

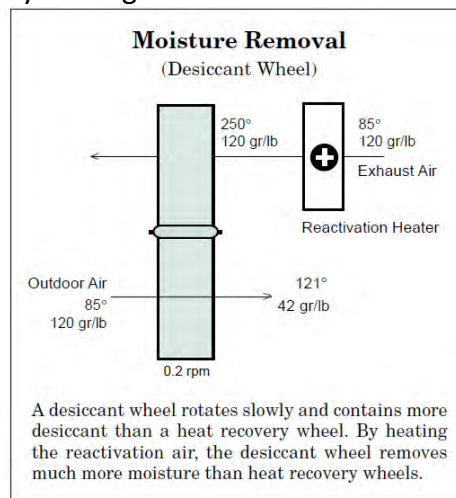
BRIEF DESCRIPTION

Desiccant HVAC systems remove moisture from outdoor ventilation air before it enters a conditioned space. A wheel that contains a desiccant turns slowly to pick up humidity from incoming air and discharge that humidity to the outdoors. A desiccant system can be combined with a conventional air conditioning system in which the desiccant removes humidity and the air conditioner lowers air temperature. Desiccant materials can be dried, or regenerated, by adding heat.

Applications

All types of buildings

- Best circumstances include: (1) need for humidity control, (2) high latent load, (3) low thermal energy cost versus high electric energy cost, and (4) need for dry cooling coils and duct work to avoid microbial growth.



Active Desiccant Wheel

(Source: Greening Federal Facilities)

Design Notes

- Desiccant systems are typically paired with Energy (Enthalpy) Recovery Ventilation or Heat Recovery Ventilation equipment.

References/Useful Resources:

[1] Greening Federal Facilities: An Energy, Environmental, and Economic Resource Guide for Federal Facility Managers and Designers. <https://www1.eere.energy.gov/femp/pdfs/29267-0.pdf>

[2] An Assessment of Desiccant Cooling and Dehumidification Technology.

http://www.ornl.gov/sci/engineering_science_technology/eere_research_reports/thermally_activated_technologies/desiccant_systems/performance_evaluations/ornl_con_309/ornl_con_309.pdf

[3] Desiccant Cooling: State-of-the-Art Assessment.

http://www.ornl.gov/sci/engineering_science_technology/eere_research_reports/thermally_activated_technologies/desiccant_systems/performance_evaluations/nrel_tp_254_4147/nrel_tp_254_4147.pdf

Energy Savings

Cooling Energy

- Energy is recovered from conditioned air that is normally exhausted from buildings. Potential annual energy savings are estimated at 20 to 30 percent, compared to conventional cooling systems.

Dehumidification

- Under low-sensible load and high-latent load conditions, dehumidification cost is reduced.

Social Benefits

Thermal Comfort

- Dehumidified air leads to greater comfort.

Microbiological growth

- Maintaining lower humidity levels prevents moisture, mildew, and rot damage to building materials.

Guiding Principles¹

Optimize Energy Performance (Energy Efficiency)

- Reduce the energy use by 30 percent compared to the baseline building performance rating per ASHRAE Standard 90.1-2007.

Ventilation and Thermal Comfort

- Meet ASHRAE Standard 55-2004, Thermal Environmental Conditions for Human Occupancy, including continuous humidity control within established ranges per climate zone, and ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality.

Associated LEED Credits (NC 2009)²

Optimize Energy Performance (Energy Efficiency)

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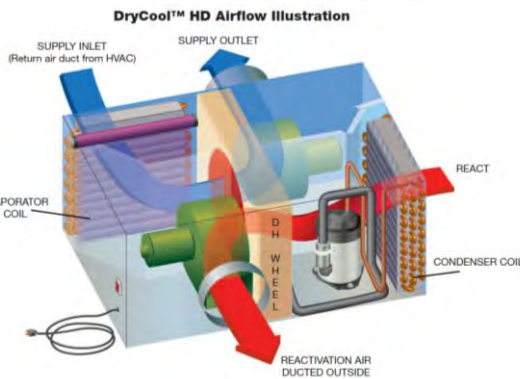
Thermal Comfort – Design

- Provide a comfortable thermal environment that promotes occupant productivity and well-being.

