



# Novel CHP Technology Wins R&D 100 Award

## Trane CDQ™ Enhances Dehumidification Performance of Traditional Air-Conditioning Coil

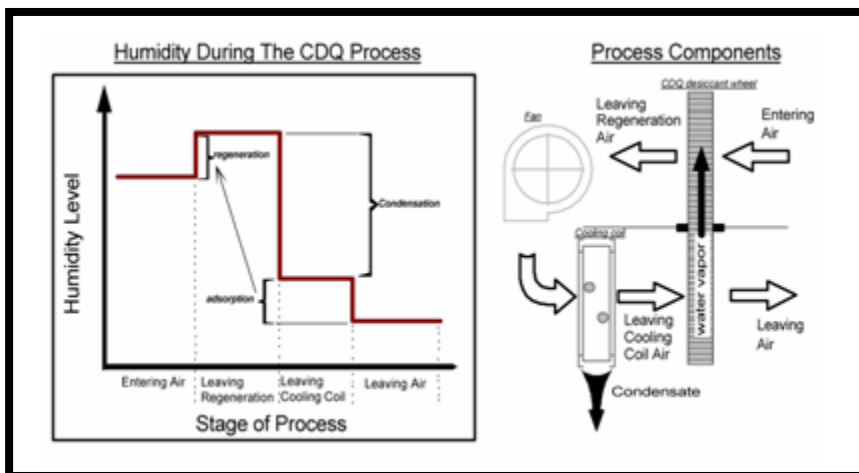
In June 2006, ORNL and Trane Company won an R&D 100 Award for their development of the Trane CDQ™ (Cool, Dry and Quiet) Desiccant System. The system uses an Integrated Active Desiccant Wheel to enhance the dehumidification performance of a traditional air-conditioning cooling coil.

### Background

Most rooftop air conditioning units cannot independently control temperature and humidity to standards required for modern, healthy buildings. This limitation in technology has created a tension between comfort, air quality, and efforts to reduce energy costs. Increased delivery of fresh, outdoor air can increase indoor humidity, prompting occupants to lower thermostat settings. In order to meet humidity requirements, oversized vapor-compression systems may be operated for long cycles at low temperatures resulting in a reduction in system efficiency and the need for expensive reheating of the very cold, dehumidified air in order to achieve comfort. This cycle occurs in thousands of buildings across the country everyday, putting an unnecessarily high burden on the electric grid during peak usage hours.

### Technology

The desiccant wheel captures water vapor that remains in the air leaving the cooling coil of a conventional air-conditioning system. The wheel then slowly rotates to be regenerated by return or mixed air upstream of the coil – using no additional heat. The activated



*The  
CDQ™  
Process*



alumina desiccant was chosen especially for this application because it regenerates at low temperatures. The ability of the wheel to adsorb water vapor decreases significantly when in contact with incoming return or mixed air of less than 80% relative humidity; however, the desiccant wheel exhibits high adsorption capabilities when exposed to the air leaving the cooling coil with a typical relative humidity of 90% or greater.

The Trane CDQ™ can be used with existing AC equipment. The technology is ideal for hospital operating rooms, archive storage, museums, libraries, or other buildings where temperature and humidity control are critical. Trane began sales and installation of the CDQ™ in early spring 2005 and will soon incorporate the technology into rooftop applications designed for use by schools, retail stores, restaurants, and supermarkets.

### Benefits

- **Efficient, independent control of humidity, temperature, and air quality**
- **Easily retrofitted**
- **Reduced operating costs**
- **Increased comfort for building occupants**



A conventional air-conditioning unit being installed on a standard curb mount fitted with the Trane CDQ™.

### Future Work

Simulations are currently being used by industry to compare the Trane CDQ technology to typical alternative moisture control methods. A comparative study of the CDQ™, a free-reheat configuration, and heat pipe enhancement on the same system is desired to serve as a “real world” validation of the product. To examine energy use using a free-reheat configuration, the CDQ rooftop unit can be operated without the desiccant wheel in place, with hot gas bypass providing free reheat. The reheat coil could be isolated and removed from the air stream when not in use. Likewise, a set of heat pipe coils could be built for insertion in place of the wheel, and the systems could be operated under heat pipe enhancement.

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