Thermochemical Fluids in Greenhouse Farming

Thermochemical fluid as support of mechanical cooling

Dehumidification through thermochemical fluids (TCF) plays an important role in supporting mechanical cooling in environments with high humidity and temperature. This application is not limited to greenhouses.

Solar power produced by photovoltaic (PV) systems is used during the day in mechanical air conditioning systems. However, the renewable electricity generated by PV systems does not always align with the demand for cooling in very hot regions, where additional cooling is needed in the evening and nighttime. Storing electricity can be very expensive, and it is much more economical to store heat and cool energy instead of using batteries or related systems. Thermo-chemical energy storage can support mechanical cooling.

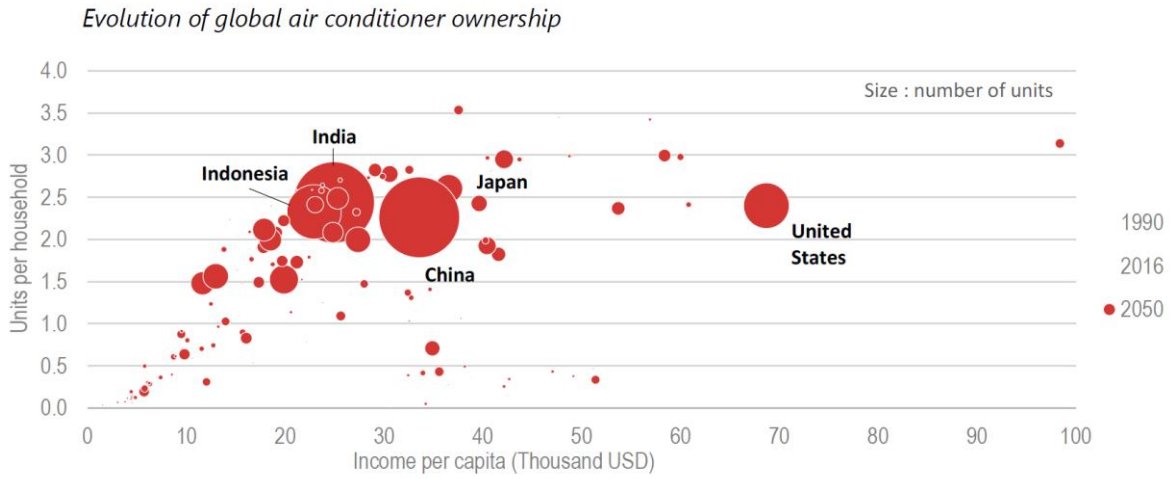

Figure 1. ***Evolution of global air conditioner ownership from 2016 to 2050 [Source: IEA Special report on Cooling; Eurosun 2018]***

The capacity of the mechanical cooling can be designed to produce the required cooling during the 24 hours within the sunny hours. The excess cooling produced during the day can be stored and released at night. Besides cooling, mechanical cooling units also produce heat, which can be used for the regeneration of the thermo-chemical fluid, which is then used for air dehumidification. In very hot and humid regions, mechanical cooling systems must first cool the ambient air to the dew point to remove the humidity, and then the temperature is raised again to the desired level. Reducing humidity through TCF also means reducing the total electricity demand, which includes the size of the mechanical cooling machines and the surface area of the PV systems connected to the cooling machines. Furthermore, dehumidifying the air allows the use of evaporative cooling as a supplementary system, especially during the night when temperatures are slightly lower than during the day, thus reducing the size of the cool storage.

TheGreefa project has received funding from the European Union's Horizon 2020 Research and Innovation Program under grant agreement No 101000801.