TECHNOLOGY

Separate Sensible and Latent Cooling for Absorption Heat Pumps

OVERVIEW

Background:

This invention pertains to water-lithium bromide (LiBr) absorption heat pumps for cooling and dehumidifying air in buildings. Currently, an air-cooled water/LiBr absorption heat pump would be incapable of operation at ambient temperatures above a critical value due to crystallization of the salt solution. The relatively low value of this critical temperature is a major barrier to the commercialization of air-cooled absorption heat pumps, since the ambient temperature regularly rises above the critical temperature in most climates that require significant amounts of building cooling.

Innovation:

Researchers at the University of Maryland have developed an innovative technique that allows an absorption heat pump to operate at high absorber temperatures (such as those that occur with air-cooling at high ambient temperature) without crystallization of the salt solution. To accomplish this, a novel air flow configuration is proposed, which incorporates a small vapor compression system (VCS). The VCS provides most of the latent cooling for the space, allowing the absorption heat pump evaporator temperature to be higher. Since the evaporator temperature determines the absorber pressure, the absorber operates at higher pressure. At a higher absorber pressure, a lower mass fraction of salt is required to absorb refrigerant vapor from the evaporator. This lower required salt mass fraction is able to resist crystallization up to much higher absorber temperatures.

Advantages:

-- Unique design lowers the condenser temperature of the VCS, resulting in a very low electricity requirement to run the system.
-- Only a small portion of the air is cooled to saturation—this key distinction allows the absorption heat pump to operate at much higher temperature than in a conventional cooling system (one without separate sensible and latent cooling).
-- The lower required salt mass fraction is able to resist crystallization up to much higher absorber temperatures.
-- The proposed system requires only a small VCS to provide a fraction of the total cooling, meaning lower system installed cost.

Applications:

Air-cooled water/LiBr air conditioners for residential or commercial applications. It will be possible for these to be produced in the near term, since all of the required technology and components already exist.

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Additional Information

INSTITUTION

University of Maryland, College Park

PATENT STATUS

Patent(s) pending

LICENSE STATUS

Available for exclusive or non-exclusive license

CATEGORIES

- Industrial Processing

EXTERNAL RESOURCES

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