¹ Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings
www.wbdg.org/pdfs/hpsb_guidance.pdf

² USGBC LEED Reference Guide for Green Building Design and Construction, 2009 Edition

Product Images

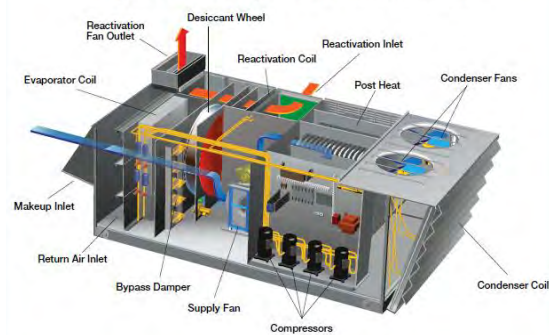


Residential application

(Source: <http://www.munters.us/en/us/Division-start-pages/Munters-DH-Division/Dehumidification/>)



DryCool Packaged Unit Illustration



Commercial application

Components

General: Desiccant wheel, Heat exchanger (Thermal wheel, Heat pipe, Refrigerants)

Solid System: Fans, Heating System, Filters, Indirect evaporative cooling system, Gas fired boiler, Circulating pumps

Liquid System: Conditioner unit, Conditioner cooler, Regenerator, Regenerator heater, Level control, Filter screening, Freestanding pump assemblies, Make up water system, Conditioner fan, Regeneration fan

Cost Range

For large, active desiccant systems, the cost is usually about \$6/cubic feet per minute (cfm), while smaller units (less than 5,000 cfm) may cost up to \$8/cfm. Installation costs vary according to specific site requirements.

Product Types

Active desiccant systems

- Active desiccant wheels use heated air for regeneration.
- A source of waste heat from other building operations can regenerate an active desiccant system.

Open-Cycle Systems

- Open-cycle systems are used for most commercial and industrial applications.
- Either solid (no corrosive fluid involved in system operation) or liquid (easy to pump to the desired locations) desiccants can be used.
- Compared to recirculation mode, ventilation mode (using 100% ambient air) is suitable for the areas where large amounts of fresh air are essential.

These TechNotes are intended to provide general information for the consideration of design strategies. The TechNotes should NOT be interpreted as an endorsement of any specific product or technology.

Desiccant HVAC Systems

[PRODUCT AND ECONOMICS]

Vendors

Munters DH Division

<http://www.munters.us/en/us/Products--Services/Dehumidification/>

Desert Aire

<http://www.desert-aire.com/>

Trane CDQ™ Desiccant Dehumidification

<http://www.trane.com/COMMERCIAL/DNA/View.aspx?i=1070>

Warranty

2 – 5 years

Info

Code

None

Restrictions

DESICCANT SYSTEMS³

A. Solid Desiccant System

The unit shall be a complete, factory assembled and tested system, suitable for outdoor installation. Each unit shall produce a capacity as rated in accordance with ANSI/AHRI 210/240. It shall be designed for either curb mounting or structural steel support. The unit shall include the following components:

1. Desiccant Wheel
2. Thermal Wheel (or heat pipe)
3. Supply Fan
4. Regeneration Fan
5. Regeneration and Process Heating System
6. Filters
7. Indirect Evaporative Cooling System
8. Gas fired Boiler (optional)
9. Circulating pumps (boiler, evaporative cooling)
10. Refrigeration Section (optional) for pre- and/or post-cooling

B. Liquid Desiccant System

The unit shall be a complete, factory assembled and tested, system suitable for outdoor installation. Each unit shall produce a capacity as rated in accordance with ANSI/AHRI 210/240. It shall be designed for [curb mounting] [structural steel support]. The unit shall include the following components:

1. Conditioner Unit
2. Conditioner Cooler
3. Regenerator
4. Regenerator Heater
5. Level Control
6. Filter Screening
7. Freestanding Pump Assembly
8. Make Up Water System
9. Conditioner Fan
10. Regenerator Fan

³ Specification language modified from the Whole Building Design Guide's Federal Green Construction Guide for Specifiers. Accessed August 2010 at http://www.wbdg.org/ccb/browse_org.php?o=84 (last updated January 2010).