

IEA SHC – Task 33

IEA Solar PACES – Task 4



Solar Heat for Industrial Processes

Evaluation of the potential of solar process heat in participating countries

Integrating solar thermal systems into industrial processes

Collector development and optimization (up to 250°C)

Numerical models for solar process heat applications

Monitoring of pilot plants


INTERNATIONAL ENERGY AGENCY
Solar Heating & Cooling Programme
www.iea-shc.org


SolarPACES
www.solarpaces.org

Background

The use of solar energy in commercial and industrial applications is currently insignificant compared to the use in swimming pools and the household sector. Most solar applications for industrial processes have been on a relatively small scale and are mostly experimental in nature. Only a few large systems are in use world-wide.

On the other hand, if one compares the energy consumption of the industrial, transportation, household and service sectors, then one can see that the industrial sector has the biggest energy consumption in the OECD countries at approximately 30%, followed closely by the transportation and household sectors.

The major share of the energy which is needed in commercial and industrial companies for production processes and for heating production halls, is below 250°C. The low temperature level (80°C) complies with the temperature level which can easily be reached with solar thermal collectors already on the market. For the medium temperature level, a number of new collector designs are currently being developed.

To be able to make use of the huge potential for solar heat in industry and to open a new market sector for the solar thermal industry, it is necessary to integrate solar thermal systems into the industrial processes in a suitable way. This may include further development of the solar thermal components so that they fulfil the requirements stipulated.

This Task is a collaborative research project of the IEA Solar Heating and Cooling Programme and the IEA SolarPACES Programme bringing together experts and industries from the residential solar heating field and the high temperature solar power field.

Main Activities

- Potential studies for all participating countries
- Investigation of the most promising applications and industrial sectors
- Development of integral solutions for solar thermal energy applications for given industrial processes
- Development and optimisation of collectors and all other components of the solar loop for medium temperature applications (up to approx. 250°C)
- Collector and component testing (medium temperature applications)
- Development of methods and test procedures for reliability assessment, especially the durability of materials and components
- Development of design tools (based on TRNSYS simulations) and a software tool for fast feasibility assessment.
- Economic analyses
- Feasibility studies
- Design and construction of pilot plants in co-operation with industry



Subtasks

A Solar Process Heat Survey and Dissemination of Task Results

The objective of Subtask A is to provide a comprehensive description of the potential and the state-of-the-art of solar heat for industrial processes. The accumulated knowledge is disseminated to solar manufacturers, process engineers, installers and potential buyers (industry). This is done by publishing an annual industry newsletter, an information dossier and a handbook on solar process heat and by industry workshops throughout the duration of the Task.

Subtask Lead Country: Spain

B Investigation of Industrial Energy Systems

The objectives of Subtask B are to identify applications and the corresponding temperature levels of the processes and/or the energy utility system suitable for solar energy. Methodologies are investigated and developed to come to integrated solutions considering solar thermal, waste heat recovery and improvements in the processes and energy utility systems.

Subtask Lead Country: Austria

C Collectors and Components

The objective of Subtask C is to develop, improve and optimise collectors, components and systems with a potential for integration in industrial processes with a temperature level up to 250°C. For a given application, the most suitable collector technology has to be selected for process heat from uncovered collectors, (advanced) flat plate and vacuum-tube collectors to concentrating collectors.

Appropriate durability test tools will be applied to specific materials and components to allow the prediction of service life and to generate proposals for international standards.

Subtask Lead Country: Germany

D System Integration and Demonstration

The main objective of Subtask D is to initiate pilot projects covering a broad variety of technologies in suitable applications representing a significant part of industrial process heat consumers (in terms of size, temperature levels, heat transfer media, load patterns, etc.). The operation of these plants shall be monitored for a representative period to provide feedback on the design and operation concept as a basis for future developments and improvements.

Subtask Lead Country: Germany

Results of the Joint Activity will Include:

- “Solar thermal systems for industrial applications – demonstration projects and case studies”, a colour brochure (information dossier)
- Industry workshops, during the Task duration
- Annual industry newsletters
- Design handbook on solar thermal systems for process heat



List of Task Participants



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