Global view on solar heat for industrial processes – From planning to realization

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Industrial heat has an important role in the global economy

Note: Figure based on 2009 data
Source: Energy Technology Perspectives 2012
Industry demand by temperatures

Source: Solar Payback / IEA / IRENA
Industrial production processes and temperatures

Source: Solar Payback / IEA / IRENA
What are the challenges of a renewables energy supply for industry?

- A hybrid system with different renewable energy sources (solar, biomass, biogas, geothermal, heat pump)

- Energy supply under exergetic consideration

- Matching of variable solar resource with load profiles (e.g. for batch processes or night time supply of continuous processes)

- Energy management system including ICT solutions and integration of waste heat recovery

- Industry as a prosumer; interconnection with district heating networks and embedding waste heat recovery and renewable sources within Industrial parks
IEA Task 49/IV  Solar process heat for production and advanced applications

- Joint Task of Solar Heating and Cooling SHC and SolarPaces
- Co-ordination: AEE INTEC (Christoph Brunner)

**Start:** February 2012  
**Duration:** 4 years  
**Participants:** 15 countries  
**Research Institutes:** 21  
**Universities:** 13  
**Companies:** 22

- All industrial processes up to 400°C.  
- Heat carrier using air, water, low pressure steam or oil  
- All types of solar thermal collectors  

[http://task49.iea-shc.org/](http://task49.iea-shc.org/)
IEA Task on Solar process heat Task 49/IV

Process heat - collectors
(Pedro Horta – Fraunhofer ISE)

Case studies Integrations-equipment Dissemination
(Werner Platzer – Fraunhofer ISE)

Process optimization Process integration Process intensification
(Bettina Muster – AEE INTEC)
IEA Task on Solar process heat Task 49/IV

Process heat - collectors
Collector database together with the European project STAGE-STE

- General requirements and relevant parameters for process heat collectors and specific collector loop components
  - Type of collector
  - Manufacturer
  - Collector model
  - Performance
  - Certification
  - Application
  - Stagnation protection
Overheating prevention and stagnation handling in solar process heat applications

- Overheating prevention and control measures for solar process heat applications
  - Measures for solar process heat applications with non-concentrating collectors
  - Special challenges for concentrating and tracked collectors
- Good-practice examples of realized measures
- References to related literature
IEA Task on Solar process heat Task 49/IV

Process optimization
Process integration
Process intensification
Process optimization, Process integration, Process intensification

- Software Tools for process integration in combination with SHIP
- Minimum energy demand for heat and cold
- Heat exchanger network
- Design of heat storages
- Optimum integration point for RES
- New process technologies
Design rules and production process information

- Integration Guideline and System concepts: How to integrate SHIP Practical design roles for planners and installers

- Wiki Web-Energy efficiency finder
  - Practical information about industrial processes, integration concepts,…
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Case studies
Integrations-equipment
Dissemination
SHIP Database on existing plants

- **253** realized plants with **194,343 m² (111 MWth)**

- Selection by country, application, solar company, collector technology, year of installation, industry,…

www.ship-plants.info
Installations by collector technology

Graph showing the comparison of gross area (m²), thermal power (kWh), and number of plants for different collector technologies:

- Air collector
- Unglazed collector
- Flat plate collector
- Evacuated tube collector
- Fresnel collector
- Parabolic trough collector
- Other or various collectors

The graph illustrates the distribution of installations by collector technology, with the x-axis representing the collectors and the y-axis showing the gross area, thermal power, and number of plants.
Realized plants by Industry sectors

![Graph showing realized plants by Industry sectors.](image-url)
Installations per continent and latitude

Specific useful heat delivery [MWh/m² gross year]

Latitude (distance to equator) [°]

- Europe
- Asia
- America
- Africa

Reduced by factor 5
Installed SHIP plants

- AEE INTEC
- NEP Solar
- SUNMARK
- HIMIM
- Solarwall®
- CSP-F Solar
- modulo solar
- Shenzhen Quir Solar Technology Co. Ltd
- Vicot Solar Technology Co. Ltd
Follow up IEA SHC task under preparation

- The scope of work covers all *low temperature solar radiation technologies* supplying either
  - thermal or photon primary energy
  - for *fluid separation* and *water treatment*
  - in regard to *industrial applications and sewage plants*
Structure of follow up activities

- **Subtask A:** Thermal driven low temperature water separation technologies and NPK recovery

- **Subtask B:** Low temperature solar collectors as separation reactor

- **Subtask C:** Solar Water Detoxification and Disinfection Systems

- **Subtask D:** System Integrations and best practice examples

Source: AEE INTEC
Thank you for your Attention

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