ASIA-PACIFIC
SOLAR RESEARCH CONFERENCE

Solar energy in industrial water
"System integration and decision support for end user needs"

Lavern T. Nyamutswa[1], Wei Yang[2], Mikel C. Duke[1] and Cagil Ozansoy[2]

[1]*Institute for Sustainable Industries and Liveable Cities, Victoria University, Melbourne, Australia*
[2]*College of Engineering and Science, Victoria University, Melbourne, Australia*
E-mail: cagil.ozansoy@vu.edu.au

Background

One of the biggest challenges facing the world in the coming years is to move away from non-renewable energy towards resource and energy efficiency in sustainable industries. The practical solutions to the challenge include improving efficiency in the supply of energy, integrating renewable energy sources into industrial processes as well as resource recovery to enhance the circular economy. Solar process heat has been identified as possessing a lot of potential in providing renewable thermal energy to industry, but this potential is still largely underutilized. In particular, there is potential to integrate solar energy into water treatment technologies. To unlock this potential, the Solar Heating and Cooling (SHC) program of the International Energy Agency (IEA) has developed Task 62: Solar Energy in Industrial Water and Wastewater Management to improve the solar energy and water nexus. IEA SHC Task 62 aims to increase the use of solar thermal/photon energy in industry, to develop new collector technologies and to open up industrial and municipal water treatment as a new area of application of solar energy with a high market potential.

Task 62 will develop and provide 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. The task will support the solar energy industry, the water technology sector and the producing industry in identifying new technologies, innovative fields of application and business opportunities. This task is led by Christoph Brunner (AEE INTEC, Austria) and subtask leaders are Dr Isabel Oller (CIEMAT-PSA, Spain), Dr Joachim Koschikowski (Fraunhofer-Institute for Solar Energy Systems ISE, Germany) and Prof Mikel Duke (Victoria University, Australia). It is further divided into 3 subtasks, and Victoria University in Melbourne, Australia, is participating in this task by contributing to Subtask C "System integration and decision support for end user needs"

Subtask C: System integration and decision support for end user needs

The main objective of the subtask is to develop a guideline for decision-making support, designed specifically for end-users/technology adopters, such as solar thermal companies, manufacturers, food producers and water utilities operating a wastewater treatment plant, to select the optimized combination of water treatment technology in combination with solar thermal/photon supply technology to achieve a certain practical outcome. The practical outcome could be something such as removing contaminants from wastewater prior to environment disposal or reuse.

Subtask C is now contacting potential stakeholders in water and wastewater industries in order to survey current technologies used or available on the market that apply solar thermal and solar radiation energy for the process and treatment of water and wastewater, including energy supply technologies, storage

management and industrial heat flows. Potential stakeholders are asked to provide information on emerging technologies that they supply, use or need, including simulation tools and design strategies of solar thermal and radiation systems.

Table 1 summarises the classification of the contacts. Of the 288 names who have been contacted so far, 24 have indicated their interest to be a stakeholder and that they have technologies which fall under the purview of the task and are interested in providing more information. Of these, two are end-users of technology, one is both a technology provider and end-user and the rest are technology providers, as summarised in the table below. Technology providers who have provided information about their technology include four companies, one of which supplies solar thermal collectors and another has a solar photo-Fenton demonstration plant. The third company has demonstrated solar thermal evaporation and solar membrane distillation at the pilot plant scale, while the last one has solar photo-electrocatalysis technology which has been tested at the lab scale. Three respondents are researchers at universities with validated pilot plant tests on solar desalination and solar photo-Fenton technologies. One research group has validated a solar photo-Fenton process which is already being used at a full scale plant. The same research group is also working on solar heterogeneous photocatalysis at the pilot plant scale.

Table 1. Contacted potential stakeholders and their classification

Total names contacted	Interested stakeholders	Technology providers	Technology end-users
288	24	22	3

More potential stakeholders are expected to provide information to the project. The information that is being gathered will be streamlined into a user friendly directory of technology providers as well as end-users who require a specific solar water treatment technology or outcome, as well as the technical features of each technology. At its end, Subtask C will deliver findings to suit end-users interested in harnessing solar thermal energy to achieve a certain water treatment requirement in their industry.

More details including background information, reports and contacts to participate can be found on the website: http://task62.iea-shc.org/

Acknowledgement

Funding to participate in this subtask was provided by Australian PV Institute (APVI) and the Australian Renewable Energy Agency (ARENA) through the International Engagement Program