Humidification dehumidification (HDH) is a promising method for decentralized, small-scale desalination because of its simple system design and compatibility with low-grade energy such as Solar thermal collector. As the HDH working temperature is between 25-95°C, it is highly compatible with mid-temperature solar thermal collector. One of the best mid-temperature solar thermal collector is external Compound Parabolic Concentrator (XCPC) which has two major advantages: it is non-tracking (no electricity consumption) and cheap maintenance. The distribution difficulties and high capital cost of the centralized water production has made decentralized water production more reasonable and vital especially in rural area and remote county such as Central Valley, CA which is far from seawater. The HDH system combination with XCPC can provide high-quality drinking water (10 ppm TDS) with renewable and cheap energy. Also, in this system, as fresh water and brine are completely divided by evaporation, brine can easily be collected and dumped out of the system.

Nature uses air as a carrier gas to desalinate seawater by means of the rain cycle, in which seawater is heated by solar irradiation and evaporates into the air to humidify it. The humidified air rises and forms clouds. Eventually, the clouds dehumidify as rain over the land, and rainwater can be collected for human consumption. The man-made version of this cycle is called the HDH desalination cycle.

External compound parabolic concentrator is range of mid-temperature thermal collector which can achieve at 200°C with 50% efficiency without any tracking or moving part. This ability easily directly the system heat up water in the heat exchanger up to 95°C and be used in the HDH cycle to produce fresh water.