INTERVIEW

# Material and Component Development for Thermal Energy Storage

## *Interview with Wim van Helden*

*The IEA SHC Programme concluded its joint project with the IEA Energy Conservation through Energy Storage (ECES) Programme on Material and Component Development for Thermal Energy Storage (SHC Task 58/ECES Annex 33). To learn first-hand how this Task supported thermal energy storage market development, we asked Wim van Helden, the SHC Task Operating Agent, to share some of his thoughts on this 3-year project.*

### Why is a project like this needed?

**Wim van Helden (Wim):** Thermal energy storage (TES) is an enabling technology. It enables better and more efficient use of intermittent renewable heat sources, like solar thermal, and makes thermal systems more flexible. And not insignificant, thermal energy storage can help to stabilize the electricity grid by power-to-heat. We need the full range of TES technologies as the very different applications ask for tailor-made solutions. The most used technology is sensible water heat storage, but this technology cannot serve those applications that need high temperatures or have volume restrictions or need storage over a long period. For these cases, compact thermal energy storage technologies need to be further developed.

### What is the current status of the technology?

**Wim:** Compact thermal energy storage can be subdivided into technologies using phase change materials, PCM, or thermochemical materials, TCM. For PCM, there are already a number of applications on the market, especially in the built environment. For TCM, there is at the moment only one mass-market application, namely in the zeolite dishwasher. Here, the zeolite technology has the double function of lowering electricity consumption and improving the drying quality of the dishwasher.

In order for both classes of technology to be wider applicable, development work both on materials and on components is needed. In this Task, both material and component experts collaborated to develop new materials, improve testing and characterization methods, and improve compact TES components and system performance.

### Is there one result or outcome that really surprised you?

**Wim:** One surprising result is that there are so many ways materials can be improved. We found that combining materials led to new classes of materials that have better storage capacity on the one hand and are more stable with a longer lifetime on the other hand. And we are probably only just beginning to understand what the possibilities for materials improvement are.

### Do you have a Task success story from an end-user or industry to share?

**Wim:** The zeolite dishwasher is a success story from industry. By using zeolite, which has a very good water vapor uptake while generating heat at the same time, a perfect combination was found between a storage material and a specific application. The material can provide the drying plus heating functionality. The use of this 'strange' material in the dishwasher generated some big design problems for the dishwasher manufacturer, but in the end, they solved all the challenges, and the product has found its way into the mass consumer market.

### How has the Task's work supported capacity and skill-building?

**Wim:** We see that the collaboration between international experts for now over 10 years and in two Tasks with the ECES Programme has led to good professional and personal relations, which were and are the basis for a large number of project collaborations. Over the last five years, there's been an increase in the number of expert groups with young scientists and engineers, initiating a new phase in the collaborations.

### What is the future of the technology – new developments, markets, policies, etc.?

**Wim:** In the past and at the moment, policymakers are strongly oriented towards the electricity part of the energy system, although I see a growing awareness of the importance of heating and cooling for the global energy system. Compact thermal energy storage technologies are best for high-temperature, high volume constraint, long storage period markets. Of these markets, we see that industrial heat and power-to-heat will be the first to be entered by compact TES. One of our Tasks in the near future will be to raise awareness of the potential of compact TES for these applications with the policymakers and decision-makers.

### What were the benefits of running this as an IEA SHC Task?

**Wim:** The grand benefit is definitely the international cooperation of experts. They share their results and experiences on a broad range of technologies and applications, generating a lot of cross-fertilization in the research and development

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work. This would not have been possible with national or even international projects, as these are more bound to pre-fixed goals and timelines and have fewer dynamics. Another benefit is that the mere fact that we have this IEA collaboration is a catalyst for national or international projects, as program owners and reviewers acknowledge the IEA collaboration as a very valuable asset and a marker of quality.

### Will we see more work in this area in the IEA SHC Programme?

**Wim:** In the last year of the Task, we started discussing the why and how for continuing this IEA collaboration. We identified the most important R&D challenges that arose from our work, and at the moment, we are in the so-called definition phase for a follow-up Task. It will again be a joint project between the SHC Programme and the ECES Programme. We hope to get the green light from the two programmes in the first half of next year and start the second half. I am looking forward to the continued collaboration of this group of experts very much.