

## Desiccant technology keeps indoor air fresh, healthy, comfortable

Indoor air quality (IAQ) concerns are spurring interest in desiccant systems to maintain indoor air at comfortable and healthy humidity levels. ORNL is working with several research partners to develop and test improved desiccant equipment as a part of integrated building heating, ventilation, and air-conditioning (HVAC) systems.

Large amounts of fresh air are needed to ventilate modern buildings. Conventional HVAC equipment cannot control the humidity fluctuations that result from higher ventilation rates and set-point temperature control. Uncontrolled humidity results in outbreaks of “sick building syndrome” among occupants and causes mold and mildew that damage structures and furnishings.

Desiccant systems use a moisture-absorbing material to dehumidify ventilation air. Typically, a system employs a lightweight honeycomb or corrugated matrix wheel whose surfaces are coated with a desiccant. The wheel rotates between a stream of incoming fresh air and a heated air stream that dries out the saturated desiccant. The dehumidified air is fed into the building’s HVAC system; the moisture removed from the desiccant leaves the building in an exhaust stream.

Desiccant systems usually supplement conventional HVAC systems. Given dry air to cool or heat, cooling/heating

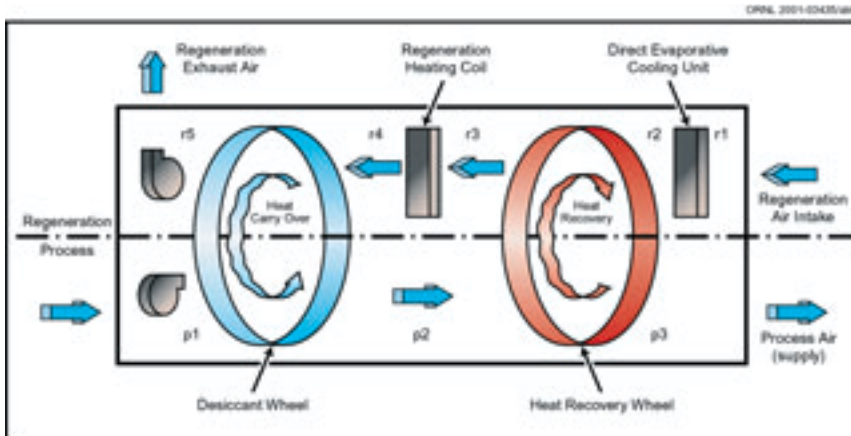
equipment does not have to work as hard or use as much energy. Smaller, less expensive HVAC units can be installed, and utility operating costs are reduced.

ORNL staff are conducting R&D on desiccant-based equipment in several areas, including testing equipment both in the laboratory and in buildings, and working with industrial partners that are incorporating desiccant technology into HVAC systems.

ORNL is also working with Georgia Tech Research Institute, Georgia State University, and SEMCO, Inc., on a field study to verify the effects of

humidity control and continuous ventilation on school IAQ and the health of schoolchildren. Building on a previous assessment ([www.ornl.gov/ornl/btc/desiccant.html](http://www.ornl.gov/ornl/btc/desiccant.html)), the field study will be used to develop recommendations and HVAC design considerations for improving IAQ in large buildings.

Contact: Jim Sand, 865-574-5819, [sandjr@ornl.gov](mailto:sandjr@ornl.gov)  
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Schematic of the operation of a desiccant dehumidification system

## Microturbine demonstrations in the American heartland

The National Rural Electric Cooperative Association (NRECA), DOE, and the Electric Power Research Institute are sponsoring a nationwide field study of power-generating microturbines at nine rural electric cooperatives in the United States. DOE is funding ORNL to help analyze the field data.

The goal is to determine the operating performance of 30- to 75-kW microturbines in various rural cooperative settings (e.g., applications, climates, interconnection and local siting requirements, installation setups, and operating fuels). Maintenance and repair data also will be collected on the microturbines to assess their reliability.

Where possible, exhaust heat will be recovered from the microturbines to increase their overall efficiency. A microturbine with a recuperator and no additional waste heat recovery has a maximum efficiency of around 20 to 25%. Using the exhaust to fire a thermally activated technology such as a desiccant dehumidification unit or to heat water can boost overall efficiency to 70% or more. [ORNL’s Cooling, Heating, and

Power Integration Laboratory (*Highlights* issue 2, 2001) is researching how best to integrate thermal recovery and thermally activated equipment.]

### Microturbine field tests at the nine rural cooperatives.

Cooperative	Location	Microturbine	Application	Thermal recovery
AVEC	Anchorage, AK	30-kW Capstone	Power at warehouse and office	Space heating
Arkansas Electric	Augusta, AR	75-kW Honeywell*	Power at electricity-generating facility	Freeze protection for plant boiler
Associated Electric	Kearney, MO	45-kW Elliott	Power for city water well pumps	TBD
Cass County Electric	Fargo, ND	30-kW Capstone	Power for domestic water heating at hotel and convention center	Pre-heat hot water for gas-fired boilers
Chugach	Anchorage, AK	30-kW Capstone	Power at warehouse and office	TBD
East Kentucky Electric	Winchester, KY	60-kW Capstone	Power at electricity-generating facility	TBD
Kotezebue Electric	Kotezebue, AK	45-kW Elliott or 60-kW Capstone	Power plant and later a commercial customer	TBD
Tennessee Valley Authority	Muscle Shoals, AL	30-kW Capstone	R&D office building	None
Tri-State G&T	Brighton, CO	70-kW Ingersoll-Rand	Industrial greenhouse	Preheat plant irrigation water

TBD = to be decided.

\*Honeywell is closing its microturbine manufacturing facilities and will buy back purchased units, so this unit will be replaced with a microturbine from another manufacturer.

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