

Nonconfidential Summary Disclosure



UM 9460: Vacuum Sweep Dehumidification (VSD) for Building A/C and Drying

THE TECHNOLOGY

This technology utilizes a water selective membrane module design for improved water vapor removal from ambient pressure gases. When used in an A/C system, VSD reduces overall energy usage through improved dehumidification of the feed gas. This efficient membrane module design does not suffer the inefficiencies of other ambient pressure dehumidification membrane systems typically caused by low driving forces across the membrane.

For a standard air conditioning feed (ARI 80/67) with a target humidity reduction of 2 g/ Kg-DA, this technology removes more humidity and uses less energy than cooling coils attached to refrigeration cycles that have a COP of 3. Additionally, VSD allows for the system to cycle on/off as needed without a sudden and uncomfortable humidity level spike.

With a scalable design and versatile placement opportunities, VSD can be used in new construction or retrofitted into existing commercial, residential, and industrial A/C systems for optimal efficiency. VSD is easier to implement than existing hybrid humidity control systems and requires less feed-back piping. VSD does not utilize sorbents nor does it form liquid condensate during dehumidification.

Early research indicates energy savings of up to 86% when designing an A/C system to incorporate membrane dehumidification, such as VSD, before an evaporative cooler. In addition, VSD improves energy efficiency in both residential and commercial drying applications (clothing and material dryer systems). The technology is also capable of producing subfreezing dew points in some commercial applications such as cold storage systems.



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COMPETITIVE ADVANTAGE

A/C accounts for up to nearly 50% of a building's total energy consumption. VSD Prototype modules have indicated energy savings of 10-35% when combined with A/C systems using refrigeration cycles (VSD energy savings are directly related to the feed humidity). With increasing energy efficiency and air quality standards, early prototypes suggest this technology offers a cost effective solution to decrease energy usage of existing building A/C systems, commercial and residential drying systems, and cold storage systems.

DEVELOPMENT POTENTIAL

Proof of concept testing has been performed in the laboratory. We are now seeking a development and commercialization partner for the optimization of the technology for production. A detailed technical dossier is available under a NDA.

PATENT STATUS

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KEYWORDS

Membrane Module, Humidity Control, Air Conditioning, Dryer, Dehumidification

PUBLICATIONS

"Membrane module design, constructions, and testing for vacuum sweep dehumidification (VSD): Part II, prototype performance vs variations in feed conditions." Journal of Membrane Science. Volume 611. 2020.
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"Membrane Module Design, Construction, and Testing for Vacuum Sweep Dehumidification (VSD): Part I, Prototype Development and Module Design. Journal of Membrane Science." Volume 576. 2019
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