Solar Heat in Industrial Processes

Interview with Christoph Brunner

The IEA SHC Programme wrapped up its work on Solar Heat Integration in Industrial Processes last December. This was a collaborative project with IEA SolarPACES. To get a better understanding of the impact of the Task, we asked Christoph Brunner, the SHC Task 49 Operating Agent, a few questions.

Solar Update (SU): Why was this project needed?

Christoph Brunner (CB): SHC Task 49/SolarPACES Annes IV: Solar Heat Integration in Industrial Processes was initiated to foster market penetration of this rather young technology that has large worldwide potential.

SU: What were the benefits of doing it thru the IEA?

CB: The IEA SHC provides an international network that allows the team of experts to take into account the perspectives from different countries. Participating countries benefit from the specific know-how of each of the other participants. For example, an international project within the IEA SHC may be capable of bringing together a supplier of technology in one country with an interesting market in another country. In this new field of solar thermal application, international cooperation was needed to analyze the potential, to develop new high performance components and adapted system designs as well as to disseminate the results of the joint effort.

SU: What is the most important deliverable of the Task and why?

CB: The Integration Guideline is an important tool because it is provides practical advice to a broad community (solar planners, solar companies, process engineers, etc). They all now have access to a general procedure so that they can identify and rank suitable integration points and solar thermal system concepts when integrating solar heat into industrial processes.

SU: Do you have a success story about Task work being used by an end-user/industry?

Important conclusions from our work on stagnation have been directly applied and tested at the large-scale solar plant at the Göss brewery in Austria. This solar

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brewery produces over 4.5 million pints of beer per year using the power of the sun.

SU: How has your Task work supported capacity and skill building?

CB: Our Task documents and publications are highly relevant for solar thermal professionals, planners, energy consultants, energy auditors, energy managers in companies, researchers and strategic decision-makers. The available wiki-Web on Solar Process Heat is one example of an online information source that reaches people globally to support capacity and skill building. Trainings within international projects, such as Greenfoods, also benefited from our Task results and expertise.

And, our industry workshop in Montpellier, France served as a platform to promote solar process heat as well as the results of Task 49. Specific workshops on solar process heat were also held for the process engineering community to educate them on the process design for solar process heat.

SU: What is the current status of the technology?

CB: The technology is generally ready to be applied, but there are barriers still to overcome. Often, the available space is a bottleneck for the installation of large scale systems due limitations of space on the roof and the ground. This bottleneck can restrict the plant size, which in turn can limit the solar ratio reached by the solar plant. Industry usually likes to see a significant share of the energy demand covered by solar if they are going to decide on a solar thermal solution. Another barrier can be storage. Large-scale plants also need large storages. Here, investment is the issue as well as storage management. New storage technologies on the industrial scale still require a breakthrough and existing large-scale water storages require good management in order to function according to simulation predictions. This is especially important when storages are used for various energy supply sources and for covering various process energy demand. While a lot of different collectors exist that can be used as process heat collectors, there is still an ongoing trend to develop targeted collectors for medium temperature collectors. In terms of the integration of solar process heat in the industrial processes, it is often not easy to make process modifications to allow for an easy integration. Traditional process technologies face the barrier that they are not designed for solar heat supply. In this context, a closer consideration of bringing processes and collectors together is important. And finally, in terms of market penetration, the economic barriers cannot yet be overcome. On the one hand a cost reduction in the production is necessary and on the other hand new approaches are necessary in order to make the financing of large plants possible.

SU: What is the future of the technology – new developments, market, research, policies, etc.?

CB: In the future, the industrial energy supply will be based on hybrid solutions and will be closely linked with regional structures (city, neighboring companies, etc.). If hybrid solutions using renewable energy are to completely meet the industrial supply then innovative and coordinated interaction between solar process heat, heat pumps, biomass and biogas and district is needed. At this point, research demand for tailor-made system solutions for industry sectors and locations is necessary.

To reach higher solar ratios in large-scale industrial projects, new storage technologies will continue to be an important research topic to achieve economically feasible large-scale storage capacities. New collector developments will further focus on the medium temperature level, with a focus on light weight collectors, simple installation procedures and economic potential.

Research on the integration of solar thermal energy in industrial process will focus on new process technologies. On the one hand, it will focus on new technologies for using low temperature heat (e.g., membrane distillation) and on the other hand a more integrated research approach connecting collectors and process technologies. This could be on the direct use of solar radiation in industrial processes that require higher temperatures. This direct use of solar radiation can minimize transmission losses. In some processes the selective use of UV radiation can have positive effects on chemical transformation (photo chemistry). Further, a closer inter-linkage between the collector and process can be achieved on the low temperature level by combining collector and process fluid heating in one unit. On the medium temperature level, simple integration pathways for solar steam solutions will be important to enable an easy connection to the industrial steam supply.

An interesting topic for future work would be to develop new "solar process technologies" for one type of operation, such as drying, This would also meet the needs of the up and coming bio-based industry to find simple and renewable energy solutions for biomass drying.

Finally, as with everything, the economic barriers need to be overcome. Cost reduction and promising financing mechanisms are indispensible to enable further market penetration.

SU: Will we see more work in this area in IEA SHC?

CB: Definately.

SU: Did the Task work on/support any standards?

CB: Yes, recommendations were developed for testing procedures for solar collectors used in solar process heat plants.

Visit the SHC Task 49 webpage to learn more and download reports or contact Christoph Brunner c.brunner@aee.at.