



Open Absorption Cycle Device for Combined Dehumidification, Water Heating and Space Cooling

Energy-Efficient and Compact Unit Is Environmentally Friendly

This open absorption cycle device for compact, low-cost, combined water heating, dehumidification, and space cooling consumes less energy and uses non-corrosive, non-toxic ionic liquid that does not crystallize. A large percentage of U.S. electricity is spent heating water and cooling, heating, and dehumidifying buildings. The average household with a standard efficiency model water heater spends more than \$500 per year on water heating alone. One attempt to reduce these energy bills is the use of the absorption cycle, which can capture and repurpose low-grade heat to provide dehumidification, water heating and building cooling. However, existing absorption technology is not scalable or feasible for residential water heating. Researchers at the University of Florida have developed a compact, high-efficiency, open absorption cycle device capable of dehumidification, water heating, and evaporative cooling. The proposed system dehumidifies the air and uses its energy for water heating. The condensed water can subsequently be given back to the dried air in an evaporative cooling process; or, when only dehumidification is desired, it can simply be drained from the system. This unit can utilize the A/C latent load for domestic water heating, resulting in significant energy savings for water heating and A/C. The system can control humidity in residential buildings, resulting in comfort and significant health benefits.



Application

Combined dehumidification, water heating, and evaporative cooling device for energy efficient, green buildings

Advantages

- Consolidates three devices into one machine, increasing efficiency while reducing the space and cost required for these three operations
- Eliminates need for harmful refrigerants, making operation more environmentally friendly
- Can be driven by waste or solar heat, saving fuel and reducing carbon emission
- Compatible with current building standards, allowing this technology to be retrofitted into existing buildings

Technology

At the core of the system is a compact open absorption cycle in which the water vapor releases its latent heat into the absorber. The released heat is subsequently transferred into the process water that cools the absorbent. The solution is generated in the desorber where it is heated by a heating fluid. The water vapor

Technology (cont.)

generated in the desorber is condensed and its heat of phase change is also transferred to the process water. The system is applicable to three of the five climatic zones in the continental United States: the mixed-humid, hot-humid, and marine zones that encompass 54 percent of U.S. homes. Under typical operating conditions, the system expects to deliver 1.63 units of heat to hot water for each unit of heat supply, while reducing the A/C load by 0.63 units. The primary energy factor is about 1.14.

The Inventors



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