditions and increase the applications of solar-driven separation and water purification technologies in industrial applications in order to push the solar water treatment market and to solve water problems at locations with abundant solar energy resources. Innovative results are expected in the field of collector technology and the identification of new applications, such as for municipal and industrial wastewater treatment plants.

#### Participating Countries

*Australia*

*Austria*

*Germany*

*Italy*

*Netherlands*

*Spain*

*Sweden*

*France*

*Portugal*

*UK*

Task Period            2018 – 2022  
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### KEY RESULTS IN 2020

#### Nexus Energy, Water & (Bio) Industry

On 30 January 2020, AEE INTEC (Operating Agent Christoph Brunner) hosted a conference at the Austrian Federal Economic Chamber on the topic “Nexus Energy, Water and (Bio) Industry.” The outcome of this one-day conference was quite clear – **water and energy in industrial applications have become central issues that require holistic approaches.** The main objective is to increase solar thermal energy use in industry, develop new collector technologies, and open up industrial and municipal water treatment as a new field of application for solar thermal energy as there is high market potential.



#### SHC Task 62 Industry Workshop

The 5<sup>th</sup> Online Expert Meeting of SHC Task 62 last November opened with an Industry Workshop organized jointly with Victoria University (Prof. Mikel Duke – Subtask C Leader). Talks from Operating Agent Christoph Brunner, Subtask A Leader Joachim Koschikowski, and Subtask B Leader Isabel Oller included topics from Task 62 work, the drivers for renewables in industry, and research on advanced solar and water technologies and research.

Discussions in the breakout sessions showed that the main industry drivers to integrate renewables to reduce water treatment emissions are **regulations**. Additionally, there is a specific **need for business cases** and the definition of **selection criteria for technologies** (e.g., costs, reliability, resource recovery, emission reduction, etc.) and **financing and risk strategies**. Specific research needs for solar technologies in water treatment were identified in **energy storages and technology flexibility, long-term and pilot testing of technologies to get answers on reliability**. Further **communication and dissemination strategies** on results are essential.



#### Specification of System Design and Key Performance Indicators as Basis for Comparative Simulation Studies

In 2021 **Deliverable A.3. on “Specification of System design and key performance indicators as basis for comparative simulation studies”** will be finalized. This report (1) identifies tools available for simulation of Membrane Distillation, (2) defines inputs/outputs as well as boundary conditions and technical configuration for the simulation and design of a MD system, and (3) defines key performance indicators, which will be derived for assessment and comparison.

### Overview on Available Solar Based Technologies Applied for Industrial Wastewater Treatment

To better understand the need for solar thermal water treatment technologies in industry and the technologies available from researchers and companies, a “User Need and Technology Profile (UNTP)” template was prepared within Subtasks B and C. The results give an overview of organizations actively promoting a technology that uses solar energy to treat wastewater. This work will continue in 2021 and include industries already reusing wastewater and show potential new application sectors for solar water treatment. In terms of solar water decontamination and disinfection using Advanced Oxidation Processes (AOPs), olive mill wastewater, cork boiling wastewater, Agro-Food industry effluents, pharmaceutical wastewater, etc., are mentioned. Based on these topics of SHC Task 62, the reports **“Existing solar-based technologies applied to industrial water decontamination and disinfection (real and research cases). Potential applications on industrial new sectors”** and **Technologies to be considered for guidelines** were completed and will be posted on the SHC website in 2021.



*Pilot photocatalytic plant installed at Finca Torreblanca, Torre Pacheco, Murcia, Spain (<http://www.life-aquemfree.eu/>)*

### Interest in Ammonia Recovery

Task participants from various institutes and universities have expressed interest in collaborating on ammonia separation. Examples of ammonia separation work include:

- Within the Austrian flag-ship project “Thermafex,” AEE INTEC tests ammonia recovery with membrane distillation via building up a pilot at a wastewater treatment plant. The system is now in the commissioning phase at a wastewater treatment plant in Austria.
- CIEMA P.S.A. has designed a new membrane distillation system for ammonia recovery. It is now under construction by APRIA Systems. The system is composed of a MD system coupled to a crystallizer for ammonia and other salts recovery. This design has been carried out in collaboration with the University of Aalborg, specifically with Cejna Anna Quist-Jensen. The new MD system is much more robust to face high pH and ammonia conditions.
- SolarSpring and Fraunhofer ISE developed a demonstration system for ammonia extraction from municipal wastewater. The system is currently under construction and will be implemented at a wastewater treatment plant near Freiburg in November 2020.